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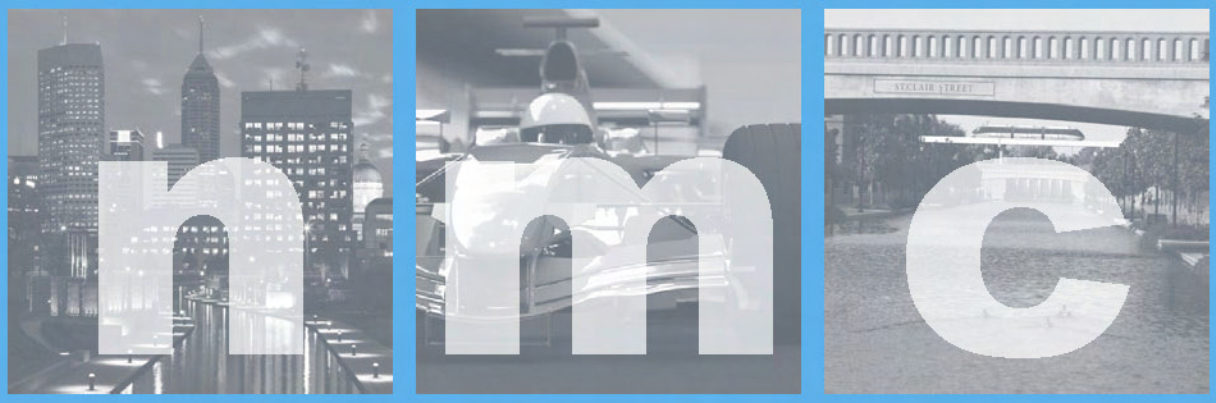

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The Arts Metaverse in Open Croquet: Exploring an Open Source 3-D Online Digital World

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Many virtual worlds offer compelling UI and interactive functions that engage and even absorb the visitor and are, in a best case scenario, supported by a grid-based and networked computing environment. Recent software developments open the opportunity for users, and most significantly learners to create and construct their own immersive and virtual, real-time learning environments. At the University of British Columbia students in Art History, Classical Studies and First Nations Studies may now navigate through virtual learning environments while annotating, critiquing, and amending them in collaboration with one another. One of the key goals of the project is to utilize game-like technology and make this technology freely available in an academic context. We envision the platform to develop over time to transform networked communication into dialogue. Presently three-dimensional virtual realities (3D VRs) are built to shed light on the core values of material culture ranging from Ancient Europe and the Near East to the aboriginal civilizations of the Americas.

Many virtual worlds offer compelling user-interface and interactive functions that engage and even absorb the visitor and are, in a best case scenario, supported by a grid-based and networked computing environment. Recent software developments open the opportunity for users, and most significantly learners to create and construct their own immersive and virtual, real-time learning environments. At the University of British Columbia students in Art History, Classical Studies and First Nations Studies may now navigate through virtual learning environments while annotating, critiquing, and amending them in collaboration with one another. The original project, "Ancient Spaces" was conceived and designed in 2003 as a platform for student-led development of virtual worlds, aimed at the teaching and learning of archaeology and cultural studies in classical (Greek and Roman) history. One of the key goals of the project was to produce game-like technology for what is now known as "serious gaming," and make this technology freely available in the public domain (open-source it), so that any academic or member of the public could modify it, and secondly create a virtual learning environment that would allow students to control content creation. We envisioned that as the platform developed over time, interactions might include story-telling, oral culture, social structure, conversation, etc. (see http://www.ancient.arts.ubc.ca). These reconstructions were to shed light on the core values of material culture in a wide range of global cultures, ranging from Europe to the Near East and the aboriginal civilizations of the Americas.

The project was designed initially as an aid for teaching and learning in departmental curricula by presenting students with an alternative way of experiencing the ancient world, and allowing them to participate actively in its reconstruction. Ancient Spaces provided students with the opportunity to engage in experiential learning. and also aided greatly in the acquisition of information technology literacy among Arts students. The project also sought to provide digital forums for peer-to-peer and teacher-to-student academic discourse, and to promote the development of multiple learning channels for Humanities students. In this spirit, Ancient Spaces aimed to enable students and non-academics to join researchers in creating and sharing knowledge beyond the walls of the university. We hoped to create a simple interface and technology for sharing, qualifying, and evaluating interactive three-dimensional content.

First Steps: Ancient Spaces

Ancient Spaces has been student-driven from the beginning and has relied on open-source software. The idea for a student-built, "massively multiplayer" world based on classical antiquity was put forward by Michael Griffin, then an undergraduate student in UBC's Department of Classical, Near Eastern, and Religious Studies in January 2003, and an early version of the software was written in the open-source library CrystalSpace (focusing on the Palace of Minos at Knossos). In July 2003, a cross-disciplinary group of students drawn from Classics and Computer Science, all with ties to the Faculty of Arts' Instructional Support and Information Technology (Arts ISIT), initiated the project. The three co-founders of the project were Michael Griffin, Dieter Buys, and Jo McFetridge. Using a 'mode' of a gaming platform called Unreal Tournament 2004 these students demonstrated that traditional gaming technology could be put to use to create a realistic and explorable 3D model of the ancient Athenian Acropolis. Core goals of the original project were:

- To generate an infrastructure that enables non-expert users to model key aspects of the ancient world.
- To educate faculty in the use of these learning objects for creating cinematic and interactive illustrations of key historical events in the western tradition.
- To engage students in the active use of this technology to complement projects in those same curricula.
- To use this infrastructure to create simulations of the social and religious context of daily life in the major centres of the ancient Mediterranean world.

Some Outcomes

In 2006 Ancient Spaces has been opened to include the First Nations Studies Program and the Department of Art History, Visual Art and Theory. Select new courses are complemented by Ancient Spaces and in true constructivist spirit pass on an improved learning environment for the next cohort of students, affording undergraduates a leading role in experiencing new (pedagogical) approaches that approximate principles of engaged participation and distributed cognition. Subsequently and in collaboration with the First Nations Studies Program at UBC and with Wilp Wilxo'oskwhl Nisga'a in the Nass Valley, considerable focus lay on the delivery of a large course entitled "Landscapes and Architecture of Northwest Coast First Peoples." In this course, students used custom-designed 3D software to reconstruct a Nisga'a village in 3D from a variety of disciplinary perspectives, including Architecture, Landscape Architecture, Geography, Art & Cultural History, and First Nations Studies. With the support of Wilp Wilxo'oskwhl Nisga'a, a first nations People on the North West Coast of British Columbia, a team of UBC students and researchers received funding to pursue the reconstruction of an ancient Nisga'a village in 3D, with special focus on the relationship between the architecture and the social structure of the village. The goal of the initiative was to develop content and technology to enable students in UBC's First Nations Studies Program and members of the Nisga'a community to log in to a common network and transform the three-dimensional space in dialog. In practice, each student focused on the creative process of gathering research to generate an accurate photo-realistic three-dimensional image from a two-dimensional site plan or written report. The environment created, now accompanied by an oral or written report on the decisions made in converting descriptive data to a fully explorable virtual space, served as a term project. Combining projects, each cohort of students generated a large and compelling but static environment.

Using the Ancient Spaces Editor, the same environment can be transformed and different theories of reconstruction explored, demonstrating the dynamic nature of archaeological knowledge. This approach allowed student creations to be shared with First Nations Elders and knowledge-holders who did evaluate student work at the end of the semester and suggested further possible development.

In another course a large, interactive 3D reconstruction of Machu Picchu in Peru was deployed simultaneously in the custom-designed Ancient Spaces platform and in "Second Life" (a 3D virtual environment). Other early projects included the reconstruction of key structures of the pre-dynastic Egyptian Hierakonpolis, and a living structure of Deir el-Medina. A model of the Temple of Jerusalem for delivery in first-year Religious Studies courses and the reconstruction of core structures of the Athenian Agora, continuing the original focus on the Acropolis of Athens, rounded out the early years of course delivery into an immersive virtual environment. Overall, the Ancient Spaces environment was used in 5 different departments reaching about 500 UBC students.

Student-Centered Active Learning: The Student as Bricoleur

In place of the in-class "slide show" approach to the study of antiquity, art history and archaeology, the Ancient Spaces 3D modeling program asks students to engage in investigative practices, work with field data, interpret the forensic evidence, and weigh competing theories. Students gain a better understanding of the ways in which a lost culture's architectural choices can shed light on its social dynamics and core values. Working from forensic evidence, including data from aerial photos, satellite images, surface surveys, topographic maps, structure measurements, and what is known as the "material culture assemblage" e.g. the accumulation of shards (pottery, stone tools, and so on) found on the occupation layers of the site, students employing the Ancient Spaces 3D model editor are able to "learn by doing"—or, more precisely—"learn by reconstructing" key architectural and artistic environments of the ancient world (Lombardi 2006). Quite clearly, the nature of the study of society and culture in the Humanities and Arts changes if you put students inside their subjects by immersing them in a virtual environment and giving them the freedom to make their own discoveries based on an interactive model of learning.

Teaching the Conflicts

Part of the project's underlying philosophy and a source of its sustainability is the large role given to student modelers, who gain experience in interpolating their designs from the available data and defending their decisions when they choose one possible solution (or perspective) over another. Students are exposed to the actual research process, during which professional researchers often draw very different conclusions about a site and its inhabitants from the same archaeological evidence. By supporting students in the production of good quality models it makes it easier for students to demonstrate their knowledge of varying theories by producing four or five different replicas of the same site reflecting interpretive conflicts in the field.

Persepctive Taking

The adoption of digital technology in the Arts, Humanities and Social Sciences encourages interactive participation in immersive experiences and thereby enables questions of representation, perception, and cognition in relation to the production of meaning. A virtual reality simulation in this context might offer profound insights into "how the world is … conceptually organized and integrated" (Castricano 2005). With the "inexplicable interaction" between mind and matter manifest in the interaction between self—at once inside and and outside a virtual environment—the potential to challenge social and cultural explanatory models that are based on classical subject-object distinctions is beckoning. By encouraging an immersive experience with the possibility of experiencing multiple perspectives, a virtual learning environment such as the Arts Metaverse might help to obviate the "outside-view predicate" (McPherson & Rabb, 2001).

The Arts Metaverse Project: The User as the Architect

The enthusiasm for digital collaboration and social networks has swept web applications, such as Second Life or Facebook, to enormous popularity. The technical and social architecture of these applications allows participants to define and develop plug-ins thus supporting some aspect of customization. In this transition " Engagement 2.0," characterized by a focus on the individual to connect online with many, is replaced by " Engagement 3.0," best characterized as a user/content driven online environment that is owned and designed by a community. Users become architects and owners of a networked environment, and it is their contribution that defines their reciprocal relationship and not the technological infrastructure that underlies it.[1]

To move from the somewhat static modeling of early virtual environments such as our own "Ancient Spaces" into a truly immersive, interactive and networked space, we adopted in late 2006 a new technical platform, Croquet.[2] Croquet is a "combination of computer software and network architecture that supports deep collaboration and resource sharing among multiple users within the context of a large-scale distributed information system. We may ask the questions to what extent a participatory culture as defined by co-creation, expression of self in participation, multimodal interaction, affinity-based self-organization and distributed cognition may contribute to a new understanding of what a social & networked environment looks like? And further: how do we translate these features into a visually compelling environment and stay congruent with the basic tenets of a self-organizing, autonomous community?[3]

If we accept as a premise that the human brain cannot realize its design potential unless it is immersed in a distributed communication network, that is, a culture, during its development (Merlin 2007), we concede that there is a yet undetermined capacity of the brain to assimilate cultural input and to accommodate it in new patterns of activity (neuroplasticity). If we grant that this activity is social, a networked online environment, such as Croquet, can be understood as an ecology and a fertile ground for expanding the collective mind of its community.

The introduction of the OpenCroquet platform as a technological but also visual metaverse affords us a first look at a radical peer-to-peer, networked, virtual environment that responds to the challenge of providing a collaborative online space and unlocks what John Seely Brown (2007) calls a "networked imagination." In an ironic inversion, "objective" technology, a prototypical seed that germinated from the subject-object split of an enlightenment philosophy and propagates in its final manifestation a culture of individual achievement and self-centredness, provides now the basis for engagement in a participatory and somewhat egalitarian networked environment. Technology now supports an emerging culture of community-based, self-organising and engaging social networks, with very fuzzy boundaries, instead of reinforcing delineations of in/out or self/other.[4]

Some Observations and Musings on "Reading" the Real and the Virtual World

We have now a 3D virtual learning environment serving in a variety of disciplines to enable digital "storytelling" or immersive "narratives" in which the participants "enter" a site or even a historical place, thus giving new meaning to the idea of the reader/spectator as a creative part of a cultural text. Is this the beginning of Learning 3.0? This question is loaded and probably more complex than we could have imagined when we began to browse the web a mere dozen years ago. If cultural narratives (that is, how culture is made *into* narrative, including oral culture) are a form of visualization, then we can employ new media technology to explore the state of the image as narrative in a postmodern world as well as the relationship the image has to subjectivity and to the production of knowledge. New media technology promises to enhance our understanding of how meaning is constructed visually and experientially.

Will a Metaverse, and our experience of living in two worlds, help us to improve our own understanding on how "particular institutions, media, texts, discourses and disciplines are inhabited, haunted, even constituted by what they cannot tolerate, by what they cannot acknowledge, by what is alien, external, contaminatory" (Royle, 1995)? And are we passing a new threshold of consciousness by expanding our way of thinking and by accepting our being in two (multiple) worlds, or are we falling back in yet another " dialectic of enlightenment" because we fail to acknowledge how virtual world and live-world are but one? Where are the boundaries between innerspace and interface? What are the manifestations of a participatory culture in the social and political realm? Could this truly participatory culture be understood as the beginning of radical social change?[5]

1 Presently Arts ISIT at the University of British Columbia and the Information Science and Information Studies Program at Duke University (http://www.isis.duke.edu) explore the potential for collaboration in creating further 3 D models to add to the Arts Metaverse environment. At UBC, the Department of Art History seeks funding to use the developed Open Croquet 3D environment for a further exploration of South American indigenous spaces, such as Machu Picchu.

2 Along with providing a flexible enough framework that virtually any user interface concept could quickly and easily be prototyped and deployed, Croquet can be used to deliver compelling 3D collaborative visualizations and simulations. In its simplest form, Croquet is a complete development and delivery platform that enables people to carry out highly collaborative work. It is a highly scalable architecture that can be used to develop powerful simulations, and multi-user on line spaces. Through Croquet-derived 3D environments, users can enjoy shared telepresence, shared authorship of complex spaces and their contents, and shared access to a wide range of network-deliverable information resources." See http:/croquetconsortium.org.

3 According to a number of authors (J. Seely Brown 2006, M Lombardi 2007) the elements that functionally define a participatory culture are: (1) co-creation, (2) multimodal interaction, (3)affinity-based self-organization, (4) immersive simulations, (5) distributed cognition.

4 This may well point towards a process where the master's tools have finally begun to dismantle the master's house (Lorde 1981), but that is a discussion for another place.

5 We want to acknowledge the contributors of a variety of sources to this synopsis: Michael Griffin, Ph.D candidate, Classics, Oxford University; Liang Shao, Graphic Designer, University of British Columbia; Bryan Zandberg, Staff Writer, ArtsBeat, University of British Columbia.

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Ulrich Rauch organizes the implementation of educational technologies for instructors, students and staff in the Faculty of Arts at the University of British Columbia. As the Director of a technical and an instructional support unit, and as trained sociologist, Uli combines his experience as an instructor with his perspective on learning technologies to research and apply eLearning strategies in support of collaborative learning. See the Ancient Spaces project website (http://ancient.arts.ubc.ca/) and the Metaverse project webiste (http://metaverse.arts.ubc.ca) for more information. Also visit the UBC Arts learning tools website (http://www.learningtools.arts.ubc.ca/), where all open source learning tools are available.

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Beyond World of Warcraft: the Universe of MMOGs

Ruben R. Puentedura, Ph.D. | *Hippasus*

Massively Multiplayer Online Games (MMOGs) have received much attention in recent years, due to the success of *World of Warcraft*. Commercial MMOGs can serve as tools in an educational setting, as well as provide templates and inspiration for educational MMOG design. However, all these uses require careful attention to what are—and are not—appropriate uses of the technology, as well as an understanding of how other commercial MMOGs differ from *World of Warcraft*.

The purpose of the current paper is to help determine the role that Massively Multiplayer Online Games (MMOGs) can play in terms of education, and what can we learn from existing commercial MMOGs. Much of the research to date has been dominated by studies of *EverQuest* or *World of Warcraft* -type games, i.e., games set in Tolkien-style fantasy worlds. For this reason, I'll be looking at four very different MMOGs in the commercial arena.

The initial question is: can we use commercial MMOGs "as is" in education? In other words, if I don't want to develop my own MMOG at my college or university, can I use a commercial MMOG in its place? The answer: perhaps. There are some areas where commercial MMOGs can certainly be used in education, but there are also some areas where we have no evidence that they work.

There are four areas where commercial MMOGs have been shown to work well in educational projects:

1. **Provide support for building narratives:** people teaching writing courses have been successful in getting people to write about the MMOGs that they care about (e.g., writing fan fiction), and by virtue of practice, get them from being not-so good writers to being much better writers.
2. **Provide support for derived media creation:** Machinima are movies that are made using the 3D engines of MMOGs, where people use their game characters as though they were puppets to construct videos. This allows people with little or no experience with video to get into movie creation quickly. Why not just have students go out and do standard filming exercises with a hand-held camera, and do an in-camera edit? Machinima creation does not replace those exercises, but rather supplements them in ways that are hard to do with a regular camcorder. For instance, students can pull together large acting ensembles in ways that are really difficult to do in the real world. The MMOG environments provide them landscapes, pre-made objects, and pre-made scenarios that they can then can fit a story within.
3. **Social sciences research:** your students are raring to try out the methods that they have just learned, and you want to send them to do something more interesting than the standard "go to the supermarket and see what people are doing as they go down the aisles" project—MMOGs are your answer. You can have your students explore the environment of players in these worlds, since they act as self-contained worlds, with accompanying cultural and economic spheres, which have been the object of much recent research (see, for instance the work of Edward Castronova).
4. **Research for educational development:** You want to teach people how to use MMOGs for education—examining commercial games is essential to developing an understanding of key features of the genre, and how they will relate to student educational interactions.

By contrast, there are two areas where no research to date indicates that using commercial MMOGs in education works:

1. **Skill transfer to related domains (e.g., economics):** while commercial MMOGs are good for social sciences research, this is a very different scenario. If you have a student who is already proficient in economics, it's great to turn them loose on an MMOG, so they can figure out how the rules of that particular world work. However, if they don't know economics, they will not come away from the experience with knowledge equivalent to Econ 101, or even remotely close to Econ 101—or to being correct, for that matter. Why is this the case? The economies of commercial worlds are highly artificial, and very tightly controlled in ways that would put the old Soviet economy to shame. Many phenomena that appear in true open markets are not present in these worlds, resulting in distortions of the workings of economics in the real world. In my research, while reading posts in forums to ascertain what players derive from their experiences in the MMOG, I have only seen wild and erroneous notions about how real-world markets operate based upon what players are doing in *Eve Online*. I have yet to come across a convincing account of "intuitive economics understanding" resulting from this type of approach.
2. **Transfer of cooperative structures:** if my students all play *World of Warcraft* together, won't the structures for in-game cooperation transfer over to other domains? Unfortunately, there's no evidence for this. Some of the positive results that have been reported look nothing like transfer of cooperative structures; rather, they look like people are getting to know each other socially in-game, and working better together as a result. This is fine, but a movie discussion night might work just as well in accomplishing this goal—there's nothing specific about the MMOG environment in this regard. What you do see is that the structures for cooperation that are developed in the game are fascinating, and worthy of study unto themselves as topics of social science research, but there is no evidence that they transfer back into other domains. In other words, learning how to kill trolls together teaches you how to put together new teams to kill other trolls—but it doesn't necessarily teach you how to put together a team to formulate new public policy.

The Games: I'll be looking at four MMOGs:

- *World of Warcraft (WoW)*
- *Eve Online (EO)*
- *City of Heroes (CoH)*
- *A Tale in the Desert (ATD)*

I'll show some snapshots taken from the actual player experience in going through these games—not the usual triumphalist screenshots showcased on the corporate sites, but rather what a novice player might encounter as they play through the game. The triumphalist snapshots show the "best bits" of the game, and are carefully selected by the game companies to entice new players. Thus, you'll see the "kill the impressively evil giant sequence"—but that's not what the bulk of the game looks like. In particular, when you're thinking about MMOGs in the context of a classroom, you need to realize that the student playing an MMOG for a class will not be able to put in the same number of hours that a dedicated MMOG player will put into the game. The illustrations show what a "newbie" to the game would see with about 10—20 hours worth of play—a reasonable amount of play for a student in a class (although much less than would be required for a dedicated research project). This is a realistic perspective—at this point in the game, a player will not have the experience and the large team ready to attack the evil giant's hold. These are deliberately "newbieish" samples, putting the characters out into the world without much prior experience or knowledge.

Elregg

Killing a boar—easy and repetitive kills are essential to building up characters in the early game.

Trading in *World of Warcraft*.

Some different types of quests: collecting herbs, finding someone who's lost, helping the cities.

World of Warcraft: Elregg, the Hapless Mage

Simple quests and scaffolding lead the character through the early stages of the world. The world itself is highly immersive, with broad vistas and landscapes, and no two parts of the landscape are alike. The game is fun, no matter what level you are—you don't have to be level 70 to get enjoyment out of the game. These are all features that are attractive to players, and account for much of the game's runaway success (over 8 million players); by extension, they are features to consider when designing a game that would be attractive to students.

There are four key aspects of *World of Warcraft* that we will look at for comparison with the other three games:

Genre: *WoW* is a fantasy game. The world is related to Dungeons and Dragons, with a bit of Tolkien, and a bit of Nordic sagas thrown in. This is a world that has resonance with students, and has resonance with students across cultures (i.e., this is not just the USA's cultural backdrop—it plays well elsewhere as well).

Objectives: The game is quest oriented. Advancement in the game is directly linked to completing quests. Early quests are individual and simpler to execute, while later quests are more complex and tend to involve multiple players. Killing some particularly powerful opponents cannot be done without the cooperative work of multiple players.

Player vs. Player (PvP): Does the game allow players to fight each other, in addition to the characters they encounter in the world? In *WoW* the answer is yes, but in controlled settings. In the player vs. environment world, you are not at risk of being killed by another player—you have to explicitly assume a player vs. player role before this can happen. This is important in terms of designing educational games, since uncontrolled PvP can be a source of frustration in games. This was a source of frustration in *Ultima Online*—players would come in as a beginner, encounter another more advanced player who would swing down their hatchet—and they were gone. *WoW* solves this issue via a controlled setting, but, as we shall see, there are other ways of dealing with this problem.

Away From Keyboard Play: These games take multiple hours. When considering them in the context of education, can something mitigate this? In particular, can you do something else while playing the game? Can you play the game with one hand while you're reading something else, or listening to a lecture? After all, you need to kill many boars to get your character to become more powerful—can you do something else that takes the bulk of your attention, while the game takes up a minimum amount? In *WoW,* the potential for this type of "away from keyboard" play is low. This is not always the case in every game, as we shall see. However, what this means is that when you're thinking about using a game like *WoW* in a class (or designing a game that plays much like it), you should count the number of hours required as true single-task hours: they will not be multitasking hours, since people will be focusing on the world full-time.

Machinima: In terms of understanding how these worlds work, it is also useful to look at the machinima that people create around them. This tells you what kinds of things people are saying about (and with) these game worlds, as well as provide you with hints as to how they might be used in a classroom narrative support setting. For *World of Warcraft,* there's a huge range of machinima being produced. The range covers the dramatic, with tragic stories being told (warriors that go off and never return to their loved ones), humorous machinima that satirize game conventions, epic machinima that exalt the game itself, and tutorial machinima that show you how to do something.

Daryesh

Trading on the market.

Battles in space.

Navigating through the universe.

Eve Online: Daryesh at the Helm

Eve Online is not set in a fantasy world—it's set in a very harsh, hard sci-fi space world. You're the captain of a mining ship—you're not walking along a field with trees and rabbits. Instead, your environment provides you with charts for navigation, and other tools that you can use to get to your destination. As in *World of Warcraft, Eve Online* is not a "template" world—space stations and ships each have their own special characteristics, with differentiation among them. Characters can be readily customized by learning new talents—overall, characters in *EO* are much more plastic than their *WoW* counterparts. The game is structured around corporations, their agents, and their proposed missions. Most of these missions are connected in some way to money-making: while in *WoW* you have markets you can visit, in

EO the heart of the game is the markets. Players have objects they can buy and sell, pricing charts, etc.—they can play the commodities market in *EO* like they would in the physical world.

Genre: "Hard" science fiction. If you like Robert A. Heinlein or Greg Bear, you'll like Eve Online. It's a very hard world in a different sense: it's a world where people are mining, trading, or plundering—these activities define the *EO* world.

Objectives: Agents will give you missions, but your ultimate goal is to build up wealth, head up your own corporation, and control regions of space—by and large, there is no "and now you take on the big bad end boss"—that is not the ultimate goal. This suggests different ways of setting goals in the game that might appeal to students: the quest doesn't have to be "beat the troll," it can be to increase your power, and to do things with that power.

PvP: Player vs. Player is not segregated in *EO*. All players at any point in time are effectively playing against all other players. So, in Eve Online you can be traveling through a section of space, and one of your fellow players can shoot you out of the sky. How does *EO* avoid the *Ultima Online* problems? The game defines regions of space that are safer, and regions of space that are less safe. If a player sticks to the regions of space that are safer, they are less likely to be shot down—but all the best goodies are in the less safe regions of space. So, you build yourself up in the safer regions, and plan how you'll work out the less safe regions of space. Therefore, PvP is pervasive throughout the game, but is set up in such a way that you can decide what you want to deal with at a given point in time. Some players have effectively set up "protection rackets" in sections of space—if you want safe passage through the section of space that they control, you will pay them a fee; if not—well, it'd be a shame if something happened to that ship… This may not sound like the most desirable thing, but the resulting complexity of player interactions is fascinating.

Away From Keyboard Play: *EO* shows very high potential in this regard. For instance, your character can learn things, even when you're not online—you can just set up your character's learning tasks, and log in periodically to change tasks or monitor progress. It also has large stretches of time when you're traveling through space—so long as you're not traveling in a dangerous region, you can put the ship on autopilot, and peek in periodically to make sure something unexpected hasn't happened. By and large, you can multitask when in *Eve Online*—so it is possible to draw inspiration from this to design MMOGs that allow for multitasking for education.

Machinima: Almost all *Eve Online* machinima tend to run very long—around ten minutes is far from uncommon. Topics tend to be either the beauty of space, and the majesty of soaring past the planets, or the celebration of battles, seasoned by the occasional touch of irony. Interestingly, overt comedy seems to be largely absent (unlike *World of Warcraft*).

Doctor Jestocost

The power management interface—the game allows the player to create mixes of powers.

A non-player character flatters Dr. Jestocost.

1950's visions of future architectures, with a large number of non-player characters with something to say.

City of Heroes: Doctor Jestocost vs. The League Of The Undead

The you-too-can-be-Superman MMOG *City of Heroes* starts things out right with the best character modification engine of any of the games, allowing players to match exactly their expectations of what superheroes should look like. Players are given suitably heroic missions defeating evil villains—no quest for filthy lucre here, unlike *EO*. As in *WoW,* teamplay is required at points in the game, although *CoH* is much more accommodating of players who prefer to play solo most of the time.

Genre: *CoH* takes place entirely in a comic book setting. Interestingly, inspiration seems to have been drawn from not just superhero comics (although these are the primary source of inspiration), but also other comic book worlds, such as *Tales From the Crypt,* and even cowboy comics.

Objectives: As with *WoW, CoH* is primarily quest-oriented: players are told to go beat the evil villains, retrieve secrets, rescue other characters, etc. Experience is gained by the player character as a result, which the player can then use to gain new skills and abilities.

PvP: Also as in *WoW,* PvP is allowed in a tightly controlled setting. The game warns the player repeatedly about the risks of the PvP setting before they enter it, almost to the point of discouraging it. Interestingly, *CoH* players seem much less enamored of PvP than *WoW* players; whether this is due to messages implicit in the game, or simply due to the playability of PvP is unclear, though.

Away From Keyboard Play: *CoH,* much like *WoW,* lacks opportunities for parallel activities—the player has to be "on" while at the keyboard. A distracted superhero very quickly becomes a dead superhero.

Machinima: It would seem at first sight that *CoH* is pretty much identical to *WoW,* only set in a comic book world. However, this is not the case—players perceive and relate to the environment very differently from *WoW.* We will see some research that illustrates this below, but a simple example can be found in the dominant style of *CoH* machinima: unlike *WoW,* most *CoH* machinima are ironic; dramatic or epic *CoH* machinima are overall rare, as are tutorial machinima.

Wah

Wah is really good at gathering mud.

Wah politely examines a compound built by someone else—stealing anything is not in character.

Wah sees a sculpture and is asked to vote on how much he likes the sculpture.

A Tale in the Desert: A Tale Of Wah

A Tale in the Desert is set in Ancient Egypt. The structure of *ATD* is unlike the other games, despite some superficial similarities. In this world you don't go around killing other players—in fact, you can't kill other players, not even "virtual baddies." The game extends an invitation to become a good citizen of Egypt by learning different crafts and skills that will enable you to make things and gain the respect of your fellow citizens. In *ATD* players are invited to approve or disapprove of their fellow players' creations, and affect their game progress accordingly. This is a very different world from *WoW:* not only are you not killing characters, but because players are asked to vote on other players' work, as well as on key features of the game world itself, they have a strong hand in determining what happens in the game itself.

Genre: The setting is a (heavily romanticized) version of life in Ancient Egypt—historical accuracy is far from being achieved in the game, though.

Objectives: The game is achievement-oriented: advancement is not linked to conquering enemies of any sort. In this regard it is somewhat like a community-friendly version of *Eve Online,* but it is even more about becoming a good citizen of Egypt, and having other fellow citizens recognize this fact. There is a story behind the game (the "tellings" of the game), but it is unlike *WoW* in that the story arc does not involve every player completing exactly the same plot points in (roughly) the same order, and instead continues in the background regardless of what a given player is doing. This gives the game a sense of an overall progressive historical time that is unlike *WoW* or *CoH.*

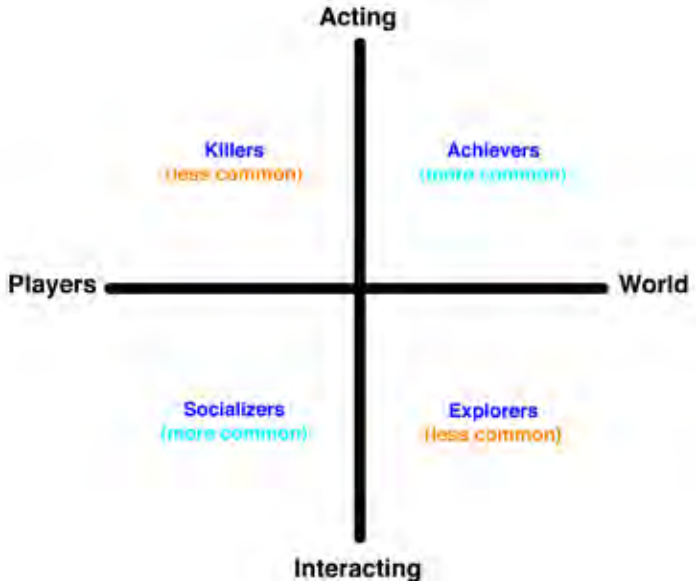
PvP: There is no PvP—period. You cannot kill other players; however, you can affect other players strongly via your approval or disapproval of their work and actions.

Away From Keyboard Play: *ATD*'s potential for multitasking lies somewhere between *EO* and *WoW* or *CoH*—you can't do as much away from the keyboard as in *EO* (e.g., learn new skills while logged off), but you can certainly operate with divided attention while completing repetitive tasks (e.g., harvesting flax).

Machinima: *ATD* does not seem to spawn the dramatic or humorous machinima that the other games do—it seems to favor tutorials with a touch of humor. Interestingly, the more tightly scripted and stereotyped backdrops of *WoW, EO,* or *CoH* (fantasy, hard sci-fi, and superhero comics respectively) seem to provide a better backdrop for player-originated narrative than the looser backdrop of *ATD*—this is something to consider when developing games for use in education.

What are MMOG Players Like?

Thus far, we've examined four very different games, and derived some observations that can inform educational game design, and trigger thoughts about designs that do not look like variations on a *Dungeons and Dragons* theme. We can now turn our attention to the players of these MMOGs: do they exhibit personality traits that are reflected in how they play these games? Richard Bartle's research (2003) provides the basis for a model for classifying MMOG players. Bartle found that different players like to do different things in games—and derived from this a classification for players, breaking them up into four groups.



Bartle's model.

The model has two axes:

- Do players like to interact more with other players, or with the game world?
- Do players like to act upon other players/the world, or do they prefer to interact with other players or the world?

Four player types result:

Killers: The name dates from 1996, when Bartle did his initial research—uncontrolled PvP was still common, so the name stuck. In today's games killers may not actually kill other players, but instead use other means to compel them to obey their will.

Achievers: These players view the game as a set of challenges that they must overcome.

Explorers: These players are less driven by a desire to conquer a particular challenge, but rather by the desire to explore new and unusual environments and situations.

Socializers: These are primarily driven by interactions with other players—they like to talk, and join parties to "hang out" with their friends. Their main reason for being in the world is a social reason—the game challenges and environments are less important.

It is important to note two things:

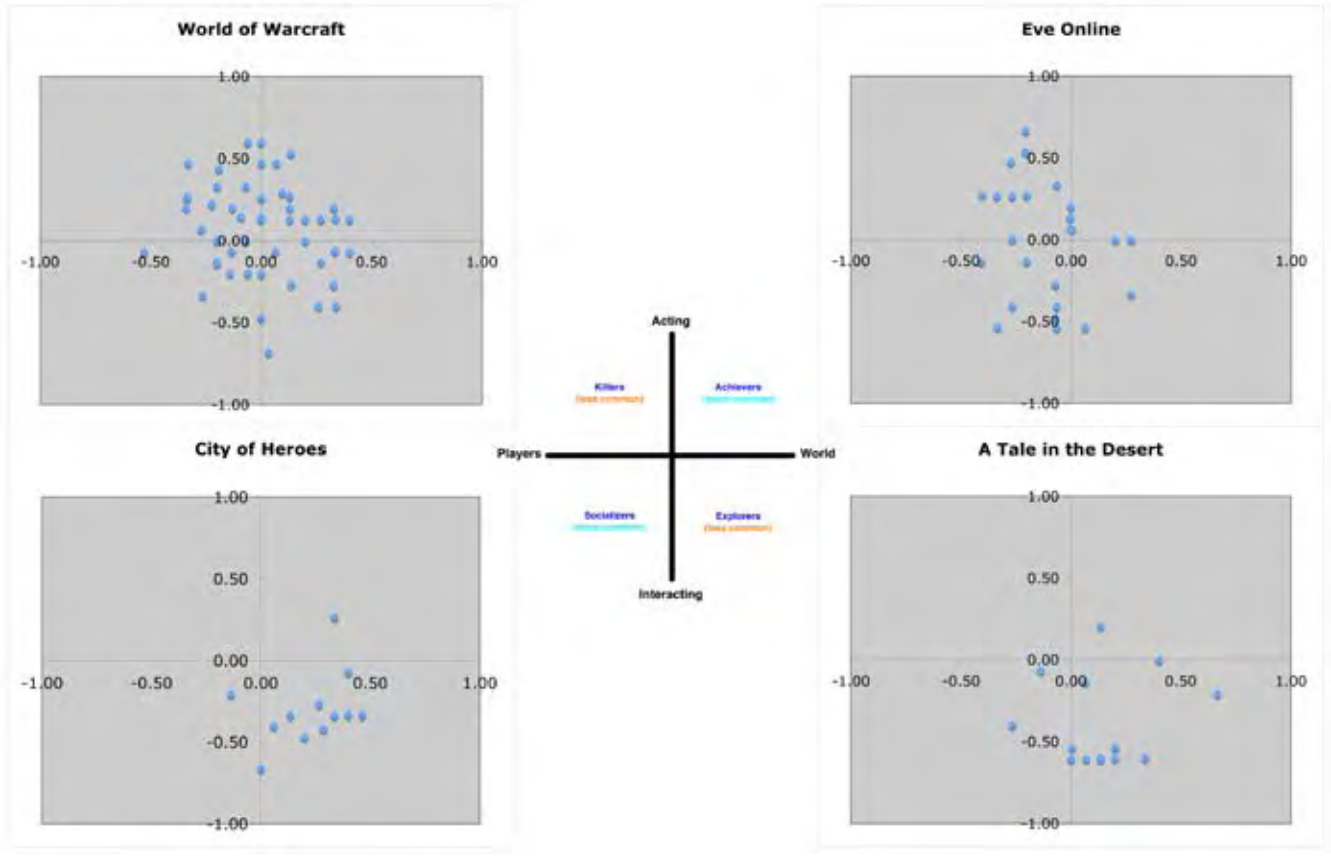
- Players are not "pure types"—most people are a mix of types.
- Players don't stay in just one static type (or mix of types)—as they stay in the world, their relationship to the world evolves. The overall observed sequence of player evolution is:

  Killer —> Explorer —> Achiever —> Socializer

It is worth noting here that Bartle has refined his original model, adding a third dimension to the player typology, and refining the evolution model of player types. Similarly, Nick Yee (2005) has developed an alternative approach to MMOG player typology that also shows promise. While both of these models provide more detail than Bartle's original work, they were not appropriate for use in the current research, for reasons that will become apparent below.

Using Bartle's model as a point of departure, I've developed some additional research on the four MMOGs described above. All of these games have been around for several years now, and have developed loyal player communities. People have discussed any and all aspects of the games, their likes and dislikes, and how they self-identify as gamers on the official game forums. In particular, players who have heard about Bartle's research and an online version of his test have taken it, and reported the results on the fora as a part of informal conversations. This is incredibly valuable, since it has allowed me to collect data without having to construct new survey requests—these are people who

over the years have spontaneously chosen to report their Bartle Scores. For this reason, I chose to stick with Bartle's original—if imperfect—model, since neither the new model, nor Yee's work provide the same wealth of self-reported results. I analyzed the complete archives for the official (i.e., game company-provided) forums for each of the games, and extracted all the reported Bartle Scores. The results follow:



Four MMOGs—the Bartle panorama.

In *World of Warcraft* the results are spread out evenly—all four types of players figure to about the same extent. *City of Heroes,* despite being superficially similar to *WoW,* clearly appeals to a different player population: its population is composed primarily of explorers, with a few achievers and a few socializers thrown into the mix. In other words, the very nature of the story of the game, even if other aspects are similar, matters tremendously in terms of what the player population will look like. In *CoH,* you're a hero—you're not a killer, and PvP enjoys much lower status than it does in *WoW*. Exploring the "feel" of being a superhero seems to be the driving interest for *CoH*'s players. *Eve Online*—unsurprisingly—features a high population of killers; however, it also features a large population of socializers. While it is true that *EO* is a hard and cruel environment, where any other player can kill you, it is also an environment where people talk with each other a lot—much more than in *CoH*. It also features some explorers—there are some game elements, such as asteroid exploration for mining that appeal to this group—but next to no achievers. Again, this should come as no surprise: in *EO*, significant challenges arise from interactions with other players, not with the game itself. *A Tale in the Desert* appears to be surprising at first—its population appears to be made up primarily of explorers, with only a few socializers thrown into the mix. While players for *ATD* have a self-image of themselves as social creatures, in actual gaming practice their interaction preference is not with one another, but rather with the game world. The (relatively unchallenging) tasks that make them "good citizens" of Egypt require some exploration, and take precedence over talking with their fellow citizens. Summarizing these results, the combination of game story style and plot with the game's specific affordances will dramatically influence the gaming population's makeup, a factor to be considered when designing games for education.

Some additional observations:

An analysis of in-game conversations and situations yielded some additional observations that have direct bearing on the uses of MMOGs for education.

"Trash talk": This was measured by recording the number of instances where players made derogatory remarks about other players as a fraction of the total number of player conversations. The order observed was:

WoW > CoH > EO >> ATD

WoW tended towards harsher, personal attacks with frequent scatological references; *CoH* favored less personal critiques of in-game competence; *EO* trash talk tended towards derisive recommendations of other MMOGs for the less fortunate players; *ATD* involved only one instance of anything remotely resembling trash talk over the entire time period sampled, where a player was (gently) redirected towards other, more violent MMOGs.

Altruism: To gain some insight into how altruism works in these games, I deliberately put my character in the path of danger or in scenarios where another player's assistance was visibly required. The order observed was:

WoW > ATD > CoH > EO

In *WoW,* requests for help were always answered, and answered effectively. True, the help was sometimes accompanied by mockery—but help was always delivered. In *ATD*, help was delivered most of the time, and without any accompanying negative commentary. In *CoH* relatively little useful help was delivered—most requests were ignored, or dealt with ineffectively. In *EO*, only general information requests were answered (sometimes misleadingly)—assistance in times of danger was not delivered.

External Narratives: The search here was for all forms of player created narrative, not just machinima, but also fan fiction, comics, etc. The number found was studied as a ratio to the number of players for that particular game. The order observed was:

WoW >> EO > CoH > ATD

Even after correcting for its huge (over 8 million) player population, *WoW* far outstripped all other sources of external narratives. *WoW* and *EO* both featured some high-quality original products, with care taken in all aspects of their production. *CoH* featured more "standard" external narratives, with the player's character slotted into otherwise stereotypical superhero adventures. *ATD* featured little beyond practical "how-to" narratives and a few attempts at historical storytelling.

Game Modification: The study here was of how much players could influence the actual game. The order observed is:

ATD > EO > CoH = WoW

ATD clearly led here, with players becoming actively upset when a proposed game modification failed to—in their view—gain proper consideration. *EO* was next, given the influence that players have over the overall game economy and development. Interestingly, this also results in a perception by some players that *EO* is "unfair" to new players, a perception that did not seem to be borne out by actual gameplay. *CoH* and *WoW* are essentially scripted by their parent companies, with only minor changes (mostly related to bug fixes) being driven by players.

Role Playing: The question was to determine how much players actually "got into character", i.e., to what extent their in-game talk and actions reflected an acting approach to their in-game persona. The order observed was:

WoW > EO > ATD > CoH

In *WoW* most players tried to play fully as characters from a fantasy novel. Interestingly, the degree of success in acting seemed to correlate rather well to other in-game skills: players who did a good job as actors could also be reliably predicted to be competent members of parties, and helpful in difficult situations. In *EO*, players matched well the characteristics of their in-game character with language and communication style, in many instances reflecting the harsh and unforgiving nature of the game world. In *ATD*, the lack of a common understanding of Ancient Egyptian culture led to a rather bland "I am a good citizen" style of role play. Finally, and most surprisingly, players in *CoH* played the superhero role very weakly: aside from a few generic superhero catchphrases and a few "superhero gymnastics" visual demonstrations, most players used language in conversations that in no way conveyed a superhero persona.

Final Remarks:

All four games present rich worlds that are worthy of further exploration unto themselves, and provide valuable lessons for the development of MMOGs for education. It is crucial to set prejudices and preconceptions aside when undertaking the latter task: both the gentle world of *A Tale in the Desert* and the harsh environment of *Eve Online* contain important elements that could be of use in educational scenarios. The narrative genre, game objectives, and modes of player interaction all do much more than provide ornamentation—they actively determine the types of players that will profit the most from the game environment, and how they will do so. Future educational MMOG development will need to take these factors into consideration so as to maximize the game's benefits for instructors and students alike.

References:

Bartle, Richard. 2003. *Designing Virtual Worlds.* Indianapolis: New Riders Games.

Castronova, Edward. 2005. *Synthetic Worlds: The Business and Culture of Online Games.* Chicago: The University of Chicago Press.

Yee, Nicholas. 2005. *A Model of Player Motivations.* Online at http://www.nickyee.com/daedalus/archives/001298.php.

MMOG Sites (Including Forums):

World of Warcraft: http://www.worldofwarcraft.com/index.xml

Eve Online: http://www.eve-online.com/

City of Heroes: http://www.cityofheroes.com/

A Tale in the Desert: http://www.atitd.com/

About the Author

Dr. Ruben R. Puentedura is the Founder and President of Hippasus, an educational consulting firm focusing on transformative applications of information technologies to education. He has implemented these approaches for over twenty years at a range of institutions, including Bennington College and Harvard University. Recent projects include uses of digital storytelling in the improvement of health care practices, the development of a new community site for performing arts festivals *(KadmusArts),* and the creation and implementation of a new approach to selecting, using, and evaluating technology in education for the Maine Learning Technology Initiative. He can be reached at rubenrp@hippasus.com.

ClevelandPlus in Second Life

Wendy Shapiro, Lev Gonick, and Sue Shick | Case Western Reserve University

In March 2007, a collaborative of Greater Cleveland-based institutions, individuals, and organizations launched one of the first "cities" in Second Life modeled after a physical city in the early 21st century. Our collaboration, known as ClevelandPlus (formerly known as OneCleveland) seeks to develop a platform for exploration of education, public service, and netizenship, to become a virtual city designed to support exploration of historical Cleveland as well as a community involvement in imagining and building a never-before-seen Greater Cleveland of the future.

Wendy Shapiro

Cleveland—we've built our city on more than Rock and Roll. "You don't have to dream to visit a Cleveland where University Circle is on the lakefront next to the Rock and Roll Hall of Fame; where the Cleveland Clinic opens operating rooms to students from Case Western Reserve University; where Millionaires' Row is preserved intact along Euclid Avenue; where a new convention center can be built in weeks; and where—by the way—the weather is always perfect." – *Cleveland Plain Dealer* (March, 2007)

Lev Gonick

In March 2007, a collaborative of Greater Cleveland-based institutions, individuals, and organizations launched one of the first "cities" in Second Life modeled after a physical city in the early 21st century. Our collaboration, known as ClevelandPlus (formerly known as OneCleveland) seeks to develop a platform for exploration of education, public service, and netizenship, to become a virtual city designed to support exploration of historical Cleveland as well as a community involvement in imagining and building a never-before-seen Greater Cleveland of the future.

The primary objective of the ClevelandPlus Project is to create and support an online virtual environment for the purpose of exploration, experimentation, research, teaching, and creative expression. It is our hope that our virtual city will help establish new channels of communication and opportunities for collaboration within Cleveland and the surrounding community.

Sue Shick

Located in the virtual world of Second Life, ClevelandPlus has been carefully constructed as a virtual collaboratory designed to provide teachers, students, researchers, health providers, patrons, and visitors with dozens of prebuilt settings for experiments in social interaction in 3-D space. It is an environment designed for formal and informal, traditional and nontraditional, real and surreal, serious and playful exploration and learning.

What distinguishes ClevelandPlus from other Second Life environments is potential for community partnership, connected to all of our community assets. Cleveland has a unique portfolio of institutional players—not only schools but museums, the library system, digital asset organizations and our healthcare systems.

The pre-launch or Phase I of the ClevelandPlus project included a partnership and collaboration with Case Western Reserve University, the Cleveland Clinic, and the Rock and Roll Hall of Fame. Individually and together we used Phase I to engage city partners and the broader community in the process of re-imagination and re-invention of Cleveland as both place and idea.

Case Western Reserve

Cleveland Clinic

Rock & Roll Hall of Fame

The Process

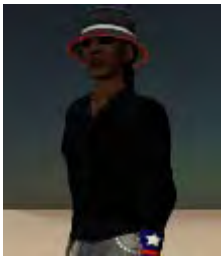
An RFP was circulated that described the purpose of the ClevelandPlus project, indentified partner institutions and included a sketch of the Second Life Island. After reviewing a series of proposals, the New Media Consortium (NMC) was selected to build the island. Within two months of the final selection, ClevelandPlus Island was unveiled.

The Process Revealed

The NMC Builders (to name a few)

Ravenelle

Shuk



CJ

Stella

ClevelandPlus Buildings

From this… **To this…**

Adelbert Hall, Case Campus

Silver Spartan Diner, Case Campus

ClevelandPlus Buildings cont.

From this… **To this…**

Kelvin Smith Library, Case Campus

Village @ 115 Residence Hall, Case Campus

Severance Hall, Home of Cleveland Orchestra

Heart Center, Cleveland Clinic

Rock & Roll Hall of Fame

An Early Fly-thru Video of the Island (March 2007)

http://www.case.edu/its/itac/Shick/nmc/flythru_final.mov

The Launch—Life in the City

Campus Life—Virtual student recruitment

In the spring of 2007 a pioneering effort led by Case Western Reserve University's admissions office allowed high school students to visit and experience Case through the virtual world of Second Life. This was a pioneering recruitment effort led by the college admissions department. Student ambassador avatars welcome future students to a virtual campus. This was an innovative initiative to attract prospective students using the 3D digital world. While other colleges and universities are using Second Life for academic purposes, we believe that Case may be the first university in the country to use it to recruit high school students as well.

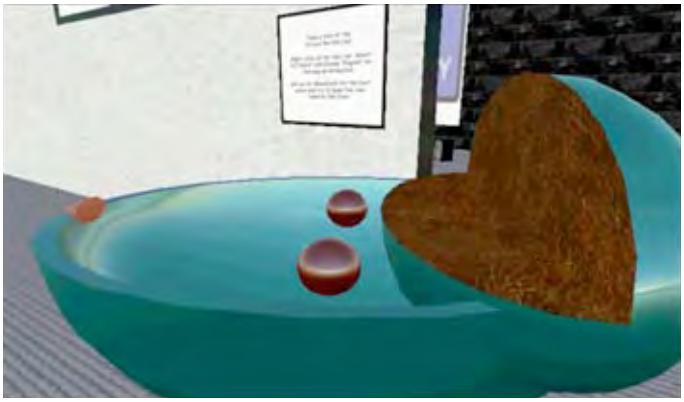
One of our student ambassadors, Mir Bear-Johnson, shared her experience.

> "I am a first year student working with the office of Undergraduate Admissions as a student Ambassador in Second Life. My job is to answer the questions of any prospective students and to give them a good idea of what the Case community is like. Meeting them in SL as opposed to a normal chat helps personalize the experience not to mention the fact that I can give them tours of the virtual campus which is way cool. All the prospective students who I've interacted with have found the simulation awesome. Because of the set up the prospective can approach us with their questions or concerns and it is much more relaxed because of that. I've answered a ton of questions about majors, and in one case supplied a prospective student with e-mail addresses of two students who could give him more information on his specific major. The hope is that the prospective or "prospies" will get all their questions answered while having fun exploring the virtual campus—the student ambassadors certainly have a fun time exploring it."

Chronicle Video: A Campus Tour in Second Life

http://chronicle.com/media/video/v53/i37/secondlife/

Campus Life—Pioneering Faculty



Educational opportunities surfaced in the fall of 2007. Four faculty in the disciplines of Chemistry, Communication Science, Cognitive Science and General Education will be conducting classes on the ClevelandPlus Island. Curricular strategies will include digital storytelling, interactive seminars, streaming lectures with the feedback sessions, and recitation with avatar Q&A. Faculty are also interested in holding office hours and conducting research projects and replicating existing labs in a virtual space. Two computer science students have reproduced Case's gaming laboratory on the ClevelandPlus Island which showcases a hover craft designed for self-paced tours. The department of cognitive science has begun exploring human cognitive issues involved in the design of synthetic worlds.

Tour of Virtual Worlds Lab in Second Life: http://slurl.com/secondlife/ClevelandPlus/186/146/37 (clicking the link will launch Second Life if you have it installed).
Video Tour of Virtual Worlds Lab: http://www.case.edu/its/itac/Shick/nmc/vwlabtour.mov

Campus Life—Second Life Culture for Students

One of our prime objectives is to generate a Second Life culture for students. We've already invited prospective students to tour the Case campus virtually. Now that they are on campus, we are calling on students to create a buzz. "Getting started in Second Life" sessions are being offered, as well as student activities hosted by student organizations, study groups, and contests. We are creating spaces to showcase student work; spaces to conduct music concerts, poetry readings, essay contests, and theatrical performances; and art galleries to showcase sculptures, building, and scripting.

Slide Show from First Student Orientation Session ➤

(http://www.case.edu/its/itac/Shick/nmc/studentorientation2.mov)

Community Life—First American live digital-simulcast of a classical orchestra in Second Life

Red {an orchestra} (www.redanorchestra.org) along with a very talented group of volunteers from Case Western Reserve University, Cleveland State University, OneCommunity and the New Media Consortium made history on a Saturday night in April, 2007. Red {an orchestra} performed its concert both in the Cleveland Masonic Auditorium as well as in three sites in Second Life with 200 participants seated in the Masonic Auditorium and 150 avatars attending the event online. This performance heralded the "Grand Opening" of the virtual City of Cleveland demonstrating to the world Cleveland's role as both a "digital city" and great cultural center. Red {an orchestra} used this concert experience in SL to explore ways of introducing new audiences to classical music. Their goal was to "REDefine classical music programming, to REDesign the concert experience, and REDiscover classical music."

Sue Shick talks about the night of the event.

> "Experiencing the concert in Second Life was awe inspiring and exhilarating... what a way to participate in a classical music concert. The weather was perfect, the stars were shining and a full moon was visible on the horizon. Before the concert we gathered in the martini bar under a large flowing tent for drinks and hors d'oeuvres. As the concert was about to begin we wandered over to our seats in the outdoor Amphitheater in front of the Kelvin Smith Library.
>
> The amphitheater was surrounded on all sides by 6 large screens. We could see and hear the orchestra tuning their instruments. The audience in Second Life was not disappointed. The live stream was exceptional. The constantly changing camera angles provided by 10 cameras and the superb audio quality from 22 audio channels presented a feast for the eyes and ears." (http://blog.case.edu/sl)

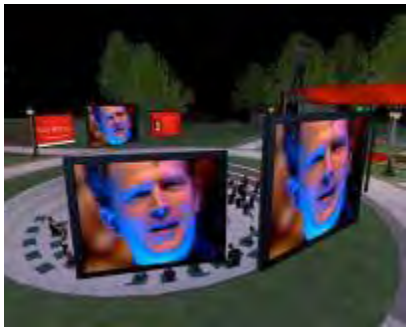
Video of the Simulcast ➤

http://www.case.edu/its/itac/Shick/Secondlife2.mov

For a behind the scenes look at the production crew take a look at this video: http://www.brightcove.com/title.jsp?title=769701032&channel=140825624.

Community Life—Cleveland IBMers meet on the ClevelandPlus Island

ClevelandPlus hosted a 2 ½ hour in-world meeting in August 2007 for the Cleveland IBM Spirit Community. The agenda included 4 speakers in 3 ClevelandPlus locations. As guest avatars arrived at the SPIRIT welcome tent, they gathered virtual souvenirs and refreshments. They also had an opportunity to practice animated gestures and enter a raffle for real life prizes.

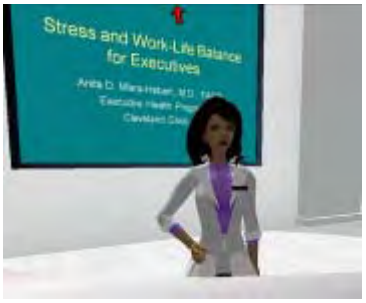


The meeting's main event took place at the outdoor amphitheater on ClevelandPlus where Lev Book (avatar of Case's Lev Gonick, CIO) and Ilike Mayo (IBM's General Manager, Dave Liederbach) gave engaging presentations using streaming media and PowerPoint slides.

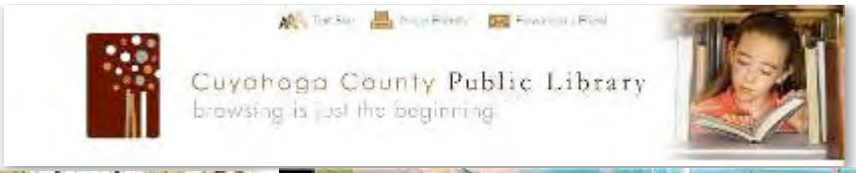
To heighten the virtual experience, the avatar attendees were teleported, in a matter of seconds, to two breakout sessions—one in the Cleveland Clinic Heart Center operating room given by Docmom Marsala (avatar of Cleveland Clinic's Dr. Anita D. Misra-Hebert, M.D) and the other at the Rock and Roll Hall of Fame given by Pavl Stenvaag (Cleveland United Way's Mike Benz, president and CEO).

Dave Liederbach believes that meeting in Second Life has real advantages for IBM. "It was informative, engaging, and social—well beyond what a conference call and/or a webcast can provide—and should be replicated for other IBM community meetings."

We learned so much by hosting this event and look forward to putting our skills and knowledge to work in all our upcoming events.



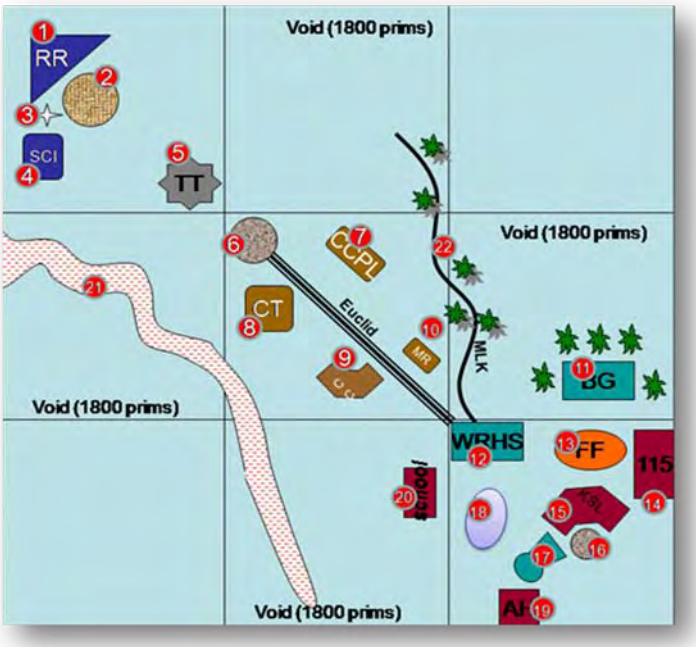
Phase II



The success of ClevelandPlus Phase I led to the development of six new islands (two full islands and four voids) which launched the beginning of Phase II. Phase II extends into the city of Cleveland and beyond. We are building aspects of the city's present, past and future. As we build we broaden our partnerships to include areas of public education, health and medicine, cultural institutions and city politics. We are building out more of the cultural area that surrounds the Case campus, University Circle. The Western Reserve Historical Society (located in University Circle) will be an integral part of the Phase II build and will serve as a conduit to some buildings from Cleveland's past. One of the mansions from Millionaire's Row, circa 1930 to 1959, will be recreated.

In Phase II the Cuyahoga County Public Library will have a centrally located building. We are excited by the Cuyahoga County public library's commitment to educational support for the broader community. The ideas their team has generated will result in some very stimulating events on the islands. The Cleveland Clinic is developing innovative projects for employee training, patient education and medical education (making use of a"holodeck" type interface).

Each of the three ClevelandPlus islands will have a large amphitheaters to accommodate large avatar audiences. We are also designing meeting areas for smaller gatherings that will take advantage of the multimedia capabilities of second life.



1. Rock Hall**
2. Meeting area
3. Windmill
4. Great Lakes Science Center
5. Terminal Tower
6. Public Square (Meeting area)
7. Cuyahoga County Public Library
8. Cleveland Trust
9. Cleveland Clinic Heart Center**
10. Millionaire's Row
11. Botanical Gardens
12. Western Reserve Historical Society
13. Football Field**
14. Village @ 115**
15. Kelvin Smith Library**
16. KSL amphitheater (meeting area)**
17. Severance Hall**
18. Spartan Diner in Sky**
19. Adelbert Hall**
20. School??? (possibly CMSD)
21. Cuyahoga River
22. Cultural Gardens (Rockefeller Park)

** Already Built in Phase I

Conclusion

As we continue to grow ClevelandPlus in Second Life we are mindful of the fact that a "build it and they will come" approach is not going to work. We are planning some truly engaging experiences and hope to explore ground-breaking methods for using Second Life. Since our entry into this virtual world we have seen exciting growth in the way avatars interact with one another, most notably the implementation of Voice Chat. Our plans for future events make use of all the multimedia capabilities available in the second life environment. We are looking forward to future developments that will further enhance the avatar to avatar communication.

To visit ClevelandPlus in second life, just join the ClevelandPlus group and then use this slurl:
http://slurl.com/SecondLife/ClevelandPlus/217/60/26

About the Authors

Dr. Wendy Shapiro serves as Director of Instructional Technology and Academic Computing at Case Western Reserve University working with faculty in the development of emerging technologies and supporting current technologies that enhance teaching and learning at Case. For over 15 years along with her administrative duties, Dr. Shapiro has been teaching undergraduate and graduate courses in the area of instructional technology. Most recently she was selected as a presidential fellow teaching for the SAGES program at Case. She has served as a consultant to the IBM Corporation and worked with the educational team at NASA Glenn Research Center. Dr. Shapiro is a published author, and has made numerous presentations on instructional technology and related topics throughout the United States.

Lev Gonick is Vice President for Information Technology Services and Chief Information Officer at Case Western Reserve University in Cleveland, Ohio. He is co-chair of the CIO Executive Council's higher education committee. He is also the founder of OneCleveland, now known as OneCommunity, the award-winning project to create a connected community throughout Northeast Ohio through high speed wired and wireless network connectivity. Additionally, Dr. Gonick previously served as chair of the board of the New Media Consortium. In 2007, he and Case Western Reserve University were recognized with a ComputerWorld Laureate for launching the Cleveland 2.0 project to leverage technology to address community priorities. In 2006, he was recognized by ComputerWorld as a Premier 100 IT leader and honored in the same year by CIO magazine with a CIO 100 Award. He also serves on the board of the National LambdaRail (NLR), the nation's next generation advanced networking research effort. Finally, he serves on numerous community Boards including the Museum of Contemporary Art, Cleveland and the Bellefaire JCB for Children, and Lawrence School for Dyslexic and other differently-abled learners.

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Folksemantic: Web 2.0 Tools for Teaching and Learning

Shelley Henson Johnson, Justin Ball, and David Wiley | Utah State University

The "folksemantic web" is a vision of information that is made understandable by computers through user contributed, folksonomic metadata. By relieving users of the tedium involved in finding, sharing and combining information on the web, the folksemantic web allows users to spend more time adding value to content and engaging in valuable human-to-human interactions. Folksemantic is a set of Web 2.0 tools that empower people to discover, remix, create, and share content. The tools give people powerful new ways to mold the web to meet their needs. Folksemantic tools allow communities to quickly create an online environment that is tailored to their interests. This paper describes a set of tools for teaching and learning.

Introduction

> The semantic web is a vision of information that is understandable by computers, so that they can perform more of the tedium involved in finding, sharing and combining information on the web (Wikipedia Contributors, 2007a).
>
> A folksonomy is a user generated taxonomy used to categorize and retrieve web content... using open-ended labels called tags.... Folksonomic tagging is intended to make a body of information increasingly easy to search, discover, and navigate over time. (Wikipedia Contributors, 2007b).

The "folksemantic web" is a vision of information that is made understandable by computers through user contributed, folksonomic metadata. By relieving users of the tedium involved in finding, sharing and combining information on the web, the folksemantic web allows users to spend more time adding value to content and engaging in valuable human-to-human interactions.

Folksemantic is a set of Web 2.0 tools that empower people to discover, remix, create, and share content. The tools give people powerful new ways to mold the web to meet their needs. Folksemantic tools allow communities to quickly create an online environment that is tailored to their interests.

Folksemantic tool set is a framework and a set of pluggable tools that support online interactions by encouraging people to create, discover, share, and remix content. It utilizes social networking to encourage user interaction and user generated content. These tools empower end-users by enabling the "write" part of the web. These informal opportunities to interact and generate content encourage learning in a context outside of traditional educational institutions. On the web today there are many end users capable of generating high quality content. The Folksemantic tool set supports the organic assembly of this content into larger parts and communities. This allows learning and propagation of human knowledge to occur in their natural contexts. These tools provide opportunities to reuse, remix, and generate meaning around resources as users interact with the resources, the tools, and with one another.

The value of the Folksemantic tool set is in harnessing user activities in context. Users receive immediate benefit and are motivated by the immediacy of the reward. Users don't have to be persuaded to bookmark using del.icio.us or post videos to YouTube. Instead, they are motivated by the immediate value that these tools provide. The tool providers in turn receive value from the vast amounts of user generated metadata and content. These rich resources can be coupled with content and metadata provided by universities via OpenCourseWare, digital libraries such as the National

Science Digital Library, and the Smithsonian Institute. The pairing of both user generated and institutionally generated content and metadata will provide users access to richer, more contextualized, and more meaningful resources.

One principle of the Folksemantic tool set is openness, particularly as it relates to data retrieved through the activities of users of the various tools. As users generate content and accompanying metadata in the form of titles, tags, and descriptions, that metadata is collected. The openness comes about through the gathering and the *sharing* of that metadata via current and emerging sharing standards.

The Folksemantic Approach

Initial approaches to the Semantic web included occasionally bewildering technologies and complicated ontologies. However, as de facto data interoperability standards have advanced and folksonomic data has become increasingly available, some of the promises of the Semantic Web are being realized much more easily than was originally conceived. The Semantic Web is showing up in the form of tags, REST APIs, RSS, Atom, Microformats and screen scrapers.

The semantic meaning of web content is constantly being described as users generate metadata for free. They tag web pages in del.icio.us, images in Flickr, rate movies in Netflix, books in Amazon, and write metadata in Freebase. Why? Because it benefits them and it's easy. The currency of the Internet is reputation, and reputation comes on the net as a person blogs, builds a social network on LinkedIn, puts popular videos on YouTube, and becomes the top hit for their name on Google. Users are motivated to generate content so they can become more visible and thereby more reputable. This turns out to be an incredibly sustainable system. Instead of spending money on generating content, online sites can rely on users to do that for them. The Folksemantic approach leverages the motivation users have to build their reputation via interacting with others and generating content on the Web. The tools we build allow users to continue to generate, tag, and remix web content while building not only their reputations, but relationships with other users in the same space. Literally, the same space. The same web page. These tools are designed to float around the web with users as they go about interacting with it.

The relationship the Folksemantic tools have with users is symbiotic. As users tag, share, remix, rate, and discuss content, they are generating metadata about that content. There are no complicated XML requirements, the user doesn't have to know RDF, it is all generated behind the scenes. Metadata is derived automatically from the user's natural interaction with the web content. The Folksemantic tools harvest this data which can then be reassembled in interesting ways using our infrastructure tools, mashups, and partner integration tools (widgets).

Folksemantic Project Description

Over the last year, the Folksemantic team has worked tirelessly to meet the goals of an aggressive development timeline. The result is a number of infrastructure tools and web services/applications that lay the foundation for our future work. These tools allow users to write to the web, reuse, remix, and generate (along the way) machine-readable metadata.

In Annorate (http://annorate.com) users can make annotations on any web page. Makeapath (http://makeapath.com) allows users to sequence web pages, creating paths through web resources for themselves or others. The OCWfinder (http://ocwfinder.com) leverages tagging technology to help users locate openly available OpenCourseWare materials. Send2Wiki (http://send2wiki.com) provides a one-click option for users to pull content from any given web page and drop it directly into a wiki for alteration. Ozmozr (http://ozmozr.com) helps users share resources with others, utilizes user generated metadata and aggregates user identities. And scrumdidilyumptiou.us (http://scrumdidilyumptio.us) is a foundational service that holds user generated metadata and relationships between web resources in a matter that is easily shareable with other systems via XML, RSS, RDF, REST, or HTML. Descriptions and screenshots of each of the Folksemantic tools follow.

OCW Finder

http://ocwfinder.com

OpenCourseWare sites provide free and open learning materials from university courses such as syllabi, lecture notes, demonstrations, video, exam questions, and other materials. The goal of the service is to provide users an extremely easy way to find OCW materials. The OCWFinder provides users a place to search for or browse through OCW courses. The service runs on the RSS metadata feeds generated by OCW sites, who can self-register for indexing.

Send2Wiki

http://send2wiki.com

Send2wiki is a service that helps users pull content from any web page directly into a wiki. The goal of the service is to make it extremely easy to build derivative works, especially of open educational resources (OER). The Send2wiki button can be embedded in webpages by site owners, or installed as a bookmarklet by users. Service features include an option for a machine translation of the content into a number of languages and preservation of the copyright license from the original page (if present). Send2wiki is implemented as a plugin for the popular Mediawiki platform.

Make a Path

http://makeapath.com

Make a Path is a site where learners and educators can sequence web pages, creating paths through web resources for others or for themselves.

Ozmozr

http://ozmozr.com

Ozmozr is a tool that includes a number of services: an identity aggregation service, a web-based RSS aggregator, a sharing tool, and a group tool. Ozmozr allows learners to locate and easily share web-resources with their friends and colleagues. It also allows them to aggregate all of the content they produce online into one place, creating a simple distribution center for scholarly materials.

Annorate

http://annorate.com

Annorate is a combination annotation and rating service. The goal of the service is to make it extremely easy to add annotations and ratings to any webpage, particularly webpages with educational content. The Annorate button can be embedded in webpages by site owners, or installed as a bookmarklet by users. Service features include five star ratings, note taking, and tagging. Ratings, annotations, and the location of the original webpage, together with the username, are stored in a relational database.

Future Directions

Through the development of these tools, and as emerging technology made its way into our design and development processes, we have determined a number of opportunities for future work. Future goals include enhancing existing tools and developing new infrastructure pieces and web services/applications. Enhancements include implementing a one-stop authentication system, such as OpenID, incorporating APIs, and developing a widget strategy for each of our existing and future tools. These enhancements will provide a simpler user experience, and allow users and other developers open access to folksonomically described web resources.

In accordance with the core values of openness at COSL all folksemantic data is provided back to users and developers via standard formats. Our current tools provide RSS, Atom, and RDF. Future tools will also include full REST based APIs. These APIs will let users reassemble and reuse their content via widgets that they will be able to include in their own websites or use to enhance their browser.

As new technologies emerge and opportunities present themselves the Folksemantic tool set must grow to meet user demands. Identity management and privacy are ever growing concerns. As users demand these features the current Folksemantic tool set will evolve to meet those needs. The addition of new features as demanded by users will encourage the adoption of these tools. As with most Web 2.0 social software, the Folksemantic tools become more useful and valuable as more users participate.

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Shelley Henson Johnson is a Research and Design Scientist for the Center for Open and Sustainable Learning at Utah State University. There she designs and researches experimental Web2.0 instructional tools such as Ozmozr (http://ozmozr.com), Send2Wiki (http://send2wiki.com), 51 Weeks (http://51weeks.com) and the OCW Finder (http://ocwfinder.com). She also consults on the development and dissemination of openly accessible digital resources, designs online instructional materials, and consults with faculty members about intellectual property issues. She was formerly adjunct faculty, an employee trainer, and online course developer for Weber State University. Prior to that she designed adventure-based corporate leadership programs and taught at a private school for teens with behavioral disorders. She received a B.S. from Brigham Young University and a Master's degree in Curriculum and Instruction from Weber State University. She is currently PhD, (ABD) in Instructional Technology at Utah State University.

David Wiley took his PhD in Instructional Psychology and Technology at Brigham Young University in 2000. A Postdoctoral appointment and National Science Foundation CAREER award later, he now spends his energies on increasing access to educational opportunity, specifically trying to solve problems related to informal learning with open educational resources in developing areas – teaching and learning with reusable educational resources, designing resources that are both effective and amenable to localization, developing infrastructure that supports the distribution and reuse of digital educational resources, and combining innovative business models and distributed collaboration to insure the sustainability of his efforts. David is currently an Associate Professor of Instructional Technology at Utah State University, Director of the Center for Open and Sustainable Learning, and a Non-Residential Fellow of the Center for Internet and Society at Stanford Law School.

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I Taught It, Bought It at the Game Store: Repurposing Commercial Games for Education

Ruben R. Puentedura | Hippasus

Commercial games can serve as effective tools for learning, greatly reducing the cost of introducing educational gaming into a classroom environment. However, care needs to be taken in doing so—the potential of commercial games varies greatly according to the outcome desired, and naïve game-playing will not yield good results. A systematic "critical gaming" approach holds the greatest promise for overall educational use of commercial games.

Developing educational games looks tempting—but even the simplest educational game requires considerable investment of staff, time, and resources. Is it possible to do something with inexpensive off-the-shelf commercial games instead? In this paper I'll argue that commercial games can be very useful indeed—but care needs to be taken in how and why they are used.

A question to ask when starting out is: how do we know that games are effective in education to begin with? Fortunately, there's a solid answer to this question: if we look at two review papers, the first one by Randel, Morris, Wetzel and Whitehill, covering studies from 1963 to 1991, and a second paper by Fletcher and Tobias, which covers studies from 1992 to 2005, we have a total of 110 studies that show a range of positive effects of games in educational settings. In the first paper, for instance, we find that 12 out of 14 studies showed positive results in mathematics and language arts, while 13 out of 46 showed positive results in the social sciences, and no studies showed negative results. Additionally, game learning overall showed better retention than traditional learning, and students showed greater interest in topics taught via simulations or games than they did in topics taught via traditional methods. Similarly, Fletcher and Tobias showed among other positive results transference of knowledge to real-life tasks, facilitation of performance and learning, and knowledge transfer to related domains.

So, in fact, there is a solid body of literature that indicates that well-designed, well-employed games can have a positive result on education. However, the question then becomes: do we always have to use a game that is specifically designed for education or can we use already existing commercial games for this purpose? This is a trickier question, and one that requires answering another question before it: what are your specific goals in using a game? In other words, do you want to:

- Provide domain-specific content?
  e.g., you're a biology professor that wants their students to recognize tree species, and would like them to acquire this knowledge as part of playing a game.
- Provide domain-specific analytic and problem-solving approaches?
  e.g., you're an engineering professor that would like students to apply key design skills to building structures in a game world, as a way of then having them transfer them to the physical domain.
- Enhance skill transfer to related tasks or domains?
  e.g., you're a writing instructor that would like students to use the stories present in role-playing games as a point of departure for their own storytelling.

- Enhance general skills or cognitive processes?
  e.g., you're a visual arts faculty member who would like students to play games that enhance general 3D visualization skills.
- Develop specific social structures?
  e.g., you're teaching a public policy course, and you would like your students to develop leadership and team organization skills that they can transfer to public policy teamwork.
- Improve participant motivation?
  e.g., you're teaching a health sciences course that requires large amounts of memorization of new terminology, and you would like your students to do so in as painless a fashion as possible.

All of these can, and have been successfully addressed by specially-designed educational games (see the papers referenced above). However, the situation when it comes to using commercial games is a little more mixed:

Provide domain-specific content: the potential of commercial games here is very weak—few commercial games are solid in this regard. Thus, our hypothetical biologist would be horrified to see what the gaming world considers to be "realistic" plant life and ecosystems. Similarly, a historian trying to make use of *Caesar IV* to teach Roman history would find an entertaining game, but one with little that would convey historically accurate information to a student.

Provide domain-specific analytic and problem-solving approaches: commercial games can be quite valuable here. A game like *SimCity* can indeed provide some planning and design skills that might be of use to future engineers. However, for maximum benefits, this particular use of commercial games needs to be framed in the context of critical gaming, an approach I discuss later in this paper.

Enhance skill transfer to related tasks or domains: the potential here of commercial games is excellent, provided the skill to be transferred is framed carefully. Writing fanfiction about role-playing games has been found to be a valuable creative writing exercise, as has creating videos (called machinimas) using the visual environments of games such as *World of Warcraft*.

Enhance general skills or cognitive processes: the potential here of commercial games is intriguing, but requires further research. There is evidence to suggest that playing *Tetris* enhances both spatial visualization skills, as well as manual dexterity. Similarly, intensively 3D games such as *Katamari Damacy* have been associated with improved 3D visualization. However, many of these results are derived from very small sample sizes; furthermore, generalization to other games is risky at best—there is no guarantee that other *Tetris*-like games will show the same results that *Tetris* does, nor that any random 3D game will improve general 3D skills.

Develop specific social structures: the potential here of commercial games is weak—game social structures have not been shown to map usefully from game needs to real-world needs. Players that learn how to band together to kill trolls may develop a wealth of new leadership and team skills—but none, as far as has been reported to date, that would transfer usefully to educational teams or the workplace (unless, of course, they plan to work for the Kill-A-Troll corporation.) For more on this topic, please see my paper on MMOGs in these proceedings.

Improve participant motivation: the potential here is ambiguous—while educational games can indeed be used to improve motivation in a course, the relevance of the game to the course must be gauged carefully. Thus, playing *Civilization IV* in a course in the social sciences as an entertaining preface to asking the students "so, how can you use what you've learned to figure out what's wrong in the game?" will probably work well, since the game makes some claim to historical simulation. Playing *Tomb Raider: Legend* in a similar course will likely fail, since the game's (very silly) depiction of archaeology makes no such claim, and the students will perceive the task as a way for an overworked professor to get out of lecturing for a day.

Looking at commercial game genres, there are some that stand out in terms of their potential for educational use:

- Interactive Fiction (e.g., *For a Change*): games in this category are particularly well-suited for narrative structure analysis exercises.
- Role-playing Games (e.g., *Final Fantasy VII*): these games provide support for studying dramatic structures, building narratives, and media creation (e.g., paintings) derived from the game world.

- Massively Multiplayer Online Games (e.g., *World of Warcraft*): these provide the same possible uses as role-playing games, but are additionally well-suited as frameworks for original research by students in the social sciences. Again, for more on this topic, please see my paper on MMOGs in these proceedings.
- Alternate Reality Games (e.g., *Perplex City*): these games can be used as support for the building of narratives, as well as in scenarios for the development of media literacy strategies.
- Sims (e.g., *SimCity 4*): these games can provide useful material for courses in systems modeling, and statistical analysis.
- Real-Time Strategy Games (e.g., *StarCraft*): these games can be used in courses involving modeling and decision optimization, provided they are analyzed from a critical gaming perspective.
- Turn-based World Strategy Games (e.g., *Civilization IV*): these games can be used to discuss historical assumptions and causality analysis within a critical gaming context.
- Twitch Games (e.g., *Tetris*): some of these games can be used to enhance dexterity and spatial perception skills.

A Case Study in Pitfalls: *Spore*

Recently, Will Wright (creator of many sim-type games, including *SimCity* and *The Sims*) has been working on a game called Spore. The game allows the player to create creatures at scales from the unicellular to entire civilizations, let them interact with other creatures in planetary ecosystems, and guide their destinies in multiple ways.

The game looks to be a fun and engaging experience, and one that should have gamers lining up to buy it on its release date. However, Will Wright (and other commentators) have additionally been touting the game as an educational "Montessori toy" that, among other virtues, will help players understand "Darwin in action." While the game could serve as a fun animation engine, an excellent substrate for storytelling, or even (by virtue of its built-in planetary systems simulator) a rough introduction to feedback loops in the atmosphere, one thing it is not is a good introduction to evolutionary theory. Consider the following:

- While creatures "mate" to produce offspring, their genes only serve as a point of departure—the player is free to modify the resulting creature any way they see fit, with no evolutionary constraints;
- The creature thus created will pretty much "work," no matter how maladaptive the traits imposed on it by the player might be;
- Fitness landscapes and related concepts are totally absent from the *Spore* world;
- Perhaps most importantly, the *Spore* world is teleological: unlike evolution, the player has a definite end goal that they want to achieve, and are expected to intervene at every point in the game to steer the development of their creature in that direction.

Indeed, if anything, *Spore* could be viewed as a simulator for a form of creationism—the furthest thing from a Darwinian model. This is not to imply that Will Wright has a secret propaganda agenda: the constraints outlined above are necessary to make this particular game fun. In fact, Will Wright himself has talked in the past about how making a game faithful to educational goals can make a game unfun: *SimEarth: The Living Planet* sacrificed gameplay to simulation accuracy, and sales suffered accordingly. That being said, there's no reason that a Darwinian game couldn't be fun and a commercial success—but *Spore* is not that game.

Spore serves as a textbook example of what to avoid when using commercial games for education. No matter what claims the manufacturer might make for the educational virtues of its game, it is wise to unpack the underlying assumptions of the game before going any further. In fact, this type of unpacking can be more valuable than any "plain vanilla" use of the game might be—in the next section I will present one such approach to the use of commercial games in education.

Figure 1: *Spore:* from top: Creatures mating on the planet The creature builder The planetary scale The galactic scale

A Systematic Approach to Critical Gaming

The following steps will help design educational approaches to games that are not fraught with the pitfalls exemplified by *Spore*—in fact, some extremely "inaccurate" (in real-world terms) games can be more useful from this perspective than more traditional educational simulations.

1. Establish what the game is attempting to represent: what is the scope of the simulation? For instance, if the game is historical, is it trying to simulate a specific historical period, or is it "generically historical," i.e., trying to represent historical processes as a whole?
2. Establish how it's doing it: is the game using a large set of coupled differential equations? Or is it using a discrete set of rules that are applied by individual agents? Or—perhaps—the game is "cheating": no matter what the player does, some in-game events will happen because they are needed for gameplay.
3. Determine its successes: where does the game match real-world behavior? How well does it do so? What specific aspects of its implementation (see 2 above) contribute to this?
4. Determine its shortcomings and their sources: there are three key sources to consider here:
   - Technical limits: how do processor power, graphical limitations, etc. influence this?
   - Game fun limits: what would be "unfun" about the game, if were to be more accurate?
   - Conceptual limits: most importantly of all, how do developer preconceptions about the nature of the topics related to the game affect the game itself? For instance, what are the sociological assumptions reflected in the societal model in *Civilization IV,* and what are their observed results?
5. Propose remedies for the shortcomings: taking into account what has been learned in 4, how can the game be made more "life-like"?
6. Propose ways to further investigate the game: are there other aspects of the game that have not been considered? Could it be used in educational settings in other ways?

Undertaking this process with an arbitrary off-the-shelf game can be an arduous task, particularly for a faculty member unfamiliar with the process. I have found that the following approach can make the process considerably easier:

1. Select a target "hard" game to be investigated: this game is selected for its potential educational value (e.g., *SimCity 4* or Europa *Universalis II*), but with the understanding that some of its mechanics may be opaque at the outset.
2. Select a simpler related game from the casual/independent games community: for instance, *Democracy* uses simulation approaches similar to *SimCity,* but is considerably simpler to pick apart; the *Diner Dash* series contains many of the key elements of more advanced strategy games. In addition to their simpler nature, it is also easier to contact the game developers directly about game mechanics than in the more advanced commercial games.
3. Follow the six-step systematic approach outlined above for the simpler game as a joint faculty-student investigation, focusing on those aspects of game mechanics that link the simpler game to the target "hard" game.
4. Turn the target game over to the students for independent investigation, critical commentary and evaluation, based upon the knowledge gained from the simpler game.

Final Remarks

There are excellent reasons for using commercial games in education. In many cases, better results can be obtained by using one of the approaches outlined above than by trying to create a (potentially very expensive) specialized educational game. Even though the limitations of most commercial games render them unsuitable for a direct "teach the content" approach, those same limitations make them eminently well-suited to teaching how to determine the assumptions that underlie a particular area of study, what the consequences of those assumptions are, and what alternative approaches might look like.

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About the Author

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Multi-threaded Interactive Storytelling for Literary Journalism

Kim Pearson and Ursula Wolz | The College of New Jersey

This research project began with conversations between the co-authors about what a magazine profile would look like if the potential capabilities of interactive multimedia technologies were fully exploited. The co-authors, a journalist and computer scientist, posited that it might be possible to create a user-directed, database-driven system for multi-threaded storytelling. To test that hypothesis, Pearson has set herself the long-term task of designing a writing system for creating news stories for database driven, object-oriented narratives. Wolz has embarked on an effort to understand the deep structure of multiple story lines and implement computer-based tool for this process. In the short term, by studying Pearson's approach to teaching journalism, Wolz realized that writers employ an implicit process to narrow the multiple threads of a story into a coherent linear story. Together Pearson and Wolz realized that they could capture multiple story lines by providing a framework to support this implicit process and allow writers to reflect upon it. This would require developing a taxonomy that could be represented in a database. Pearson is creating such a taxonomy that abstracts the elements of one sub-genre of literary journalism: the in-depth profile.

It has become a truism that we first use new technologies in the way that we use the old technology most like it, and it is only over time that we learn to use new technologies on their own terms. So it has been with our use of networked digital technologies for journalistic storytelling. In the last 15 years, journalists have progressed from using digital media platforms primarily for shovelware to thinking of creative and practical ways of using technology to make news more accessible, useful and engaging for news consumers. While this has resulted in new conventions for web writing and design, as well as interactive database-driven infographics and games, the full potential of interactive media for narrative construction and presentation still remains to be explored. The research described in this paper, the Nancybelle project, concerns a collaboration between a journalist and a computer scientist aimed at creating a tool for structuring and presenting media-rich, interactive works of literary journalism. If successful, the resulting tool should not only lead to an enhanced storytelling tool, but should offer new ways to help journalists fulfill their mission of promoting informed citizenship.

The hybrid genre of literary journalism combines the conventions of fictional narrative with hard news reporting. At their best, these stories read like compelling fiction. Premiere examples of the kind of work we are talking about can be found in magazines such as the New Yorker and the New York Times Magazine. Presenting these kinds of narratives online raises both challenges and opportunities. Long text narratives are not conducive to web presentation, but "chunked" or segmented narratives also have drawbacks. Web readers have multiple points of entry into and exit from a story, disrupting the narrative flow.

However, online and interactive media have the potential to enhance the power of a compelling narrative. The availability of multiple media extends the storyteller's ability to create immersive, evocative storyworlds. Interactive media technologies can also facilitate the presentation of a story from multiple perspectives—a capability that is tantalizing for many reasons. First, it gives a storyteller more ways of engaging a reader. Second, contrasting story perspectives can be used to educate or promote civic engagement.

This research project began with conversations between the co-authors about what a magazine profile would look like if the potential capabilities of interactive multimedia technologies were fully exploited. The co-authors, a journalist and computer scientist, each had reasons for being intrigued by the question. Pearson is a journalist concerned with finding new ways to engage audience with rich, complex non-fiction narratives. Wolz is a computer scientist (with training in computational linguists) interested in deep structures of multimedia information dissemination. We posited that it might be possible to create a user-directed, database-driven system for multi-threaded storytelling.

To test that hypothesis, Pearson has set herself the long-term task of designing a writing system for creating news stories for database driven, object-oriented narratives. Wolz has embarked on an effort to understand the deep structure of multiple story lines and implement computer-based tool for this process. In the short term, by studying Pearson's approach to teaching journalism, Wolz realized that writers employ an implicit process to narrow the multiple threads of a story into a coherent linear story. Together Pearson and Wolz realized that they could capture multiple story lines by providing a framework to support this implicit process and allow writers to reflect upon it. This would require developing a taxonomy that could be represented in a database. Pearson is creating such a taxonomy that abstracts the elements of one sub-genre of literary journalism: the in-depth profile.

Achieving the goals of this project requires a kind of collaboration between journalists and computer scientists that has been long in coming to both professions. There has been a tendency among journalists to think of computing professionals as mere technical support people as opposed to potential collaborators. Conversely, since journalism has been technology-dependent since the days of Gutenberg, it's inevitable that changes in the technology of news gathering and dissemination would affect the form and content of journalistic writing. This collaboration is unique in that it brings a writer and technologist together from the beginning, with the expectation that innovations will emerge that affect both fields.

This collaboration is an outgrowth of an ongoing partnership between journalists and computer scientists at The College of New Jersey. In the summer of 2006, TCNJ Computer Science professor, S. Monisha Pulimood, directed a project with Pearson and computer science students that led to the creation of a new, custom content management system (CMS) for Unbound (http://www.tcnj.edu/~unbound), an online news magazine that has been published since 1996 by TCNJ journalism students. Pulimood continues to conduct mentored student research on the enhancement of the Unbound CMS, working closely with Pearson and her students.

More recently, Wolz, Pulimood and Pearson became co-PIs on a newly-awarded National Science Foundation grant intended to expose rising 8th graders to opportunities in computer science through instruction in interactive journalism. The three-year demonstration program consists of a summer camp with follow-up enrichment activities in which students will report and write news stories, and also create simple databases, animated infographics, editorial cartoons and games (NSF).

The Nancybelle project comes at a time when the news industry is in a crisis that has been decades in the making. The audiences for news have been growing smaller and older for decades (Mindich, 2005). Industry professionals and concerned news consumers are exploring a plethora of ways of harnessing emerging media to re-engage audiences and sustain viable media enterprises. Currently, these efforts emphasize the use of social media such as blogs, as well as user-generated content, and the exploration of alternative story forms such as interactive graphics and games (Quinn, 2007). There is also an emphasis on portability, as stories are more frequently packaged for presentation across platforms: print, broadcast, online, cell-phone, PDA, iPOD.

Background

Computing professionals working in journalism have advanced the critique that technology should allow users to extract news that matters to them. Adrian Holovaty, a self-described "programmer-journalist" who creates relational databases for news and information, is a leading proponent of this view. Holovaty argues that news organizations need to stop thinking of presenting news primarily as stories, and focus instead on ways of organizing news content as "structured data." After all, Holovaty says, when a fire takes place, what people really want to know is fairly predictable: where it happened, were people hurt, what caused it, etc. A database system of the type that Holovaty builds would extract this information from public records and make it accessible to news consumers who can not only learn about that fire, but others that might be related to it (Holovaty, 2006b).

With backing from the Knight Foundation, Holovaty is now launching Everyblock.com, a news aggregator that promises to aggregates "an unprecedented depth of local news and information in select cities."(Holovaty, 2006a). Undoubtedly, Everyblock will deliver a wealth of timely information customized to meet users' information needs.

Holovaty acknowledges that his approach sacrifices narrative, and that narrative has its place:

A news story is intended to be "consumed" by humans, not computers. Indeed, one could argue that's what makes a good news story great: it's literature — more art than science. Well-written prose is unpredictable, and predictable prose is boring. Why should art be machine-readable (Holovaty, 2006b)?

Indeed the routine fire story, whose essential information Holovaty would reduce to searchable data elements, can take on the pathos of mythic narrative in the right hands. It's a story of humans against nature — or against the nefarious arsonist. There's the manic leap of the flames, the firefighters' heroic assault, the miraculous rescue, the tragic loss. These narratives serve a cultural function, creating bonds of community and shared values (Kovach, 2007).

Of course, there are routine hard news stories that are more prosaic. The corporate earnings story, for example, is so predictable in its structure that Thomson Financial was able to program robots to "write" the stories (van Duyn, 2006). Knowledge-based artificial intelligence agents assemble the stories into a pre-determined format. This approach works for this kind of story because it conforms to readers' expectations for concise, accessible information.

Thompson Financial's approach takes advantage of research over the past two decades in artificial intelligence and natural language processing, where the emphasis has been on creating hardware and software systems to automatically generate texts. Our project, however, draws upon research into tools for storytellers emerging from developers in the interactive cinema and gaming communities. For example, Kevin Michael Brooks' 1999 dissertation, Metalinear Cinematic Narratives: Theory, Process and Tool (Brooks, 1999) describes a software tool that assists creators of multithreaded fictional narratives in planning, creating and presenting stories in audio and video formats. Brooks' system consists of five key elements:

- The Structural environment, which abstracts the narrative process;
- The Representational environment, which describes the relationships between story elements;
- The Writer Feedback environment, which uses artificial intelligence agents to advise writers on the "constructability of the collection of story clips;"
- The Presentational environment, which allows audience members to use story agents to sequence video clips; and
- The Agent Scripting environment, which allows storytellers to create new story agents (Brooks, 1999, p. 96).

Game developer Chris Crawford has also created an agent-based tool that allows writers to construct what he calls "story worlds." His technology, SWAT (StoryWorld Authoring System) casts those agents as "verbs" that define relationships between characters and drive the plot forward. Other systems, such as Façade, allow users to function as a character in a story, interacting with computer-generated characters to create narratives that have a fairly consistent arc, but not a pre-determined outcome (Façade). Still other systems facilitate the creation of multi-threaded hypertext and hypermedia.[1]

These systems, while intriguing, are not designed for journalistic storytelling. Such a system requires that chunks of content be defined not only in relation to their function in the plot threads, but also in terms of their journalistic structure. So, for example, the story's lead, newspeg, and other elements would need to be defined. We believe it should be possible to create a system that provides non-fiction storytellers with the ability to generate user-directed, multi-perspective, multi-media, metalinear narratives. The complexity of the tool we envision would not make it appropriate for breaking news stories, at least in the short term, however, it might open new frontiers for documentary makers and literary journalists.

Literary journalists combine the conventions of narrative fiction with the rigor of hard news reporting. Tom Wolfe identified several common components of literary journalism: scene-by-scene story construction, extensive use of dialogue, experimentation with point of view, the use of a narrative arc that invokes a literary "masterplot," and the incorporation of symbolic detail (Wolfe, 1973).

This hybrid genre is usually featured in magazines such as the *New Yorker* and the *Atlantic Monthly,* the magazine sections of newspapers, and radio television documentaries. Literary journalism uses the cultural power of stories to add context, dimension and insight to news reporting. Classic works in the genre such as W.E.B. Du Bois' *Souls of Black Folk,* John Hersey's *Hiroshima,* and Edward R. Murrow's *Harvest of Shame* have not only enlightened and informed — they have affected the course of public discourse on contentious issues. (It should be noted that the incorporation of broadcast news in our canon of literary journalism stretches the traditional definition of the genre.) Literary journalism can make a particular contribution in these times of increased diversity accompanied by cultural fragmentation, significant economic and technological dislocation and contentious intra- and international relations. However, in order for that to happen, literary journalists need ways of engaging audiences who have been turning off the news and turning to comedians and talk show hosts for perspective on world events. This research seeks to complement the work of literary journalists, not replace existing forms of the genre.

Multi-Threaded Storytelling as a Data Structure

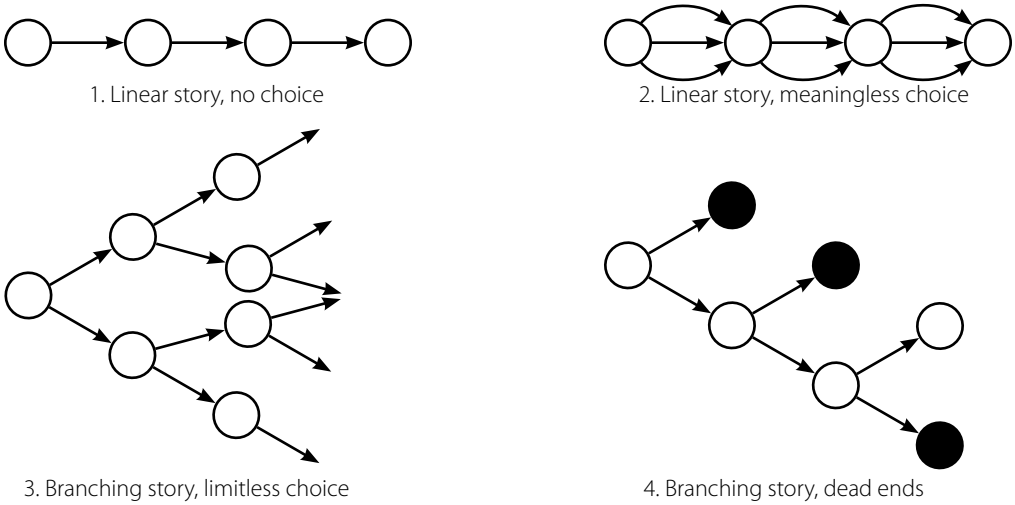
Non-linear, computer-based storytelling certainly exists already as video games. Significant debate is occurring[2] both within the industry as well as in the popular press as to the influence of narrative on game environments. As reported on CBSnews.com:

> "Creating powerful narratives is the next step — not shinier guns or ultra-realistic intestines. We need real emotional and intellectual experiences. The potential is there for video games to become the paramount medium and it won't be through the resolution they're played at. It will be through the stories they tell." (Vitka, 2006).

A convergence of themes is occurring. The distinguishing feature of non-linear storytelling (going back to Tolstoy's *War and Peace*) is the degree to which the story becomes interactive. This in turn suggests a model of story element "nodes" or choice points that lead via alternative "arcs" to other nodes. Our collaboration is trying to make sense of these nodes and arcs. Our insight is that graph-theoretic analysis of such structures in the abstract can be applied to storytelling. We are not the first to try this, but we suspect we are the first to consider how to create tools that support the writer in developing and expanding multiple perspectives in a journalistic piece, rather than abandoning powerful story perspectives on the cutting room floor.

Noah Falstein writes about the "Natural Funatvity" of games and provides a graph-theoretic analysis contrasting highly constrained choice with infinite choice.(Falstein) He presents four models as shown in Figure 1: (1) a "no choice" (e.g. linear story), (2) a progression with a bounded "meaningless choice" where the player has the allusion of choice but where the story always "folds back" to the same story elements. He also presents (3) an infinite choice model where each node leads to unique new nodes that in turn exponentially expand the story line. He rightly criticizes this approach as impossible to implement computationally. Finally he also presents a "Choose wisely" version of the infinite choice version. The user must choose paths wisely or "die." Here dead end nodes result in places from which you cannot recover. Games of this type, he rightly claims, lead to player frustration.

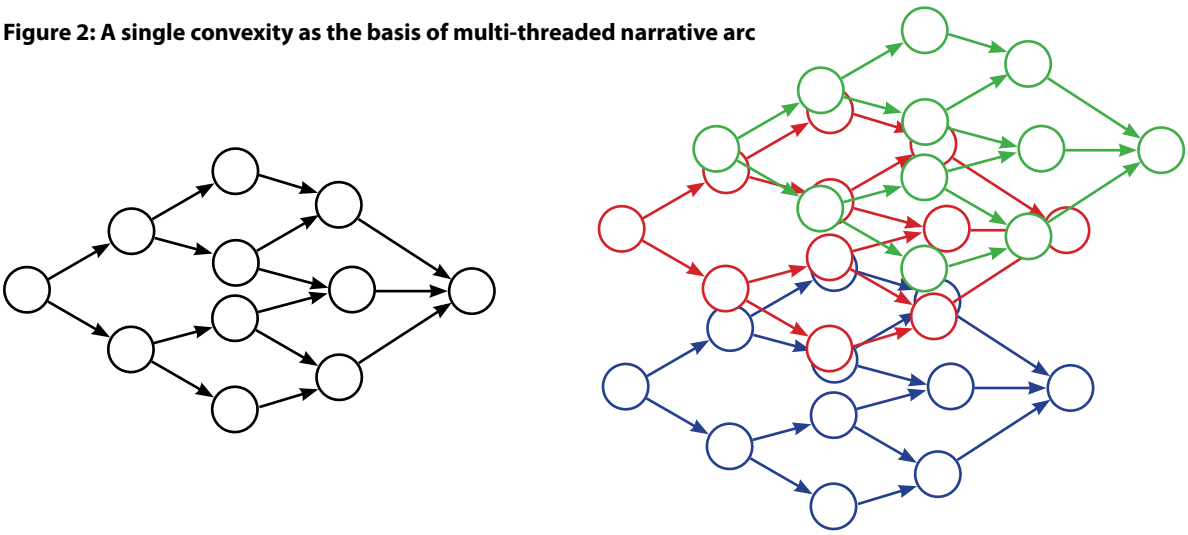
Figure 1: Story node sequence as graph



1. Linear story, no choice
2. Linear story, meaningless choice
3. Branching story, limitless choice
4. Branching story, dead ends

Falstein suggests an ideal structure that he calls "convexity" because of its outwardly curving shape. See Figure 2. A player starts with just a few choices, which expand, leading to more choice that gradually contracts back to a single outcome, or small set of outcomes. Falstein argues that a series of such convexities provide a sufficiently rich set of choices to support interactivity while simultaneously constraining the game so that (1) it can be reasonably implemented, and (2) it doesn't create frustrating dead end nodes for the user.[3]

Figure 2: A single convexity as the basis of multi-threaded narrative arc



Ultimately Falstein's model is still a single narrative arc with some variability built into the storyline. Our approach extends this by overlaying multiple convexities upon one another. See the multicolored graph in Figure 2. We discovered the need for overlapping multiple convexities as Wolz observed Pearson's struggle to choose a narrative arc in a news magazine story she was trying to tell. Whereas the game designer of a fantasy world has the prerogative to develop a story in a particular direction, the journalist's ultimate goal is to draw out the facts of an event or phenomenon.

A Domain of Inquiry

We are testing our hypothesis by working with a prototype story that lends itself to multiple story angles. The story is a profile of Nancybelle Valentine, a retired design pattern-maker who was a key founding employee of the Liz Claiborne fashion empire. According to the company's former international president, Jorge Figueredo, Valentine was "a legend" in the company because of the role that she played in the development of the company's early collections, and her close working relationship with Claiborne (Pearson, 2005a). In addition to her unheralded contributions to the fashion industry, Valentine is interesting because of her rich family background, which includes the fact that her childhood was documented in photographs by the noted Harlem photographer, James Vanderzee. Further, Valentine has been active in the lesbian community in New York and New Jersey over the last several decades, in addition to being a leader in her church. Her story can be told through a focus on fashion history, women's history, African American history and gay and lesbian history, and connections to a variety of contemporary topical issues emerge from each narrative thread.

Nancybelle Valentine's story easily lends itself to the magazine profile format. Pearson first began to think of the story as a web-based narrative in Spring, 2005, creating a branching narrative with image galleries in HTML (Pearson, 2005b). Seeking ways to make the web-based presentation more dynamic and topical, Pearson, Wolz and their students began discussing non-hierarchical storytelling approaches, as well as the incorporation of video, audio and interactivity. In the summer and fall of 2006, Pearson and several students created additional video, audio interactive and image artifacts, further developing the story. In addition, her students created a non-hierarchical flash interface inspired by the interactive web-based collage, aisforapple.net. The challenge with such an approach, of course, is to preserve narrative coherence while taking advantage of the freedom of exploration that the web offers.

Modeling Nancybelle as Multiple Storylines

We are approaching the problem first, by using relationally connected spreadsheets to plot out the narrative threads, as well the relationship between the content chunks and the elements of the journalistic meta-narrative (Pearson, 2005c). This very simplistic tool was immediately accessible to Pearson, simultaneously giving insight to Wolz on how a more complex relational database could be implemented. Our guiding principle has been to model the user's, in this case writer's, process and then create the interface from that model. This has encouraged Pearson to be highly reflective about how she thinks about story creation. Using well-known technology, such as a spreadsheet interface, lets her concentrate on the story rather than developing mastery of the technology's interface.

From a technical perspective, representing these relationships as an overlay of convexities presents an array of challenges that requires us ultimately to think about (1) what are the chunks that constitute the "nodes" of our graph, (2) what are the decision making points for the reader that lead to other chunks (the arcs of our graph). As a first pass, Pearson is articulating the relationship between the chunks as series of tables implemented in a collection of spread sheets. This will provide Wolz with the implicit structure for representation within a relational database that, in turn, will provide us with an interface more supportive of the writer. Because we do not have a good abstraction for the process of developing the multiple threads we cannot yet define the relationships in the database. We are committed to having the process drive the technology rather than the interface drive the writing process to patiently experiment with Nancybelle using existing tools, including index cards and pencils.

Questions that have arisen from this process include on the technical side: "How big is a "chunk" of information in a "node" and what does the node look like? Is it a text snippet, a photo (or worse, a montage?), a video or audio clip, or something large that contains these as set of constrained elements? What is the level of granularity of these chunks? How do we support the writer in her attempt to get these chunks right?

One of the most challenging technical questions involves the representation of certain literary elements of the narrative. For example, Pearson's reporting revealed that part of the way Nancybelle Valentine's family raised her to have ambitions beyond the limits imposed by the poverty and discrimination they experienced was to expose her to elite culture, such as opera. Her mother's insistence that Nancybelle and her sister have annual studio portraits also reflects the family's aspirational spirit. Pearson plans to draw out this aspect of Nancybelle's story through references to the work of scholars. However, she experimented with invoking the symbolic meaning of the images by creating a slide show of family photographs with an aria from "La Boheme" sung by Enrique Caruso playing in the background.

In journalistic terms, this is a sidebar—a secondary story or graphic element intended to augment the main story. However, the pairing of Caruso with the family portraits is also intended to function as a rhetorical device similar to Du Bois' pairing of Negro spirituals with poetry from the European canon as a prologue to each chapter of The Souls of Black Folk.[4] Du Bois' strategy greatly affected the way middle class African Americans saw themselves and raised their children in the early to mid-20th century. The question arises, however, as to how much of this detail can be represented in a database and at what level of granularity it can be incorporated into a presentation?

More abstract questions include the perspective problem. The writer may design explicit pathways through the set of nodes, where the alternative narratives are captured in the pathways through the piece. However, inevitably alternative pathways will appear as a reader chooses to move out of a node by switching context. Can we create support for the writer to anticipate these unexpected paths that the game industry calls "emergent behavior? This leads to the question of who controls the story: the writer, the user or perhaps even the writing system itself? Can we define processes that search out unexpected pathways and present them to the writer who in turn can elaborate upon them to create even more explicit storylines? Or can the user be allowed to do this, contributing to the stories in a community?

Next Steps

Having articulated the hypothesis, our task now is to flesh out the Nancybelle story by constructing the remaining "chunks" that tell her story from multiple perspectives. Our intent is to complete a "hard-coded" version of a hyper-document and then "reverse Engineer" the result to abstract out the multiple convexities. Our highly reflective, collaborative approach provides us with the tools necessary to begin to understand what it means to create a multi-threaded story that is coherent to the reader. It also provides the basis for understanding what sorts of tools we can design to support both the writers and readers of such stories.

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Notes

1. See, for example, *StorySpace* (http://www.storyspace.com), *Dramatica.* (http://www.dramatica.com), *Inform* http://www.inform-fiction.org/inform6.html

2. See for example, Lee Sheldon, *Character Development and Storytelling for Games.* Course Technology, 2004, Chris Bateman (Editor) *Game Writing: Narrative Skills for Videogames.* Charles River Media Game Development Series, 2006.

3. Similar analysis and data structures can be found at the International Game Developers Association Game Writers SIG: *Foundations of Interactive Storytelling.* SIG: http://www.igda.org/writing/InteractiveStorytelling.htm

4. Du Bois' frankly propagandistic approach might seem non-journalistic to some observers, and unwise to emulate. However, I think it is justified in order to convey the spirit of the times. Literary journalism is distinguished by the latitude writers exercise in displaying an authorial perspective. It should be noted that *Souls of Black Folk* is considered one of the 100 most important works of journalism of the 20th century, according to a faculty panel at New York University. http://www.nyu.edu/classes/stephens/Top%20100%20NY%20Times%20page.htm

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Kim Pearson is an associate professor of English at The College of New Jersey, specializing in writing for journalism and interactive multimedia. Over the course of a 30-year writing career, her articles have been published in venues ranging from the Online Journalism Review to Black Enterprise Magazine. Pearson is a contributing editor for BlogHer, a leading online community for women bloggers. She is a co-PI on a National Science Foundation grant, *Broadening Participation in Computing via Community Journalism,* along with Ursula Wolz and Monisha Pulimood of the TCNJ Computer Science department.

Out of the Cave or Further In? The Realities of Second Life

Gregory Reihman, Ph.D. | *Lehigh University*

This paper offers a philosophical reflection on some educational uses of virtual reality. More specifically, by discussing how Second Life was used in a philosophy course, the paper explores how philosophical theories (specifically, the views of Plato) can help us make sense of virtual entities, and how virtual entities can help us make sense of philosophical theories. In addition, the paper shows that virtual worlds can help us reveal, understand, and question some of our core assumptions about what we count as real. In this way, the author argues that our beliefs about reality are more malleable than most of us typically believe them to be.

In this paper I explore two possibilities. The first is that our beliefs about reality might be more malleable than most of us typically believe them to be. The second is that virtual worlds can help us reveal, understand, and question some of our core assumptions about what we do—and what we perhaps ought to—count as real.

Because this paper is at least partly about how our beliefs about reality undergo change, I invite you to take a few moments to think about, even jot down, your views on the brief set of philosophical questions listed in the box below. In fact, if you're willing, I invite you to join in an ongoing study by participating in a pre-article survey and post-article survey, in order to see if we might measure (roughly, to be sure) the malleability of your metaphysical views. If you are willing to do so, please fill out the short survey online at http://www.lehigh.edu/~grr3/survey. If you prefer to skip this survey business altogether, please jump ahead to section 1, below.

Virtual Reality Survey

1. How likely is it that some experience could change your beliefs about what makes something real or about whether some particular entity is in fact real or unreal?

2. Rank the following kinds of entities in order of how real they are

   _____ everyday entities (e.g., tables, chairs, apples)

   _____ mental entities (e.g., ideas, perceptions)

   _____ dreamt entities

   _____ fictional entities, places or characters (e.g., Shakespeare's Hamlet, Middle Earth)

   _____ scientific entities (e.g., electrons, molecules)

3. In your opinion, virtual worlds are …

   … real in the same way our everyday world is real.

   … real in the same way our mental worlds (e.g. ideas, perceptions) are real.

   … real in the same way dreams are real.

   … real in the same way fictional places (e.g., the setting of a novel) are real.

   … not real in any of these meanings of the term real, but still in some sense real.

   … completely unreal

4. In your opinion, avatars (the entity/person/character in a virtual world that is controlled by a computer user) are …

… real in the same way ordinary persons are real.

… real in the same way mental entities (e.g. ideas, perceptions) are real.

… real in the same way dreams are real.

… real in the same way fictional characters are real.

… not real in any of these meanings of the term real, but still in some sense real.

… completely unreal

The Core Questions

The core philosophical question that guides the thinking in this paper is this: What's real about the virtually real? The core pedagogical question is this: What educational value might virtual reality have for those learning about philosophy?

For many of us, the first blush answer to these questions is quite easy to give. It goes something like this:

> "Virtual worlds are not real; avatars in a virtual space have no ontological or ethical status; and taking such things too seriously is a foolish waste of time."

Embedded in this claim are both an ontological judgment (about the reality of virtual entities) and a related quasi-ethical value judgment (that time spent with unreal entities is time wasted). However, those who spend even a short time wrestling with some old philosophical questions, reading some provocative fiction, and actually exploring a virtual space will either temper or abandon this initial judgment.

In what follows, I discuss a project of philosophical inquiry into virtual reality by offering a case study about a college course and an analysis of student perceptions on the real and the virtually real. The case study and the analysis have led me to the views I seek to defend here: That our beliefs about reality are more malleable than many of us suspect and that virtual worlds can have a leavening and rearranging effect on tightly-held core metaphysical assumptions.

Background: Educational Uses of Virtual Reality

In recent years, educators and inter-institutional consortia have been working to discover what educational value might be gained by using virtual worlds.[1] These efforts typically focus on three main uses of virtual realities: as a way to teach content, skills, or attitudes; as an object of study; as a way to test theories.

Educators who use virtual realities to teach content, skills or attitudes rely on the immersive aspect of such worlds to allow students to enter a realistic environment rich with details. In such environments, students can more directly experience an historical event, visualize a physical process, or work through complex problems in simulations that offer immediately observable results. Some educational researchers have found that such uses have the added potential benefits of heightening student engagement, increasing student control over the pace and direction of their learning, and accommodating a wider variety of learning styles than traditional approaches.[2]

Others academics are turning their eyes on the virtual worlds themselves. Recognizing that an increasing number of students are already engaged in gaming activities (educational or otherwise), such researchers ask what effect these activities have on students cognitively, emotionally, and socially. The virtual environments here become an important object of study because that is where many students *are*. For example, sociologists are beginning to study how individuals interact in such spaces[3] and psychologists are studying the effects of virtual realities on our body image and sense of self.[4]

A third application is the use of such spaces to test theories. While computer-generated virtualizations and simulation have long been used to test theories in the natural sciences, mathematics, economics, and engineering, other disciplines can now more easily use such tools. What's changed is the fact that virtual worlds can now visually simulate complex social phenomena by creating richer visual representations that allow for the testing of social, philosophical, literary, and aesthetic theories as well.

In philosophy, my field of study, researchers have new opportunities to test theories of metaphysics (roughly, the study of what is real, what is not, and why) and ontology (roughly, the study of what types of things there are and what

makes one type of thing different from another). Virtual worlds give us a powerful new tool that allows us to illustrate metaphysical concepts and theories, compare competing views, bracket certain aspects of reality, and advance our understanding of what grounds our ontological. Philosophers have long used vivid examples (e.g., allegories of caves, evil geniuses, brains in vats, twin earths, etc.) to prompt such thinking, but these new forms of visualization provide new opportunities we are only now beginning to see.

A Philosophy Course

Sensing these opportunities, I decided to use Second Life in a course I was teaching in Fall 2006 in Lehigh University's College of Arts and Sciences.[5] In this course, 21 first-year students with little to no prior experience with philosophy explored a wide range of philosophical and literary perspectives on what we do, and what we should, count as real. The course, titled "Dreams and Realities: Philosophical Constructions of the Real," was described for students in this way:

> How do we decide what is real and what is not? Although our scientific, religious, and ethical beliefs depend on our answer to this fundamental question, we rarely give the question itself the attention it deserves. In this course, we will study a wide range of texts that offer competing pictures of reality. In particular, we will look at how claims about reality are often made by first defining something else (for example dreams, illusions, or appearances) as unreal.

The class started out as a fairly typical philosophy course. We read works by a wide variety of authors representing both traditional approaches to these questions (e.g., Plato, Berkeley, Descartes) to those who came at it in unusual ways (e.g., Borges, Nietzsche, Freud, and Baudrillard). The goals in reading such a wide variety of texts were, first, to help students appreciate the range of available metaphysical positions and, second, to create opportunities for students to uncover, explore, and evaluate their own presuppositions about such topics.[6]

For the purposes of this paper, I will not go into any great detail regarding the content of these works. However, suffice it to say that two-thirds of the way through the semester students had worked carefully through a number of works that offered a range of views, while engaging in a series of intense discussions not only about whether it makes sense to say one type of thing is more real than another but also about how we actually go about deciding the reality (or degree of reality) of things. They worked through a number of candidate philosophical and literary answers to such questions. Then students were then asked to enter Second Life to test these theories in a virtual world.

How We Rank Entities

At this point I owe it to the reader to provide a bit more explanation about what I mean by "what counts as real" and what it means for something to be *more* real, or *differently* real than something else. Indeed, perhaps the most difficult part of teaching students about metaphysical or ontological theories lies in finding a way to make it clear what it means to rank the reality of various entities, or what it means to say that one kind of thing is a different *kind* of being than another. Most students (indeed, most persons) do not initially find it meaningful in any way to say that one thing is more real, or differently real, than something else. To help move us past this initial skepticism, I used a series of 'reality ranking' exercises. Such exercises reflect my assumption that students actually do hold views on such topics even if they are not fully aware of what they believe or why. These exercises helped students to clarify their own ontological positions (or pre-suppositions) and, in the process, discover, through discussion with their peers, why they ranked things as they did.

Reality Ranking Exercise

Instructions:

Step 1: Arrange the following items in order of how real you think they are. As you do so, take note of the criteria you are using to order the items. Also, if you think an item is in some important respect "differently real," i.e. cannot be compared with the others, locate it in the right hand column instead.

A cup of coffee

A caffeine molecule

The taste of coffee

The form (or essence or definition) of a cup of coffee

Your memory of the taste of this morning's coffee

A cup of coffee you dreamt about last night

The fictional cup of coffee I'm describing right now

A cup of coffee sitting unperceived in an otherwise empty office

A cup of coffee in Second Life

More real	"Differently real"
Less Real	

Step 2: Now, order the items as [philosopher x] would rank them, taking note of any entities that are difficult to rank on this particular theory.

Many of those who undertake this sort of exercise find that they hold quite strong views about how to rank these items and that they use a wide variety of different, contradictory criteria to rank entities. Moreover, most find it surprising to discover not only that they think about these things quite differently than their peers but also that these differences are greater than they would have guessed.

In order to complete Step 2 of this exercise, students have to understand deeply the ideas of a philosopher if they are to properly order the items based on that philosopher's view. Moreover, such an exercise is useful in that it helps reveal shortcomings with these views, often revealing when a particular theory is silent on the placement on one entity or another and thereby helping to show which theories might be more exhaustive (i.e., able to cover more cases) than others, or more useful in particular contexts.[7]

Second Life in a Philosophy Course

To see the role Second Life played in teaching metaphysical concepts and clarifying ontological views, let us take the case of Plato, the first philosopher we read in the class and the thinker whose ideas we found ourselves returning to again and again throughout the semester. After a brief overview of his take on these questions, we'll turn our attention to the relevance of Second Life.

In Books VI and VII of the *Republic,* Plato offers us two images that help us understand his view of what it means to be real and his reasons why we ought to take some things as being more real than others. The first image is the divided line, described in *Republic* VI.509d-511e. In that passage, Plato invites his reader to envision a line that represents the hierarchy of the real. In the way he ranks entities and the forms of cognition one uses to think of these entities, he reveals that he has two main criteria for his ranking: intelligibility and truth (though other criteria such as permanence and originality play an equally important role as well). Hence, intelligible entities (i.e., those only accessible by the mind) are ranked as more real than visible entities (i.e., those accessible by the senses). Why? Visible entities (the objects of our everyday world) are constantly changing and are harder to define precisely than the forms of those objects. It follows for Plato that a physical coffee cup is less real than the cup-ness that all such coffee cups have in common.

Plato also believes that objects further down the line are in some way copies, or instantiations, of their intelligible, permanent, originals existing further up. Physical objects 'participate' in the forms and are, in some sense, copies or representations of the more real forms located further up the line. First principles and the forms of objects (i.e., those aspects that all commonly-named objects have in common) are therefore located higher on the line than physical objects; physical objects, in turn, are located higher than shadows, images, and reflections of these objects. By moving from the visible toward the intelligible, that is, by grasping the principles behind observable objects, the mind moves from the less real toward the more real.[8]

Plato supplements his image of the divided line with an allegorical tale. In order to describe "our nature in its education and want of education," he invites us to "see human beings as though they were in an underground cave-like dwelling with its entrance, a long one, open to the light."[9] According to Plato, the uneducated person is like a prisoner deep in the cave who, seeing only shadows cast from models of objects, mistakes such shadows for reality. The process of education is the process of seeing these shadows for what they are: illusions three degrees removed from reality (they are shadows of models of the objects themselves). Through a gradual process of learning to think through to the truth, an educated person ascends out of the cave into the sunlight, and only then sees things as they truly are. This allegory maps neatly onto the divide line, for the ascent from the cave (from shadow to model to original object) parallels the ascent up the divided line (from illusions to objects to forms), as captured in the figure below.

Plato's Divided Line and Allegory of the Cave

	Objects of Cognition (Form of the Good)		**Modes of Cognition**	**Description of Cognition**		**In Cave Allegory**	
Intelligible Realm	"Being"	Higher Forms	Intellection *(noesis)*	dialectic, getting to first principles, 'beyond hypotheses'	"Knowledge"	original objects, outside the cave	The Sun
		Mathematical and Scientific Forms	Thought *(dianoia)*	investigating hypotheses; scientific and mathematical thinking		models of objects, casting shadows	the fire
Sensible Realm	"Becoming"	Things of the physical world	Trust/belief *(pistis)*	unreflectively perceiving or accepting things without knowledge	"Opinion"	shadows	prisoners
		Images	Imagination *(eikasia)*	producing representations of things; artistic activity			

To become an educated human being, in Plato's view, is to move mentally up the divided line (out of the cave). It is the role of the philosopher (or the educated person, more generally) to revisit the cave in order to "turn" others so that they too will come to see the illusory nature of the phenomenal world and begin to rank entities that once seemed distant and unreal (the Forms) as being, in truth, the most real and, consequently, the most valuable aspects of all.

Now, to the core questions of this paper: how might our understanding of virtual worlds benefit from a study of philosophers such as Plato and how might our understanding of philosophers such as Plato benefit from our study of virtual worlds?

Let us take the second question first. To grasp Plato's main position, one must try to accept something that is, in truth, very difficult to accept; namely, that the criteria we most commonly use to determine the reality of things—visibility and tangibility—are wrong. Most of us tend to side with Samuel Johnson who, when presented with Berkeley's claims concerning the non-existence of matter, kicked a rock and declared: "I refute it thus"[10] or with David Hume, who found that philosophical speculation seemed to dissolve as unreal as soon as he engaged in a good game of billiards. But if we are to make any progress toward understanding a thinker like Plato, we have to begin by asking why he might have thought that a coffee cup is less real than the form of the coffee cup, when the latter is intangible, invisible, and, hence, accessible only through the intellect.

Here is where I believe virtual realities can play a role. Students who are immersed in a virtual environment such as Second Life have an opportunity to grasp many of Plato's key ideas more easily. For example, in such an environment, virtual objects begin to seem real. While we cannot literally touch virtual objects, somehow we do experience them as tangible and solid. We maneuver ourselves around objects, we expect the floor to hold the weight of our avatar, we do not like being pushed. Yet, precisely because we do not think of virtual worlds as "really real," we can quite easily recognize that we are experiencing an illusion, even as the illusion persists. As a result, we are led to the conclusion that the senses are capable of mistakenly reporting unreal entities as real and that they therefore are probably not our most trustworthy allies in finding metaphysical truths.[11] This conclusion—that the senses deceive but offer us only a lower form of reality—is one of the key views defended by those who ascribe to a Platonic view of the world.

Moreover, the experience of entering and exiting a synthetic world has a function similar to the experience of the educated person in Plato's allegory of the cave. Plato's allegory was offered to help those of us still in the cave grasp what it must be like when one's reality is exposed as being merely an illusion. By becoming immersed in a virtual world and then, moments later, seeing it all as an illusion, students may be better able to see Plato's point that our everyday world of objects is in fact an illusion somehow projected from a deeper reality. Like a mental warm-up exercise, such an experience may prepare the mind to see some larger truth, in precisely the same way that Plato uses images (divided lines) and allegories (caves) to convey the truth as he saw it.

Now, a serious Platonist might object at this point that this immersion in a virtual world is actually a descent *down* the line rather than an *ascent* up. After all, the images one encounters displayed on a computer screen seem to lead one further away from the objects one encounters in physical reality. As such, they would seem to be in the 'shadows, illusions, reflections' category—that is, *below* physical objects on the divided line. Similarly, concerned educators might argue that getting lost in a synthetic world seems to actually move us one step further away from the real and the valuable. In other words, if Plato's right and the physical world is merely a copy of the real, then isn't a virtual world just a copy of a copy of the real? Shouldn't we be concerned such technologies are actually leading us further into the cave rather than helping us to escape?

At first glance, these worries seem perfectly legitimate. Indeed, many (most?) uses of Second Life or other virtual worlds reinforce these concerns. One need not explore Second Life for long before noting the strong emphasis on the (literally) superficial aspects of things, such as clothing and footwear, or before encountering individuals using the space to play out their sexual fantasies. These concerns might for some be primarily ethical or moral in nature, but from a metaphysical perspective, the concern is that the objects one encounters here are more like what Plato describes as shadows, illusions, reflections. They are mere copies of physical objects and hence they carry the mind in the wrong direction. It was largely for this reason that Plato offered a critique of poets and artists, for he believed they too threatened to lead us astray from the things that were most real—and, by implication, most important—leaving us in a world of copies and ever darkening shadows.

As an illustration of this view, consider the reporting blogs of regular users. There one finds lengthy descriptions that seem to be focused almost exclusively on topics such as fashion in Second Life, dating in Second Life, and so forth—topics quite distant from typical academic or philosophical discourse. For example, consider Natalia Zelmanov's blog, on which one can find extensively detailed descriptions on how she created various Second Life entities based on actual physical objects: skirts, hair, shoes, even bodies of celebrities such as Olympic figure skater Sasha Cohen and fictional characters such as Padmé Amadala (as portrayed by actress Natalie Portman).[12] The casual reader will quickly conclude that the cognitive activity behind all of these projects is activity that moves from the consideration of an original physical object down the divided line toward the realm of images.

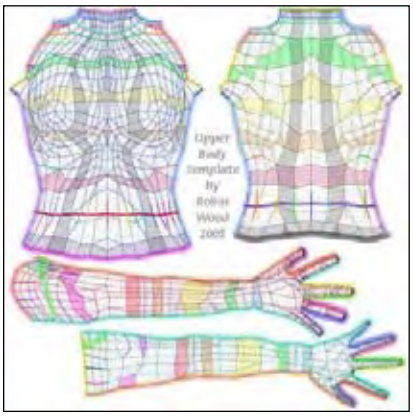
To underscore the point, consider the work of companies such as the Fabjectory that allow us to purchase "electronic characters made into incredibly detailed, full color, real-life statuettes."[13] In other words, one can now own a physical copy (Fabjectory statuette) of a virtual entity (Second Life avatar) that is based on the physical body of a celebrity (Natalie Portman) who is portraying a fictional character (Padmé Amadala). Given such a string of reproductions, it is not hard to imagine Plato grimacing at our rapid slide down the divided line, further and further away from the real, the rational, and the right.

However, I do not believe this initial estimation is correct and I offer the following thoughts as at least a proposal for why Second Life and other virtual worlds might actually hold the potential for users to be led out of the cave, not further in. To start, consider how virtual objects are constructed. Objects in Second Life are built up from 'prims'—basic shapes that are stretched and pulled into an endless variety of configurations. A cup of coffee in Second Life is given shape—in-formed—by a foundational geometrical formula. Yet the eye takes the result as something quite different. Here the eye and the mind offer competing ways of grasping the true reality of the entity under consideration. Moreover, the ease with which one can create multiple copies of physical objects that share the same basic underlying structure can help one grasp what Plato is getting at when he says that there is something like a core definition or a common form lying behind the multiplicity of commonly-named objects we encounter in our everyday world. This is a good rough analogy to what we teachers of philosophy mean when we say that physical objects are "copies of" the forms. The form of a coffee cup is whatever fundamental attributes all coffee cups in the physical world share, something that seems quite quickly revealed to someone who tries to make one in Second Life. Thinking of it this way, it becomes hard not to imagine Plato—who was, after all, inspired in part by the Pythagoran view that "All is number"—pleased to see that not far beneath the surface of a Second Life object is an algorithm, and that the objects we see in Second Life are, in the end, really numbers.

Interestingly, a closer read of the fashion-focused Second Life blog I mentioned earlier actually makes all this quite apparent. If we imagine Plato concerned about the mental energy spent on designing miniskirts and mermaid tails, we must also imagine him pleased upon seeing the mind of the designer accomplishing her ends using the kind of programming shown in the box to the right, or by making use of the Second Life avatar texture map (below)[14]:

```
objectName = "sample-long"
numObjects = 12
xRadius = .42
yRadius = .5
flareAngle = 45.0
bendCoefficient = 0.0
rotOffset = <0.0, 180.0, 0.0>
posOffset = <0.0, 0.0, 1.0>
```

Seen this way, it is not hard to imagine Natalie Zelmanov—designer of the skirts and celebrity avatars, writer of the Second Life blog we've been discussing—cognitively working her way up the divided line, not down.



I do not mean to claim that anyone who devotes time and mental energy to creating objects in Second Life is by necessity drawn to see the mathematical form behind their projects. I am also aware that many users can simply copy or buy objects made by others who have done the hard work of creating virtual objects based on the mathematics that give rise to form. Moreover, Plato himself never believed that merely practicing a craft was sufficient to lead one to philosophical insight. But such a possibility does exist and it seems to be somehow closer to the surface of things, and perhaps therefore more easily accessible, when one is working with Second Life objects than it is for things found in ordinary physical reality.

More importantly, objects and avatars in a virtual environment have great potential to serve as what Plato described as "summoners." In his account of the divided line, he writes:

> Some objects of sensation do not summon the intellect to the activity of investigation because they seem to be adequately judged by sense, while others bid it in every way to undertake a consideration… The ones that don't summon the intellect are all those that don't at the same time go over to the opposite sensation. But the ones that do go over I class among those that summon the intellect.[15]

Plato thinks we perceive certain physical objects and understand (or think we understand) them immediately. To use his example, we see a finger and we understand it to be a finger. But for other objects, or for the same object seen in a different way, the senses are not adequate. As an example, he points out that our ring finger is simultaneously big (bigger than our pinky) and small (smaller than our middle finger). In other words, some of the entities we perceive will leave us satisfied believing that our senses are adequate to grasp the reality of the entity. But others challenge us, making it impossible to rely solely on the testimony of the senses and leading us to think in different terms if we wish to understand what we are seeing. When he says 'summon the intellect' he means, roughly, that we are led to think about what we see, to begin drawing on higher-order mental skills to make sense of what our senses alone cannot adequately grasp.

Objects and avatars in Second Life can be powerful summoners for they present themselves both as simultaneously physical and as virtual, real and unreal, tangible and intangible. The thoughtful observer who spends the time to reflect on the nature of these entities should find their intellect summoned. Moreover, virtual entities summon in a way Plato would find superior to the summoning power of certain everyday objects. For, in the ordinary physical world, only a special class of objects seen in the right way would summon the intellect. When we simply perceive a finger, our intellect is not summoned until we see the finger as both bigger and smaller at the same time. But a virtual finger *does* present itself to us as both real and unreal at the same time. We don't even need to compare it to a second finger. It follows that there are in fact better opportunities for summoning in a virtual world than there are in the ordinary world of physical objects.

Plato might also see the opportunity for virtual entities to lead users to actually diminish their prioritization of the physical and discover a more intellectual approach to life. Indeed, those put off by the emphasis on physicality and attractiveness that pervades much of Second Life might bear in mind Plato's observation that the physical attraction of beauty, too, can summon our intellect and get us pointed in the right direction. The ascent from a focus on the physical to a focus on the intellectual is captured most elegantly in Plato's *Symposium,* where the seeker after beauty first falls in love with the body of a single beautiful person, then begins to love the form common to all beautiful physical entities, and from there will begin to love the beauty of intangible things, until, at last, be beholds the form of beauty itself, which Plato describes as follows:

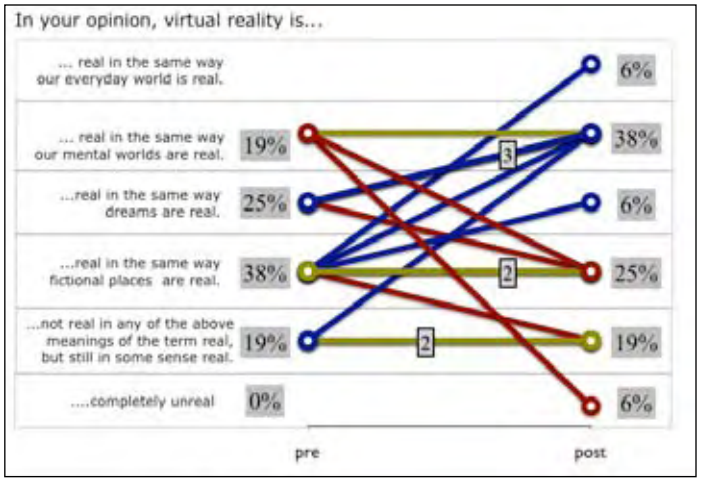
> This beauty is first of all eternal; it neither comes into being nor passes away, neither waxes nor wanes; next, it is not beautiful in part and ugly in part, nor beautiful at one time and ugly at another, nor beautiful in this relation and ugly in that, nor beautiful here and ugly there, as varying according to its beholders; nor again will this beauty appear to him like the beauty of a face or hands or anything else corporeal, or like the beauty of a thought or a science, or like beauty which has its seat in something other than itself, be it a living thing or the earth or the sky or anything else whatever; he will see it as absolute. Existing alone with itself, unique, eternal, and all other beautiful things as partaking of it, yet in such a manner that, while they come into being and pass away, it neither undergoes any increase or diminution nor suffers any change.[16]

This is a stunning picture of the promise of the Platonic ascent. However, even if we do not endorse fully Plato's particular vision of where this summoning will lead us, it is clear that virtual entities have great potential to summon our intellects and lead us somewhere important. Virtual reality entities hold this promise out to us. Despite, or perhaps even because of, their emphasis on creating and manipulating appearances, they have the potential to prompt deep ontological questions, to summon us to reconsider our understanding of the nature of things, to provoke us to wonder whether we have good reasons for thinking as we do about what counts as real, and maybe even leading us to a deeper understanding of beauty in its most universal form.

Changing Views

To close, I hope to share some results from my Fall 2006 class. If you elected to complete the 'pre-article survey' please pause for a moment at this point to take the 'post-article survey.'[17]

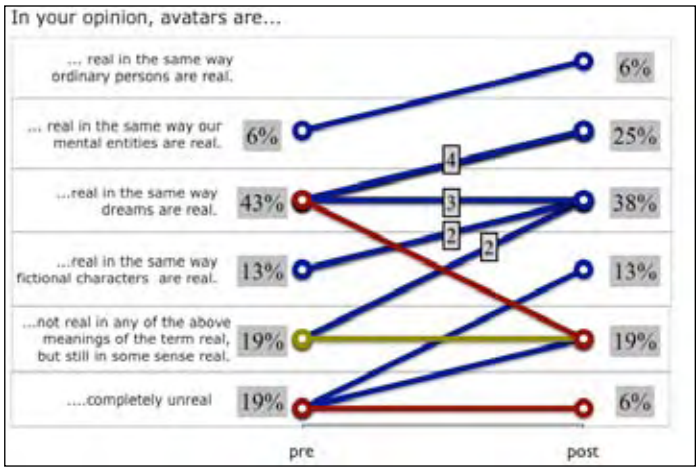
In the 'Dreams and Realities' course, I asked students to complete a Reality Survey at the start of the semester and a Virtual Reality Survey just before we began working with Second Life. They took the Virtual Reality Survey again at the end of the course. At the start of the course, students fell fairly neatly into one of two camps. About half felt that all judgments about reality were subjective and about half felt that such judgments were absolute. Nearly all agreed, however, that their view on the matter was fairly obviously true, and most expressed trouble seeing how anything might be said to be "more" or "differently" real than something else.



In the Virtual Reality Survey, students were asked seventeen questions; in what follows, I present the result from two questions most germane to our present topic. On the chart below, each line connects a student's views on the first VR survey ("pre") to that same student's second VR survey ("post"). Each line represents one student, except where more than one student had the same response, in which case the number is indicated on the line itself. The numbers along the sides in grey represent the portion of respondents in each category.

If we take the categories along the left-hand side as ontologically neutral (i.e., not arranged in a hierarchy from less to more real) then we can see evidence of the core point of this paper, that our views about what we count as real are susceptible to change. Moreover, if we take the categories as ordered (as Plato did with his divided line), then this graph shows how some students (blue lines) demoted virtual reality entities, how others (red lines) did just the opposite, and how still others did not change their view at all (green lines).

Students were asked a similar question about the reality of avatars. Here, students had an even more pronounced change in their view:



Again, the particular order in which the categories are listed on these figures only makes sense within a particular ontology and one might rightly object to the categories and the order they are placed here. In my class, and for the purposes of this paper, I plead metaphysical ignorance: I do not know which things are more real than others nor do I have a firm position on which labels we ultimately ought to use to sort entities into their proper categories. Certainly, a different philosophical viewpoint might use these same categories, but place them in a different order. However, the most important conclusion nevertheless stands, even if one were to shuffle the categories around randomly. It is this: 15 of the 16 students who took both surveys revised their stance on the ontological status of virtual reality or of avatars, some making quite radical shifts.[18] In many respects, what I have said so far is merely the start of the project of inquiring into the realities of Second Life. The other authors we discussed in the class would have more to contribute to the topic, each adding to the many competing pictures of how we construct our picture of reality. And with each new theory we test, Second Life has the potential to be similarly useful both in illustrating and challenging those metaphysical views as well.

I hope it has become clear how our understanding of virtual worlds might benefit from a study of philosophers such as Plato and how our understanding of philosophy might benefit from excursions into virtual worlds. Philosophy offers us criteria for meaningfully differentiating entities into something like a reality hierarchy and a vocabulary for debating about what kinds of entities ought to count as more real than others. We also have discovered, I hope, a model of philosophical dialectic that we can use to refine these criteria if we happen to disagree with the particular solution Plato

offers. And disagree we should, for there is much work to be done in this area. To start, we re-read other philosophers with this task in mind, and test out their metaphysical proposals in virtual realms such as Second Life. If we do so it's hard to imagine how we could not emerge thinking differently of what's real, what's not, and why.

To the reader who has come this far only to have found my take on this matter unpersuasive, I invite you to go further than I have gone here. Pick up the works of some of these authors and visit Second Life or some other virtual environment with their theories in mind. See for yourself whether or not things seem different—or, perhaps we should now say, seem differently—when you do.

Notes

1. For example, the Macarthur Digital Media and Learning initiative, the NMC Campus, and the Serious Games initiative.

2. See AJ Kelton (2007) *Second Life: Reaching into the Virtual World for Real-World Learning,* ECAR Research Bulletin 2007 (17) for an extensive discussion of educational uses and benefits of multi-user virtual environments.

3. See, for examples, Jon Hindmarsh, Christian Heath, Mike Fraser (2006) "(Im)materiality, virtual reality and interaction: grounding the 'virtual' in studies of technology in action," *The Sociological Review* 54 (4), 795–817 and Robert J. Bloomfield, "Worlds for Study: Invitation - Virtual Worlds for Studying Real-World Business (and Law, and Politics, and Sociology, and....)" (May 25, 2007). Available at SSRN: http://ssrn.com/abstract=988984

4. For an example, see Bigna Lenggenhager, Tej Tadi, Thomas Metzinger, Olaf Blanke (2007) "Video Ergo Sum: Manipulating Bodily Self-Consciousness," *Science* 317 (5841), pp. 1096 - 1099

5. In the same seminar offered the previous year (Fall 2005), students read the same works and looked at Second Life during class time, but the virtual world was not integrated into the structure of the class.

6. The syllabus can be found by locating this course online at: <www.lehigh.edu/~grr3/classes>.

7. Different items can be used on the ranking list based on which philosophers one is aiming to illustrate or compare. For example, when working with Borges, Egan and Dick on questions of identity, fiction, authenticity, and memory, the following items could be used:

Your body
Your mind
Your idea of someone else
The body of someone else you know well
The mind of someone else you know well
Your memory of who you were last year
Your mental image of your body
You, as you appear when you dream of yourself
Your avatar in Second Life
The body of an android
The mind of an android

8. Although this is only a rough characterization of a very complex metaphysic (that my fellow philosophers will no doubt find it incomplete), I hope it proves adequate for the present purposes.

9. Plato, *Republic,* tr. Alan Bloom, Basic Books, 1991 p. 193, Book VII.514a.

10. See Boswell's *Life of Johnson* (Oxford University Press, 1980), p. 333. Note that I do not claim to endorse Johnson's view on this point. In fact, I think he hits the rock but misses Berkeley's point altogether.

11. Philosophers have long used thought experiments, optical illusions, and, more recently, films, to accomplish this same end. However, because of the visual intensity of virtual world immersion, the experience is much more persuasive and, therefore, effective.

12. See "Day 97: Making Flexi Prim Skirts with Ged Larsen's LoopRez Script" Accessed June 2nd, 2007 <http://slnatalia.blogspot.com>.

13. From the main website of The Fabjectory, accessed September 16, 2007, <http://www.fabjectory.com>.

14. This template, developed by Robin Wood, can be seen online at http://www.robinwood.com/Catalog/Technical/SL-Tuts/SLPages/AVUVTemplates.html. The image is used by permission of the artist. Accessed June 2nd, 2007.

15. Plato, *Republic* 523b-c

16. From Plato, *Symposium,* translated by Walter Hamilton (New York: Penguin, 1954). 92-94

17. Link to http://www.lehigh.edu/~grr3/survey

18. 12 of the 16 students changed their view on how to ontologically categorize virtual reality and 12 of the 16 students changed their view how to ontologically categorize avatars, but three of the students who did not change their view on the former did change their view of the latter. Hence 15 of the 16 changed their view on one topic or the other.

About the Author

Greg Reihman is Director of Faculty Development and Adjunct Professor in the Philosophy Department at Lehigh University. In addition to his own work in philosophy, Greg works with faculty, librarians, and instructional technology consultants to foster excellence and innovation in teaching and learning at Lehigh. Greg holds degrees in philosophy from Yale University (B.A.) and the University of Texas at Austin (M.A., Ph.D.). From 1998 to 2004 he worked at Stanford University, teaching in and helping to administer the Introduction to the Humanities Program. In 2004-5 Greg was a Mellon Faculty Research Fellow at the Penn Humanities Forum. His philosophical research interests include the history of modern philosophy, classical Chinese philosophy, comparative philosophy, and philosophies of technology and education.

Pleasure, Play, Participation and Promise: Socio-emotional Dimensions of Digital Culture Which Are Transforming the Shape of New Media Literacies

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Drawing on several inter-related ethnographic studies of multimodal virtual worlds, this paper will examine the significance of affect on transformative moments in people's online lives. These moments, whether filled with great joy and hilarity or laden with angst and sorrow, are all moments which crystallize experience, provide a privileged locus for the creation of knowledge, and have a significant impact upon identity. From younger adolescents who embrace online communities as part of their normal socialization, to the silver surfers, the older generation of converts to digital culture, I will explore the motivations and emotions of a range of individual cases in order to illuminate the key factors which are driving the changing dimensions of new media literacies.

Introduction

The mushrooming of social networking sites is evidence of a mainstream and global shift in online participatory culture. From the early days of IRC (Internet relay chat) and fan forum communities, to the more recent uses of blogs, Facebook, YouTube and Second Life, people of all ages are continually finding new spaces in which they are developing a sense of community and building relationships with others. Each new space has its own semiotic resources which users draw upon to forge both identity and meaning as they interact and participate. These resources are multi-layered and complex, and offer a richness of multimodal expression uniquely afforded by each space.

Researchers of new media literacies are also fascinated with the ways in which people are innovating on and subverting traditional literacy practices to develop hybrid new forms of literacy for communication. Language use has at one end of the spectrum become poetic and haiku-like in some social spaces such as Twitter, and at the other end it has become detailed, elaborate and richly descriptive in social spaces such as fan fiction forums. Blogs increasingly use images and videos; in virtual worlds such as World of Warcraft and Second Life, avatars are used to construct and convey certain kinds of meanings about identity, and music and sound effects are used not only in podcasts and YouTube videos to add meaning, but also in presentational sharing sites like Rock You and Slideshare. The addition of voice in Second Life has added an entirely new dimension to an already richly semiotically enhanced world. And social participation in each of these spaces is what is driving and shaping them.

There is a long socio-cultural tradition (Barton, 1994; Gee 1996; Street, 1995) in which literacies and the learning of literacies is defined broadly within their social and cultural practices. The implication of this for education is that we need to understand the social contexts in which literacies are being developed, explored and indeed invented. Understanding the social dimensions of new media literacies practices are of significance. In this paper I will focus on the social and emotional dimensions which are working to shape both new literacies and the future of new media. In particular, I argue that play and belonging are two fundamental principles which inherently transform people's identities, and in doing so provide the motivation, incentive and desire for many people to engage in online community spaces.

Play

Play has historically been recognized in Western education as a means by which young children learn literacy (Piaget, 1962; Vygotsky, 1978; Hughes, 1999). Much current early childhood pedagogy emphasizes the value of play to promote engagement, a crucial condition of learning (Cambourne, 1988). Yet as children progress through to the latter years of schooling and enter institutes of higher education, the attitude towards play increasingly becomes one of discomfort. Play and learning are frequently constructed in a mutually exclusive dichotomous relationship.

Yet after several longitudinal studies dating from 1997, my own research (reported in Thomas, 2007), conducted primarily with youth, has demonstrated how young people are playing, experimenting, and manipulating the affordances of digital texts for their own pleasures and purposes. Children are creating and managing their own online communities (Thomas, 2004; Unsworth, Thomas, Simpson and Asha, 2005), participating in online fan fiction communities (Lankshear and Knobel, 2004; Black, 2004; Thomas, 2005), creating role-playing web forums (Thomas, 2005, 2007), creating, writing for and editing their own zines (web magazines) (Guzzetti and Gamboa, 2004; Lankshear and Knobel, 2005) and are publishing their own multimedia weblogs, including photoblogs and podcasts (Lankshear and Knobel, 2006). Additionally, there is a growing body of research that suggests playing computer games has the potential to be a highly effective means for literacy learning (Gee, 2003).

It seems to me that the value and significance of play cannot be trivialized, as young and old alike play together in online communities, virtual 'communities of practice' (Wenger and Snyder, 2002) in which learning is almost an unexpected side effect of play. Galarneau (2007, p.1) calls for a reframing of play, stating:

> …play and learning take on new dimensions within the context of an increasingly participatory culture that blurs traditional boundaries between … teachers and learners. …learning is a systematic activity where the contributions of the individual contribute to the larger collective intelligence, and learning is often a by-product of play or creativity.

Galarneau even defines play as a critical skill, and a productive phenomenon which should be leveraged in the classroom for all of its potential for authentic learning. Play is indeed a motivator for learning and can provide a safe context for intellectual and creative freedom that leads to risk taking, experimentation, problem solving and innovation.

In *Youth Online* I present a number of case studies where young people are creating and co-producing extraordinary multimodal texts, using high level sophisticated language. As one young girl explained to me:

> i try to be as verbose as possible. i try to use figures of speech, metaphors and alliterations. i try to make my language colorful, detailed, full of unexpected turns and twists. just in general, a good read. (Kitten)

In one chapter of the book I outline the story of two particular girls I interviewed, Tiana and Jandalf, over a course of three years. For several years prior to my interviews, they had been involved in role-playing a form of crossover fan fiction (they combined the worlds of Star Wars and Middle Earth as well as alternative universes). Towards the conclusion of my interviews they had just completed co-authoring a 50,000 word novel. The process they followed to this end involved purposeful play across a range of sites. The girls role-played both synchronously (through Yahoo! instant messenger) and asynchronously (through their role-playing forum) to create the basis for their fanfiction, then they would transform those transcripts into a single fanfiction text to post at fanfiction.com. Both girls also kept a livejournal and a blog for their central character for the purposes of exploring and developing their character and enhancing their fanfiction writing through better characterization. This type of fictional play also allowed the girls to learn, explore, and develop aspects of their real identities. Play for these girls and indeed for the other young people in their roleplaying sites was a means of exploring and constructing the self, and I argue that through the virtual play, they were authoring versions of themselves. The narrative and fiction serves as a safe distancing mechanism to explore feelings and experiences of adolescence that were either difficult or unexplored through their real selves.

In Wenger's (1998) communities of practice model, identity is seen as a significant component of learning. In outlining a social theory of learning and the significance of identity, Wenger explains that learning changes who we are, and creates 'personal histories of becoming' (1998, p.5). 'Communities of Practice,' according to Wenger and Snyder (2000), are informal groups of people bound together through a shared passion for a joint enterprise. Wenger (1998) explains that the conceptual framework, in which 'community of practice' is a constitutive component, is that of a social theory

of learning. A social theory of learning is based on a number of premises, including: the fact that as social beings, we learn through social interaction; the idea that knowledge can be equated to competence in a valued enterprise, and is realized through active engagement in that enterprise; and the understanding that learning occurs through our social experiences which ultimately leads to meaning (Wenger 1998). A social theory of learning, then, is connected with learning and knowing within social participatory experiences. Wenger (1998) goes further to propose a model to represent a social theory of learning, which is comprised of four constituents: community, meaning, practice and identity. As we tinker with our identities and explore new versions of self, whether through an entirely fictional character or an avatar in Second Life that is more or less a second self, we are learning. Tinker, explore, play, experiment–this notion of playfulness is assuredly not trivial, but a notion which has serious implications for learning.

Jim Gee (2003) explored the notion of how certain games provided players with opportunities to be positioned within the game as an expert, adopting the stance of an 'authentic professional.' He found that the level of deep learning that occurred as a result of becoming the expert was profound, providing children with significant and deep ways of learning about the world. In talking about one computer game, he explained that the practice of thinking *like a historian* becomes a transformative factor for the student and/or game-player. Even though fictional and playful, he explains that once the learner is involved as a participant in history, they are able to think critically about it and learn from that experience (Gee, 2003).

In *Youth Online* I explored the type of learning that young people were able to identify for themselves, and one 14 year old boy told me the following story:

> Last year I made a great little discovery. I'm involved with online role-plays and game sims. I like ancient period role-plays and I like them set out either in script form or in book form. I play many different characters. I like playing characters of intelligence and charm if I can get it. It has been in the sim *Heroes of Chaos* where I really learned about Ancient China and the Three Kingdoms period. The forum gave me bucketloads of information about Ancient China. I also read the book of which HoC is based off: *Romance of the Three Kingdoms.* It's around... 120 chapters ^_^. It's the second most read book in the world behind the Bible. It's a part of Chinese history and China's a communist country. Three Kingdoms Period 189-250's.
>
> Here I play Zhou Wei, an ancient Chinese strategist of my own division. He's rated one of the most smartest people in China in the game :) <insert cheesy grin here>. The purpose of the game: for kingdom rulers - to unite China, for officers- serve with loyalty. Become powerful. Famous. Anyway Zhou Wei, he's intelligent, so he uses uncommon words, for example: when Zhou Wei met a general who gives alms and such to the poor, he bowed and said "It is a great privilege to meet such an honourable and philanthropic lord!" But he's also excitable. For example, when finding that an allied general managed to really mess up by burning 20,000 innocents alive without an apology, he went berserk and his words just flurried out, leaving people wondering, "What did he say?" Another example.... After a long and tedious battle, Zhou Wei returns home, and is surprised by his wife... He is so happy to see her his words yet again mashed. "Zhou Wei: Z-z-z-Zhen! I.... I am sooohaappytoseeyou!! Youcan'tbelievehowmuchi'vemissyou... Generally, how I talk whenever I am excited, Making people go "What?"
>
> I have already become quite articulate through using Zhou Wei's intelligent speech(tm). To do this, I read a lot and see how people of my character's 'stature' and 'personality' talk, and I simply pick and copy pieces into Zhou Wei's speech.
>
> (Percirion, 2002)

Percirion also related a wonderful story about how he also played the character of his wife, and how he studied his best female friend at school to get her behaviors and speech patterns authentically female.

In addition to my research with young people, I have also studied the effect of identity play in Second Life with my post-graduate students. The responses from the students were astounding and highly rewarding, summed up with the following quote from one student's reflection paper:

> My close friend and colleague thinks that since starting this course and spending time as Denver (my avatar), I have "blossomed" offline. My entire identity has changed – my perceptions about who I am, the way I think and interact, and the way I see the world now - has changed as a consequence of the journey Angela has encouraged us to take.
>
> (Denver, 2006)

Even the playful process of constructing one's avatar and viewing the self from the outside had a powerful impact on students' everyday lives.

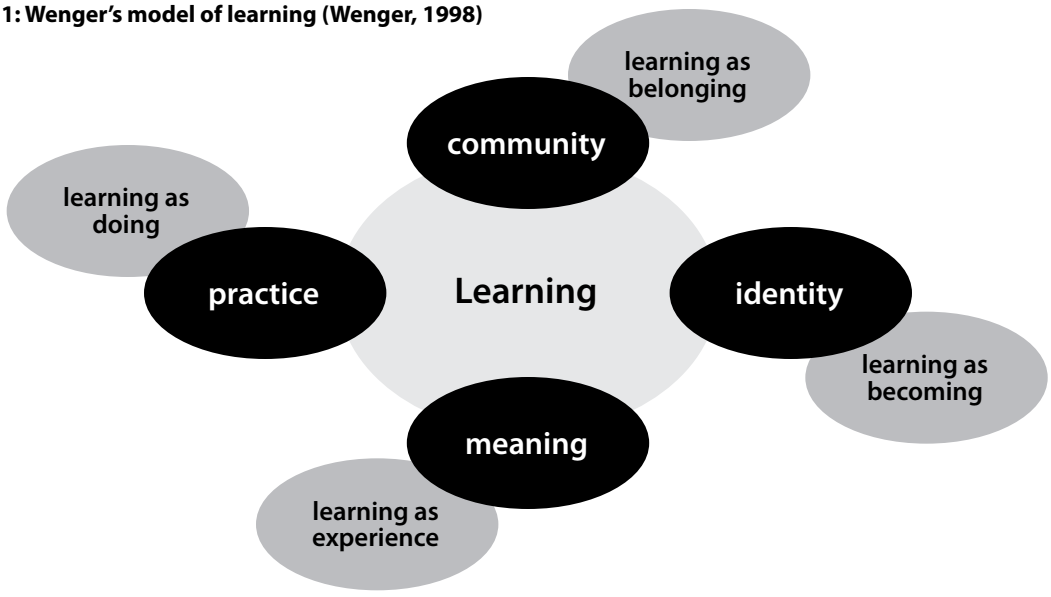
Belonging

Although the notion of 'Communities of Practice' has traditionally been associated with adult and workplace learning (Wenger and Snyder, 2000), and also with business and employees (Wenger and Snyder, 2000; Mitchell, 2000; Young, 2000), there has been a cross over of interest into virtual communities, albeit with a focus on e-commerce (Lipnack and Stamps, 1997; Tapscott, 1999; Turban et al, 2000). Also the four aspects of the model of a social theory of learning (see figure 1) and Wenger's definitions seem to lend themselves to a wider consideration of community and the types of learning that occur within communities which have no business or commercial enterprise at stake. Wenger and Snyder (2000) for example, remark, '… people in Communities of Practice share their experiences and knowledge in free-flowing, creative ways that foster new approaches to problems' (Wenger and Snyder, 2000, p. 7).

In fact, Wenger (1998) proposes an enhanced view of learning to that of other social views of learning such as constructivism (Phillips and Jorgensen, 2002) and Vygotskian notions (1981). Wenger claims that in communities of practice, certain practices and processes characterize learning, namely:

> **Evolving forms of mutual engagement:** discovering how to engage, what helps and what hinders; developing mutual relationships; defining identities, establishing who is who, who is good at what, who knows what…
>
> Figure 1: Wenger's model of learning
>
> (Wenger, 1998)
>
> **Understanding and tuning their enterprise:** aligning their engagement with it, and learning to become and hold each other accountable to it…
>
> **Developing their repertoire, styles, and discourses:** renegotiating the meaning of various elements; producing or adopting tools, artifacts, representations; recording and recalling events; inventing new terms and redefining or abandoning old ones; telling and retelling stories; creating and breaking routines.
>
> (Wenger, 1998, p. 95)

Figure 1: Wenger's model of learning (Wenger, 1998)



Unlike Vygotsky's theory of learning (Vygotsky, 1981), Wenger's model does not require the combination of expert and novice. In this theory, members of the community work things out together, to achieve certain purposes for their mutual benefit. This closely relates to the notion of social capital. Social capital refers to the way in which people establish networks, participate and make contributions to the common good of a community, because of the high value members place upon the community. Cox (1995) further defines social capital as '... the processes by which people establish networks ... and social trust … [to] facilitate co-ordination and co-operation for mutual benefits' (Cox, 1995, p.15).

Stewart-Weeks (1997) examined voluntary organizations and concluded that they produced social capital because they had the 'capacity to achieve' (Stewart-Weeks, 1997, p.97) and he attributed this to factors such as: communities creating allegiances, communities being learning organizations capable of transforming and developing, communities working together for a collective purpose and communities which can put new knowledge to work. Coleman (1990) further explains the notion of social capital as being those productive behaviors that are invested by people into a community to produce a social profit or resource that will be desired and consumed by others.

Falk (2003) argues that learning occurs when social capital is built. He states that, '… learning occurs when the set of interactions utilizes existing knowledge and identity resources and simultaneously adds to them … Learning occurs *in* the interactions' (Falk, 2003, p.5, italics in original). In discussing identity as a component of social capital in communities of practice, Lesser and Storck (2001) claim, '… a sense of identity is important because it determines how an individual directs his or her attention … [t]herefore identity shapes the learning process' (Lesser and Storck, 2001, p.832). In these views then, it is clear that identity, learning and community are intimately linked.

Wenger (1998) also asserts that issues of identity are inseparable from learning, knowing and community, and in that, in fact, '… the concept of identity serves as a pivot between the social and the individual' (Wenger, 1998, p.145). Linking with the previously argued concepts of identity as both a social construct and constitutive of 'lived experience,' Wenger claims that his perspective on identity '… does justice to the lived experience of identity while recognizing its social character–it is the social, the cultural, the historical with a human face' (Wenger, 1998, p.145).

In speaking about participatory culture, Jenkins et al. argue that it is 'a culture with relatively low barriers to artistic expression and civic engagement, strong support for creating and sharing one's creations, and some type of informal mentorship whereby what is known by the most experienced is passed along to novices' (Jenkins, Clinton, Purushotma, Robison and Weigel, 2006, p. 3). This was evident in the stories of many young people, and also in my post-graduate students as they first entered Second Life as newbies. From Percirion's story in *Youth Online* comes this story:

> Sometimes Zhou Wei is taken along with lord Xian Jing to diplomacy… sometimes he is invited to a party… Sometimes people come up and talk to him... Sometimes he shimmies over. Some of the game masters are given historical characters… those who really play them according to history I love to play with, because it just makes you glow. My first interaction with historical characters was Yuan Shu, the brother of Yuan Shao. Yuan Shu conducted a fire attack on a city and killed 20,000 innocents. I still love to role-play with them, because it can get so interesting. Sure, I can get angry with the characters (Die, Shu, die) but we smooth it over. Vendettas can be so much fun ^_^
>
> (Percirion, 2002).

The sensation Percirion relates about "glowing" when he was able to play alongside the game masters was not simply because he was in their presence, but because it was through that play that he was provided an opportunity to observe ideal models of participation, and become a part of that himself. The type of learning from the masters was by watching, mimicking, and practicing. This provides further evidence to me of the devaluing effect of dividing children and young people into classes or groups based solely on ability grouping. I find it not only a tragic loss of real and authentic learning scaffolded by peers, but a way of setting up those students for failure, and for rare chances to "glow." This one expression of Percirion's really touched me, because it perfectly encapsulated the transformation of identity and sense of self and belonging through this playful learning experience. He further elaborated on how he felt he had transformed emotionally due to his engagement and involvement with his community:

> I have had some experiences that have made me laugh a lot and others that have moved me to tears. One of these things was the real life death of Luo. In *Heroes of Chaos,* last game we received an announcement that famed member and role-player Luo had died in a fatal car accident- the other person was drink-driving. He was legendary- I shed my own tears then a whole 4 sims together mourned his loss.
>
> But the real shock came later when Luo appears, and announces his brother had panicked and told them he had died, when he had only broken his arm/ribs. I was crying, but I was also laughing in relief. Even one of the coldest, so called meanest Admins on there hugged me in tears before we discovered he was still alive. Luo was probably one of the most emotional experiences of my life.
>
> (Percirion, 2002)

This emotional engagement within the community is a contributing factor and evidence of the high level of belonging experienced by Percirion in his role-playing sim. He spent hours and hours contributing to the life of the role-play threads in the sim. He spent hours outside of the sim studying, reading, researching the way people spoke to sound intelligent, and watching his female friend so that he could make an authentic wife for his play. His contributions were valued by the other participants, and they became friends, mentors and guides to him. Those relationships were ones of mutual trust, engagement and pleasure. Oh, and learning. A community of learning which became a privileged locus for the creation of knowledge.

As with my research on young people's play, I have also extended my research to examine the communities of older people. In particular I have been studying the "silver surfer" generation on YouTube, older people who are becoming YouTube celebrities simply through their participation and reaching out for a wider community. The case of Geriatric1927 is one I like to share. Peter, an 80 year old gentleman residing in the UK, began uploading videos of himself relating stories of his youth and early working years as a radio engineer in wartimes. Soon he was part of a supportive YouTube community, and rose quickly to fame, garnering unwanted media attention. He finally agreed to be interviewed and then this led to him being nicknamed the "granddaddy" of the Internet. He receives hundreds of messages every day from younger people telling him they appreciate his stories, and making him feel a true sense of belonging in the community. More recently, Peter was featured in a top selling remake of the Who Generation's *My Generation,* and has become an inspiring spokesperson for older people in the UK. He is a modest man who shies away from the fame, and has said on regular occasions that his only motivation for sharing was to find some people who would listen and communicate with him. But it has truly transformed his life.

Conclusion

Based upon the case studies I have touched upon here and elaborated upon in *Youth Online,* I have observed a number of key impacts that playfulness within communities of practice has had on new media literacies. These include, briefly:

- Leadership – communication, conflict resolution, handling group dynamics, praise, support, scaffolding newbie learning, new forms of negotiation, maintaining community longevity
- Communication – from linguistics to multimodal semiotics
- Multimodal literacies – understanding how meaning is made at the intersection of semiotic modes
- Identity – risk taking, play, reputation management, consciousness of lexical resources, the personal as political
- Storytelling and narrative
- Code-cracking, hacking, innovation, 'cool hunting'
- Spaces which allow subversive play, resistance, disruption, crossing boundaries, the insertion of self, parody, satire, dialogue, critique, fantasy and performance of desire

It seems to me then that our aim is to find ways to leverage play, and to develop communities of practice which can provide authentic contexts for this play. In what ways do people manipulate the affordances of existing digital resources in innovative ways that push the boundaries and 'transform' those resources? It has long been the case that computer hackers have been revered by the programming underworld for their expertise at "hacking"–by constantly

inventing brilliant new ways of cracking, breaking and manipulating the code. Although hacking itself has negative connotations, we recognise that people young and old can be highly inventive when provoked and motivated to 'crack codes.' Children especially enjoy resisting "rules," and as James Gee explained (2003), they can't help engaging in practices where pushing the boundaries and exploring limits of a technological system such as a computer game are concerned. The sort of innovative creativity of the code-cracking and boundary pushing mentality is what I believe would be imperative to explore as far as the use of digital resources is concerned. We want to orient our students towards positive and productive ways of transforming existing resources so that they develop the capacities and competencies of innovation with digital resources. We need to investigate what innovations students are already making and what distinguishes innovation from ordinary use, applicative use of digital resources. In doing so, the aim is to further advance communities' capacities for innovation, invention and transformation, since it is these capacities for boundary pushing which have come to be so necessary for the advancement of globalized technological growth.

In summary, I would recommend recognizing the following points as supportive of the type of transformative pedagogy which maximizes the potential for innovation, creativity and identity change:

- Teach in and around an environment which privileges play
- Recognize that play and experimentation lead to innovation
- Find ways for students to be involved in active participation and take on learner responsibility, leadership and autonomy
- Provide learners with opportunities to become authentic experts in a fictional context which is still able to deal with significant social and cultural issues, and allow mixed groups of students to be mentored through the journey of participation
- Emphasize team-work and communication
- Include opportunities for role-playing, identity play, spaces to imagine and dream

Naturally, these recommendations should be complementary to an approach to pedagogy which utilizes teaching strategies such as scaffolding and explicit teaching. The challenge for us in all curriculum areas in education is to find that perfect balance of teaching structures and strategies to promote optimal learning.

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About the Author

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Searching for an Ideal Live Video Streaming Technology

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Live video streaming technologies are widely used in broadcasting news, connecting friends and relatives in online chat rooms, conducting businesses online face to face, selling products and services, teaching online courses, monitoring properties, showing movies online, and so on. With a promising future for live streaming, companies have been developing technologies with various standards. As a result, for viewers, watching a live or on-demand video online could easily turn into a frustrating search for a plug-in or a media player, a struggle with figuring out what is being shown in a tiny picture box or in a large, fuzzy picture box or impatient waiting for intermittent signals to resume or for video and audio to be synced. The goal of this study is to provide data, by comparing different live streaming technologies, for live streaming producers to make an informed decision as to what technology to adopt for their own live streaming needs. The study aims to democratize the live streaming process.

Introduction

Live video streaming refers to sending video and audio signals in real time over the Internet. Today, live video streaming technologies are widely used in broadcasting news, connecting friends and relatives in online chat rooms, conducting businesses online face to face, selling products and services, teaching online courses, monitoring properties, showing movies online, and so on. Much interest has been invested in taking advantage of live video streaming.

In-Stat, a digital communication market research company, predicts that high-speed Internet-connected households are expected to grow from 194 million in 2005 to 413 million by 2010 (Burns, 2006a). Almost all corporations, universities, schools and governments today are equipped with broadband connections. In the United States, 80% of the online U.S. households had a broadband connection by February 2007, according to Nielsen/Netratings. Bruce Leichtman, president and principal analyst for the Leichtman Research Group, predicts that the number of broadband subscribers in America will nearly double in the next five years (Burns, 2006b). A 2005 study by AccuStream iMedia Research shows that the consumption of streaming videos is positively correlated to whether the consumer has a broadband connection. In-Stat analyst Gerry Kaufhold said that growth in broadband adoption had attributed to the increased demand for online video (Burns, 2006a). Revenue-generating opportunities are expected to grow as content aggregators and portals, such as AOL, Google, Yahoo!, MSN and Apple, offer online video services and redefine the future of television (Ibid.).

With a promising future for live Streaming, companies have been developing such technologies. Many standards, however, are being used. As a result, for viewers, watching a live or on-demand video online could easily turn into a frustrating search for a plug-in or a media player, a struggle with figuring out what is being shown in a tiny picture box or in a large, fuzzy picture box or impatient waiting for intermittent signals to resume or for video and audio to be synced.

Unlike encoding an on-demand video sometimes for multiple popular media players, the encoding of a live streaming video is usually restricted to only one media format due to high cost. Therefore, ideally, a live streaming technology has the following characteristics:

1 Audience can easily access a streaming video. The audience does not have to download a plug-in or a media player and can use any broadband connection speeds to access the live streaming.
2 A video can be streamed and accessed on multiple operating systems. In other words, server software, broadcasting software, and player software, can be operated both on Windows and Mac OSX, if not Linux also.
3 A stream provides outstanding image quality, for instance, large image size and crisp image.
4 A stream provides outstanding streaming quality. There is no or little delay, no rebuffering, and no audio/video mismatch.
5 Setting up a stream is relatively easy. Streaming in this technology does not involve a big learning curve and can be done within a short time.
6 Setting up a stream is inexpensive.
7 Finally, a live stream can be recorded.

Unfortunately, technical data regarding the existing live streaming technologies do not exist in the market for streaming media producers to decide which is an ideal live video streaming technology. For streaming media producers, picking, learning and using a live streaming technology can become a daunting task. These days, most companies are advised to outsource their live streaming events to a specialized company. A live streaming process often sounds and looks mythical and expensive. The goal of this study is to provide data, by comparing different live streaming technologies, for live streaming producers to make an informed decision as to what technology to adopt for their own live streaming needs. The study aims to democratize the live streaming process. As part of the package of the study, tutorials on how to each live video streaming technology are included on the study website.

Technologies come and go. Today's popular technologies may be obsolete tomorrow while some unpopular ones may become dominant in the future. Flash streaming video is a case in point. Before 2004, hardly anyone would have thought of the popularity Flash streaming video is enjoying today in 2007. Many streaming producers are familiar with the chart that shows Flash Player's penetration rate. It is doubtful, however, that many streaming producers know about the efforts in the streaming media industry that take advantage of the widely popular presence of Java, which is listed as the No. 2 most pre-installed player in that chart. Therefore, this study tested and compared the following eight popular—or not-so-popular, but seemingly promising—live streaming technologies, including two Java-driven technologies from Clipstream and VX30:

1 Adobe's Flash Media Server 2 and Flash Media Encoder;
2 Apple's QuickTime Broadcaster and Darwin Streaming Server;
3 Clipstream's Clipstream Live and Repeater;
4 Internet 2's Digital Video Transport System (DVTS);
5 Microsoft's Windows Media Encoder and Windows Media Server (included in Windows 2003);
6 Real Networks' RealProducer Plus and Helix Server;
7 VideoLan's VLC; and
8 VX30's VX30 Live and VX30 Broadcast System.

Methodology

The study was conducted in May 2007. Taking advantage of the university summer break, the authors hijacked a computer lab with 20 dual-bootable iMacs and turned it into a streaming lab. Even though every iMac was equipped with an embedded Webcam, an external digital video camera was connected to each broadcasting computer to capture video images. Such a camera is especially useful for DVTS because DVTS could not recognize a Webcam and had to use a DV camera. All iMacs had the same hardware configuration and same Internet connection speed—100Mb/second. Six computers were equipped with Windows 2003 Server and installed with the server-side software for six of the streaming technologies. Another six computers were used as broadcasting machines to stream off their counterpart server machines mentioned earlier. VLC streamed off its residing computer as it is designed. So did DVTS. A Pinnacle TV for Mac HD Stick was hooked to one iMac to stream HD TV signal constantly. The TV signal was aired through an LCD projector to a large screen. All the cameras on the broadcasting iMacs face this large screen. In total, 15 iMacs were used in the test.

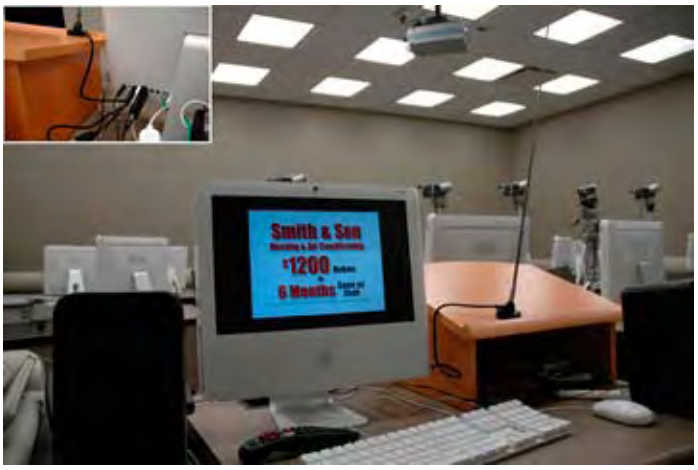
The first item tested was the ease of setting up a stream in each technology. The ease of setting up streaming was defined as the total amount of time used to set up both server software and broadcasting/encoding software. SnagIt by TechSmith and iShowU by shinywhitebox were used on Windows side and on OSX side respectively to capture screen shot videos during the server software and the broadcasting/encoding software installation and configuration. All the installations and configurations were done without hesitation since the people who did them were trained beforehand. The captured videos from two different computers (if a server was used) were spliced. The time was based on the total video length in each case (sample video).

The second item tested was latency. Latency refers to the time difference between the moment when a video/audio signal is sent out from the broadcasting computer and the moment when the signal is received on a user's computer. For producers who are engaged in video broadcasting, latency may not be a big issue. The audience may not be aware of the signal delay. If a live streaming technology is used for real-time communication, such delay is very annoying. Amount of latency affects the initial buffering time. The longer the latency, the more initial buffering time is needed. An online stopwatch from http://stopwatch.onlineclock.net/ was used to precisely measure the duration between the moment when a signal is sent and that when the signal is received. The stopwatch was used on the receiving computer. The video camera that was hooked to the broadcasting computer pointed at the receiving computer to show both the stopwatch itself and the stopwatch inside the video. A video capturing software program was used to capture the latency performances in each technology. Since the amount of delay varies over time, we sampled five moments in the captured video and averaged the amount of delay in each moment. The average will be the typical delay for each technology (sample video). Latency and initial buffering are not the same thing, but, since they are highly positively correlated, amount of latency can be regarded as an indicator of amount of initial buffering a user would normally encounter when watching a live streaming video.

The third factor—ease of watching—was measured by "can watch without downloading anything" and "rebuffering frequency." The fourth factor—image quality—was measured with a Likert Scale. Both the third and fourth factors were measured by external reviewers. Conducting a test in a controlled environment can surely yield controlled results. A live streaming, however, is received by users with different operating systems accompanied by different media players and plug-ins, Web browsers if browsers are involved, and Internet connection speeds. A test on live streaming in a controlled environment can hardly tell what the aggregate real-world experience is like. Therefore, the authors of this study asked professionals in the real world to answer the questions related to item 3 and item 4. A survey Web site was set up to collect data. Recruitment was conducted through professional digital media Web sites and listservs. The survey was open 24 hours a day for seven days. Data collected from the testers were analyzed using descriptive statistics since no systematic random sampling was involved. A video was used in the survey sheet to show to the participants different kinds of rebuffering effects.

This is the setting of the testing site. All server machines are in the back row. All broadcasting machines are in the front two rows, each connecting to an external video camera looking at an HD video signal on a big screen.

Each broadcasting station is installed with one live streaming broadcasting software program on the Windows side except for QuickTime.



A Pinnacle TV for Mac HD Stick was hooked to one iMac to stream HD TV signal constantly.

The fifth factor was cost for setting up a stream. This included the cost of the software, including the server and the broadcasting where applicable, and the hardware. Several applications were based around Open Source technologies, and thus were free of charge. Many had Open Source equivalents and while noted are not considered within this publication. The hardware component was based around a Dell PowerEde 1950 or an Apple XServe for the server components. These were chosen with regard to their equivalency in price and power, both utilizing similar chipsets and form factors. The Dell server cost around $2700, while the Apple came in around $200 more. Additionally, unless the Operating System was required, the price was included in the base cost of the hardware. Several technologies can run on Linux or other Free / Open Source operating systems — or even a 'desktop' operating system with little or no impact upon the performance. QuickTime Streaming Server requires OS X, which was included in the price of the XServe. Windows Streaming Server required Windows 2003 Server, which is an additional cost on top of the hardware.

After we had got data from measuring (1) easiness of setting up a stream, (2) latency, (3) can watch without downloading anything, (4) rebuffering frequency, and (5) cost for setting up a stream, we compared and ranked all technologies for each factor based on the raw data. After all ranking scores were obtained from each factor, we averaged the ranking scores each technology earned across the five factors. The closer this score is to 1 (No. 1), the better the performance. Based on this total score, we ranked all the technologies. Since some people may hold the philosophy that "All is well that ends well," which is, only what the audience sees should count no matter how much price the media company has to pay, we then took into consideration only "latency," "can watch without downloading anything," and "rebuffering frequency" in the calculation and presented an alternative ranking.

Finally, we found out whether a technology provided operating system compatibility for server, broadcaster and player and whether a technology had live streaming recording capability. Since these are yes or no questions, we did not factor them into the ranking.

The following chart shows the resolution and image size used when each technology was measured in terms of the first four factors.

	Clipstream	DVTS	Flash	QuickTime	Real	VLC	VX30	Windows Media
Resolution and Image size	555kbps 320x240px	30Mbps 720x480px	550kbps 320x240px	560kbps 320x240px	512kbps 320x240px	1216 720x480px	555kbps 320x240px	548kbps 320x240px

Findings and Discussions

In total, 138 submissions were received. Each evaluated different numbers of technologies. Our log shows that some respondents accessed the survey with a dialup connection, which did not fulfill the broadband requirement, and some entries were identical. We removed those entries to make sure the result would not be tinted. So, all the calculations are based on the 124 legitimate cases. Respondents from eight countries filled out the survey, but most of them (81%) came from the United States (See Chart 1).

Clipstream

Clipstream is a playerless Java-driven streaming technology. The company, with the same name, developed both on-demand and live streaming technologies using Java. Both on-demand and live streaming are done through a Web server. No streaming server is involved. A virtual player is sent to the user's computer while viewing is going on. After the viewing session is over, the player is gone.

Clipstream live streaming is made possible through Clipstream Live, a broadcast software program. To boost salability, Clipstream Repeater can be used on another computer or computers to handle bigger traffic flow for a live video stream. Both Clipstream Live and Repeater are Windows-based though its streaming videos can be easily viewed on almost all Macs and on most PCs so long as Java Runtime Environment is installed. Clipstream allows live video streaming recording. The interface is straightforward and easy to use. Considering the fact that no streaming server is involved, its Live price, $199, makes the technology very affordable though one license of Repeater costs $999.

Clipstream Pros: Most testers (71%) did not experience rebuffering in Clipstream. Because its streaming is based on popular Java technology, viewing across operating systems is easy. An overwhelming majority of the testers (89.4%) claimed that they did not have to download anything to view the live stream. Its latency performance was not bad either (2.85 seconds). Setup is fast (2.56 seconds).

Clipstream Cons: The biggest problem with this technology is that there is an almost constant 1/4-second audio/video mismatch though audio/video matching was not part of the testing. The image looks soft, and Clipstream's image quality was rated the poorest by the testers. There is no full-screen viewing button built into the broadcast interface.

Clipstream earned a total ranking score of 4 and an audience-oriented ranking score of 5. In short, Clipstream still has much room for improvement before it is ready for prime time.

DVTS

Usually unknown to the non-professional world and sometimes even the professional world, DVTS (Digital Video Transport System) is a high-quality live video streaming method developed by Internet2. It is largely being used in universities where an Internet2 connection is available. The minimum Internet connection speed must be 30 Mbps for the DVTS signal to be sent. Likewise, the same minimum Internet connection speed must be available for the signal to be received smoothly though in our test, we found that a 10Mbps connection still allowed a user to receive a live feed but with much rebuffering.

DVTS comes with both a Windows version and an OSX version; however, the OSX version requires command line operation, and is much less convenient than its Windows counterpart.

DVTS Pros: Since DVTS uses 30Mbps uncompressed video for streaming, it provides very high-quality images with extremely low latency in a 720x480 px frame. Actually, its latency was the shortest among all the technologies tested (0.21 second), and it won the biggest crowd (44%) among the testers to cheer for its image quality as "Excellent." DVTS is the second easiest to set up a streaming (2.38 min). This open-source technology is free.

DVTS Cons: DVTS is too advanced a technology to be popular now. Apart from the fact that it needs a minimum 30 Mbps connection speed, which is hardly available for home use, it is engaged only in multicast streaming. Multicast is a more efficient and cost-effective technology than unicast technology for streaming. Unfortunately, almost no public ISP supports multicast. As a result, home Internet users cannot access a DVTS stream.

Since not many people know about this technology, viewing DVTS streaming, chances are, involves downloading and installing the software. Digital recording of a DVTS live streaming session is impossible though the recording can be done via a video tape in the broadcasting camera. Because of DVTS's bandwidth thirst, a user may encounter frequent rebuffering if a connections drops lower than 30 Mbps. There is no de-interlacing filter for this technology.

DVTS earned a total ranking score of 2 and an audience-oriented ranking score of 3. It is a very promising technology for live streaming waiting for the infrastructure to catch up.

Flash

When Macromedia (now part of Adobe) introduced Flash streaming video in 2004, its live streaming capability was built in, but hardly anyone ventured to do live Flash video streaming on the commercial level because there was little technical support available at the time. Doing Flash live video streaming continued to be a hobby among hardcore Flash video fans until February 2007, when Adobe quietly introduced Flash Media Encoder (still not many media producers know of its existence today). This timely addition, in fact, drastically pushed Flash live video streaming ranking to the front seat in our study because it is much easier to set up a Flash live stream now, and many other factors got a boost.

Flash Pros: As of July 2007, Flash Media Encoder (FME) was only Windows-based, but it enjoyed the highest pre-installation rate (91.2%) in our study. Flash Media Encoder's interface is very easy to use. FME allows digital recording of a live video stream. Flash live video streaming has one of the shortest latency (0.96 second). Soon after a user connects to a live feed, the image is on without any blur.

Flash Cons: FME is a good start in the Flash live video streaming effort. Pushing a live feed to a Web page, however, still involves time-consuming player building in Flash. That is why setting up a Flash streaming takes the second longest time (7.22min). Its image quality still needs improvement. Our internal testing shows that, when its default frame size, 720x480px, is used, there is almost always a mismatch between audio and video, and the audio is hardly recognizable even with a 100Mbps connection speed. As a result, we were forced to use a smaller frame size. Even with the small

frame size, rebuffering can still be an annoying factor form time to time. FME is free, but it won't work without the expensive Flash Media Server 2, the backbone of Flash live video streaming.

Flash live video earned a total ranking score of 7 and an audience-oriented ranking score of 2. Flash live streaming is a very promising technology. If developed well in the next several months, by taking advantage of the wide popularity of Flash Player, Flash video has the potential to win another battle in live streaming as its on-demand counterpart did, but it is still a work in progress. Much needs to be done before it can be widely accepted by the live streaming community for commercial use. Right now, its good user experience comes with a high price for any company that wants to deliver content via Flash live video.

QuickTime

QuickTime live video streaming is still a comparatively new phenomenon. It was not possible until Apple introduced QuickTime Broadcaster, a desktop application, in late 2005. Together with QuickTime Streaming Server or the free open-source Darwin Streaming Server, QuickTime Broadcaster captures and encodes audio/video into QuickTime compatible formats including H.264, the latest standards-based codec in the industry. To view a live stream, QuickTime is needed.

To combat the low pre-installation rate of QuickTime on Windows systems, Apple has bundled free QuickTime with its popular iTunes both on Windows systems and on Macs. In addition, Darwin Streaming Server can be installed on both operating systems. However, QuickTime Broadcaster is OSX-based only. This is the only solely OSX-based broadcasting software. This fact could hinder the acceptance of QuickTime live video streaming in the PC-dominant world.

QuickTime Pros: The biggest advantage of QuickTime live video streaming technology is that both QuickTime Broadcaster and Darwin Streaming Server are free. With a Mac computer, QuickTime live video streaming is very easy to set up (3.91min). Digital recording of a live stream is possible. In our study, QuickTime enjoyed a very high pre-installation rate (87.9%), but we have to take into consideration the fact that the test was conducted among media professionals among which Mac ownership was high. In the real world, the QuickTime pre-installation rate is 67.6%.

QuickTime Cons: The biggest problem with QuickTime live streaming is its long latency (10.41 seconds). That fact is translated into a long wait before the videos comes up for a viewer. In addition, the video almost always looks fuzzy and dissected at the beginning. Only around half of the testers (52.8%) said that they did not experience any rebuffering. Its image quality is mediocre among the competitors.

QuickTime live video streaming earned a total ranking score of 3 and an audience-oriented ranking score of 7. QuickTime live video streaming technology has more battles to fight before it can become mainstream. Right now, streaming media producers have to pay a big price for QuickTime's live streaming quality and image quality though the technology can be used for free.

Real

Real Networks Real live streaming is made possible by RealProducer and Real Helix Server, both of which are Windows-based only. To view a Real live stream, RealPlayer is needed, which is available both on PC and Mac.

Real Pros: RealProducer allows live streaming recording. Its interface is very easy to use.

Real Cons: Considering it was one of the earliest live streaming technologies available, Real misses the mark against its modern competitors.

During the test, obvious mismatches in audio and video were observed. Clients experienced constant and frequent rebuffering issues. Additionally, audio speed was perceptively doubled in parts of the stream. The video quality appeared "soft" in most cases as well. Despite troubleshooting with Real Networks engineers, we were not able to resolve these issues.

Real's reputation for bundling software also hurt their profile in this study. Some testers intentionally did not have RealPlayer installed because they were afraid of spyware and unsolicited ads, nor were many testers willing to install Real for the purposes of conducting the test. Because of this, some results may be skewed.

Real's performance was mediocre on ease of streaming setup, and on latency. Finally, Real is one of the most expensive streaming technologies tested.

Real live video streaming earned a total ranking score of 8 – the lowest among all technologies tested – and an audience-oriented ranking score of 8 (also lowest).

VLC

Like DVTS, VLC is for live streaming only and cannot do on-demand streaming. VLC is an encoder, server, and media player all in one. Apart from streaming live a camera shot, it can also stream live a DVD movie or a media file.

VLC Pros: As an open-source program, it is free to download. Its Windows version and OSX version are equally convenient to use. There are also various versions of VLC for Linux. It supports the widest array of media formats. It even plays FLV files, which none of the other major media players do.

VLC won four out of six No. 1s in our test. Since the software is free and there is no specially high requirement for hardware, VLC is the least expensive for live streaming. Its image quality was rated by the testers as the best and as good as that of DVTS. Even though VLC's high default bit rates (1024kbps for video and 192Kbps for audio) were used, VLC users experienced the least rebuffering. Finally, VLC live video streaming is the easiest to set up (1.54 minutes).

VLC Cons: VLC is not web-friendly because embedding a VLC movie in a Web browser is not as easy as embedding Flash, QuickTime, Windows Media, or Real movies; and letting viewers watch a VLC in a web browser is more difficult. Users usually have to view a VLC live streaming video directly inside VLC. Since VLC is not as well known as the big players, users usually have to download it to view content. Its latency can also be improved.

VLC live video streaming technology is the biggest winner in our test. It earned a total ranking score of 1, the highest of all, and an audience-oriented ranking score of also 1, still the best. As a cross-platform technology, VLC has the potential to become an ideal live video streaming technology if it can solve its browser-embedding hassle and boost its latency performance.

VX30

VX30 is a playerless Java-driven streaming technology. The company, with the same name, developed both on-demand and live streaming technologies using Java. Both on-demand and live streaming are done through a web server. No streaming server is involved. A virtual player is sent to the user's computer while viewing is going on. After the viewing session is over, the player is gone.

VX30 live streaming is made possible through VX30 Live Video Encoder. To boost salability, VX30 Video Broadcast Server can be used on another computer or computers to handle bigger traffic flow for a live video stream. The VX30 Live Video Encoder is Windows-based, but its Video Broadcast Server is platform independent. VX30 streaming videos can be easily viewed on almost all Macs and on most PCs so long as Java Runtime Environment is installed. VX30 allows no live video streaming recording though recording can be done through a tape on the broadcasting camera. The Encoder interface is straightforward and easy to use.

VX30 charges an annual fee for using the VX30 live video streaming technology. Currently, pricing is done at $2 per employee or student rounded up to the nearest thousand. For instance, there are 100 people in a department. That will be 2 * 100 = 200 rounded up to $1,000 as the annual charge. The only difference in academic pricing versus corporate pricing is the cap. There is an annual cap of $25K for academia and $50K for corporate. This charging system is different from that of any other companies in comparison. Based on the fact that most universities and companies update their technologies once every three years, we decided that the comparable charges from VX30 for its live video streaming software amounted to $1000 (typical situation) x 3 years = $3000.

VX30 Pros: VX30 is one of the top technologies that provide clear video images in the 320x240px frame size category in our test. Most testers (75%) did not experience rebuffering in VX30. Because its streaming is based on popular Java technology, viewing across operating system is easy. An overwhelming majority of the testers (89.4%) claimed that they did not have to download anything to view the live stream. A full-screen viewing button is built into the virtual player.

VX30 Cons: The biggest problem with this technology is its latency. Actually, its latency (20.17 seconds) is the longest among all the compared technologies. That means a user has to be very patient before s/he can see the video image. In the streaming industry, it is widely believed that eight seconds of initial buffering is the maximum time a user is normally willing to wait. The server setup system is archaic and unnecessarily convoluted. Since an annual fee is charged, in the long run, using VX30 live streaming technology is not cheap.

VX30 earned a total ranking score of 5 and an audience-oriented ranking score of 3. VX30 live streaming technology is a work in progress.

Table 2: Performances And Rankings Of Eight Live Streaming Technologies

	Clipstream	DVTS	Flash	QuickTime	Real	VLC	VX30	Windows Media
FOR YOUR INFORMATION								
Server can be installed on	Windows	N/A	Windows	Windows/ OS X	Windows	ganged with broadcaster	Windows	Windows
Broadcaster can be installed on	Windows	Windows/ OS X (The OS X version is primitive.)	Windows	OS X	Windows	Windows/ OS X	Windows	Windows
Can be viewed on	Windows/ OS X	Windows/ OS X (The OS X version is difficult to use.)	Windows/ OS X	Windows/ OS X	Windows/ OS X	Windows/ OS X	Windows/ OS X	Windows/ OS X (only with the help of Flip4Mac)
Live streaming recording capability	Yes	No	Yes	Yes	Yes	Yes	No	Yes
PERFORMANCES AND RANKINGS								
Easiness of setting up streaming	2.56 min	2.38 min	7.22 min	3.91 min	5.20 min	1.54 min	6.30 min	10.20 min
Ranking	3	2	7	4	5	1	6	8
Latency (seconds)	2.85	0.21	0.96	10.41	7.17	3.82	20.17	10.30
Ranking	3	1	2	7	5	4	8	6
Easiness of watching (% of no download needed)	89.4	26.1	91.2	87.9	73.8	42.1	89.4	85.5
Ranking	2	8	1	4	6	7	2	5
Rebuffering frequency (% of no rebuffering)	71.4	54.2	64.1	52.8	12.5	89.8	75	77.1
Ranking	4	6	5	7	8	1	3	2
Image quality (% of excellent quality)	3.2	44	17.8	25.1	16.3	44	32.7	29.6
Ranking	8	1	6	5	7	1	3	4
Cost for setting up streaming	5 Clipstream Live: $199 Clipstream Repeater: $999 Streaming through a Web server, no streaming server is needed. Server: PowerEdge 1950 (Base): $2700 Total: $3898	1 DVTS Player/ Encoder/ Server all in one (Open source): $0 PowerEdge 1950 Server: $2700 Total: $2700	7 Flash Video Encoder: Part of Flash CS3 Professional Suite: $699. Flash Media Server 2: $4500 Red5 (Open source): $0 Dell PowerEdge 1950 (Base) as a streaming server machine: $2700 Total: $7899	3 QuickTime Broadcaster: $0 Darwin Streaming Server (Open source): $0 QuickTime Streaming Server: Included in OS X Server (Included w/ hardware) Apple XServer Dual 2Ghz (Base): $2900 Total: $2900	6 Real Producer Plus: $199.95 Helix Streaming Server: $4000 Windows 2003 Server: $615 Dell PowerEdge 1950 (Base) as a streaming server machine: $2700 Total: $7514.95	1 VLC Player/ Encoder/ Server all in one (Open source): $0 PowerEdge 1950 Server: 2700 Total: $2700	8 VX30 Live and VX30 B-Cast: $1000 (annual fee). Streaming through a Web server, no streaming server is needed. Dell PowerEdge 1950: $2700 Total: $5700 (Based on the fact that many companies/ schools upgrade technology every three years)	4 Windows Media Encoder: $0 Windows Streaming Server: Included in Windows 2003: $615 Dell PowerEdge 1950 (Base) as a streaming server machine: $2700 Total: $3315
Ranking	5	1	8	3	7	1	6	4
Average Ranking Score (with all factors included)	4.17	3.33	5.67	5.00	6.33	2.00	4.33	5.17
Ranking	3	2	7	5	8	1	4	6
Average Ranking Score (With only the audience factors [image quality, latency, rebuffering, and easiness of watching] included)	4.25	4	3.5	5.75	6.5	3.25	4	4.25
Ranking	5	3	2	7	8	1	3	5

(The smaller the ranking number, the closer to No. 1, the better.)

Play with the Interactive Chart Weightings online to manipulate the weights based on your needs.

Windows Media

As one of the legacy streaming technologies, Windows Media is probably the most often used technology among the industry for live streaming.

Windows Media Pros: The Windows Media Server comes along with Windows 2003. No extra money needs to be paid for using the Windows Media live streaming technology. Windows Media a very stable system. More than three-quarters of testers (77.1%) reported that they experienced no rebuffering.

Windows Media Cons: However, Windows Media lags behind other technologies on several counts. It takes the longest time (10.20 minutes) to set up a stream. Its latency is unreasonably long (10.30 seconds). Without the help of third-party software Flip4Mac, watching Windows Media live video on a Mac is impossible. Its image quality is mediocre.

Windows Media earned a total ranking score of 6 and an audience-oriented ranking score of 5. In spite of its traditional and continued popularity, Windows Media live streaming technology is facing competition from newcomers, such as VX30, Flash, etc. Without drastic improvement, Windows Media can be easily replaced by the newcomers for live streaming.

Conclusions

Our 2007 live video streaming study shows that Videolan.org's VLC is a big winner in the live video streaming technology competition. It is cross-platform both for streaming media producers and for audience. It is very easy to set up for streaming. The image quality is outstanding. There is little rebuffering. The latency still has room for improvement, but is within the tolerable range for broadcasting. It is free. If VLC can be embedded in a Web browser with ease, it will be much more user-friendly. Right now, embedding VLC is possible, but asking thousands of regular Web users to manually install plug-ins to view VLC live streaming is not a realistic solution. VLC is the closest to being an ideal live video streaming technology.

Both our testers and we the authors are highly impressed by what DVTS, the next generation of live video streaming technology, can offer. DVTS is by far the best technology for live video streaming on Internet2 speeds. The image is of TV broadcast quality and second to none. Its close-to-zero-second latency is appropriate even for real-time communication, let alone broadcasting. It is one of the easiest technologies to set up. Since it takes advantage of the

multicast feature of Internet2, it saves bandwidth for the signal emitter, thus making live streaming cost effective. Yet, DVTS is still waiting for the multicast feature to be populated to the general public ISP realm to make itself truly relevant to the general public. Like VLC, this amazing technology is free. Making DVTS web-browser friendly does not seem to be part of DVTS developers' current effort, but, again, to make it relevant to the general public in the future, such effort must be made. Its substandard Mac application still needs a great deal of work.

Flash is a very promising live video streaming technology though it has some room for improvement. All other technologies need to be much more improved to push themselves to the ideal level.

This study has the following limitations:

1 All the cameras point to a projected HD TV signal – not real-life scenes and sound. Though all captured the same scene, not all were from exactly the same angle and distance.
2 Audio was not part of the test due to the nature of the setup.
3 The coordination between audio and video was not tested.
4 Not all the technologies used the same resolution because DVTS and VLC provided only 720x480px resolution while all the rest used 320x240px resolution.
5 No massive simultaneous viewing was tested.
6 The cost of bandwidth usage was not in the equation.

The authors will take into consideration these factors when we repeat this study.

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Selling through Storytelling: The Tale of New Media Advertising in Consumer Culture

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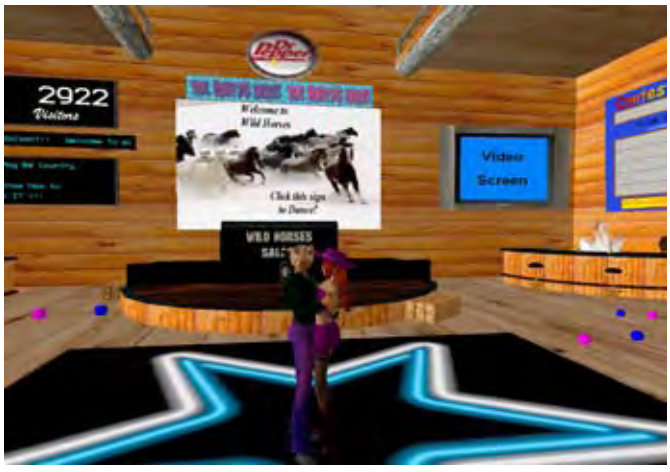
Some businesses are presenting alternate corporate profiles online, complete with a reconstructed history of how the company came into existence. These mock histories target a new generation comfortable with new media and moving between truth and fiction. The latest PR/advertising/promotional research examines the potential and pitfalls of product and company representation through new media. Two of the most significant storytelling strategies include engaging consumers in an interactive (and often altered) environment and allowing consumers to create their own "user" stories – but what's at risk?

Introduction

Nearly 60 percent of the national advertising budget involves integrated marketing and advertising (Lebkowsky, 2006). No longer are companies relying on traditional forms of advertising and the plethora of choices (many untested) is overwhelming to established and upstart businesses. How far should a business "go" when creating a new image? Some businesses are presenting alternative corporate profiles online, complete with a reconstructed history of how the company came into existence. These mock histories target a new generation of consumers that seem comfortable moving between truth and fiction. It would appear at first glance that the latest research in public relations, marketing, and promotions on reaching audiences has an eye and ear toward younger consumers. Some of these strategies include innovative approaches to using Web sites, blogs, and virtual communities, among others. From personal communication devices to mock movies to company-sponsored independent record labels to sonic branding, there's more ways to reach young consumers than ever before. What works? What doesn't?

Sonicity Fitzroy (SL)

On the other hand, the virtual reality game *Second Life* tends to point toward an older, more professional, group of consumers as residents, who are more than willing to tap into the new media culture (if merely evidenced by their land and merchandise expenditures and time online). A sense of nostalgia can often be detected in SL conversations, hinting of an older audience seeking to recapture its youth, by exploring, dancing, playing and, of course, shopping.



In reaching these younger and wanna-be younger audiences, corporate marketing strategies are designed increasingly to engage consumers in an interactive (and often altered) environment and allow their customers to create their own "user" stories regarding products or services. This paper examines how storytelling, as a marketing technique, addresses the needs and wants of the emerging digital consumer, and offers an overview of trends and technology that invite and entice consumer participation -- but what's at risk?

Buying into Consumer Culture

The same year that Vance Packard (1957) re-released his book *Hidden Persuaders,* a social commentary on the U.S. consumer culture, Apple unveiled a Super Bowl commercial that introduced its "Macintosh" computer, featuring a storyline that played off George Orwell's *Nineteen Eighty-Four.* Nearly two decades later, that commercial would become comedic fodder for the adult cartoon series *Futurama:* as a runner heads toward a huge wall screen, she thrusts a package into an image of "Mom" (rather than the Orwellian Big Brother). The TV is shattered. At which point, a man in the audience yells: "Hey, we were watching that."

All humor aside, advertising has a powerful influence on culture – making it, duplicating it, reshaping it, and distributing it in more efficient ways than ever before. It sounds simple, but the concept is powerful: advertising is a business in and of itself. It would be easy to dismiss the impact of advertising on our lives, if commercials had not become more relevant and entertaining than programs themselves at times. American culture is advertising culture, regardless of our position on its impact. Neil Postman's Amusing Ourselves to Death offers the reader a glimpse into how entertainment and technology have blurred the line between fact and fiction in news, religion, and politics. It was first published in 1985; consider how much closer we have come into that reality.

Once we acknowledge that the advertiser's goal is persuasion, rather than to solely inform or entertain the viewer or listener, it becomes easier to understand how much power and control American consumers have turned over to marketers, even sacrificing their children to the advertising gods (Schor, 2004). Refer to Calvert (2004), DeGaetano (1998) and Elias (2004), for instance, with regards to research on children's attentiveness to high stimuli and interactive media. As any parent eventually realizes, children can be the best form of word-of-mouth advertising. Children prompt "us" to buy things for them – and even direct our attention to media. *Webkinz,* an online game for children, showcases virtual pets online every day, where intrigued tikes can earn virtual dollars for time spent on the computer. The process begins once someone purchases a "real" stuffed *Webkin* for a child, which comes complete with an online code to unleash its virtual personality. The interactivity of the Web allows for children to re-conceptualize play and storytelling.

Power of Storytelling

In a recent editorial in the *Philadelphia Inquirer,* freelance writer Katie Haegele (2007) shared her thoughts on how much, if at all, storytelling transforms "the context of new forms of media?" The question can also be posed as how do new forms of media impact storytelling. She directed the question, particularly, to professor Sue Thomas, who helped integrate an online creative writing program into De Montfort University's new media graduate specialization in Leicester, England. Thomas responded that storytellers have "changed their stories according to context and circumstance" and "they need a fluid environment to stay alive and fresh" (Haegel, 2007). So what one ultimately finds is that while the "core of the narrative [is] intact," an individual medium can allow for a unique perspective through presentation (2007).

Mark Deuze (2005) calls attention to findings on the impact of storytelling in journalism and advertising, nationally and internationally (e.g., Papper, et al., 2004; BIGresearch, 2002; Huysmans & de Haan, 2003); and from this work he has concluded that consumers dramatically underestimate, albeit unintentionally, their media usage. They lose track of time when engaged in a good story or activity. Advertisements blend into the fabric of life as well. Deuze (2005) states, "[B]ecause of the pervasiveness of media in everyday life and the multitasking way we engage with those media, more than half our media use 'disappears' when we are asked about it." Deuze explains that "media making" is evidenced in part by the popularity of blogging and podcasting, as well as company strategies that invite viewer feedback. Deuze (2005) borrows the term "egocasting" from Christin Rosen to describe "the phenomena of just doing our own highly individualized thing when immersing ourselves in the multiple media around us." Sonia Livingstone (2004) points toward the obvious blurring between participation and production in message design and delivery; subsequently Deuze states, reminding us of what futurist Alvin Toffler predicted nearly 30 years ago, "This invisibility of making and using media simultaneously can be set against the increasing invisibility of media in everyday life."

Credit card companies, like Visa, have intrigued us with commercials that take us on adventures through back roads, deep within jungles or high on mountainous cliffs, inside amazing 007 plots worthy of front row seats. One commercial, themed *Visa – All It Takes,* begins with an American woman passenger traveling in a jeep accompanied by a guide on a jungle dirt road. The jeep stops when they spot a lifeless monkey ahead on the road in front of them. The woman leans over to check on the animal, which immediately sports a mischievous grin. She is suddenly aware that she has been "conned" by the chimp and its furry partners, now in the process of stealing her luggage.

She eventually trades the luggage for bananas, and retrieves her Visa from them. "All ends well with *Visa*" is evidently the moral of the story. *Visa* commercials are among the many *YouTube* favorites, and the extra publicity is priceless.

No doubt, one of the best ways to captivate an audience is to hook them on a good story. Better yet, the trend is to invite viewers to tell a story – their story! Storytelling conferences draw thousands, who want to tell and listen to stories, annually across the U.S. and world. Is it then so surprising that audiences respond in similar ways to online invitations by sponsors? One might quickly note the number of digital storytelling workshops that have surfaced over the past five years. For several years, the *Wizard of Ads Academy* has been a leader in helping clients turn commercial announcements into emotional experiences for audiences and profits for businesses. The best advertising agencies, like *Dick Orkin's Radio Ranch,* know the secret to an audience's captivity is to entice it through a well-crafted story with a creative punch line. Storytelling is becoming a must for marketers, who relish the benefits of lifestyle marketing, relatable product and user "story" placement, and a holistic strategic approach given the challenge of reaching consumers within a multi-mediated environment.

Full Circle Marketing

As featured on *60 Minutes,* the *Girls Intelligence Agency* (GIA) enlists young girls, 10 to 14, to host slumber parties where they and their friends test market products. Some of the GIA clients have included: Disney, Mattel, Procter & Gamble, Johnson & Johnson, Nestle, Lego, Sara Lee, Dreamworks, Sony, and Warner Brothers. Advergames (e.g., Lucky Charms Webisodes), virtual communities, and sponsor calls for user stories fuel 24-hour marketing campaigns that contribute toward a consumer lifestyle. *The Hollister Company,* an offshoot of *Abercrombie & Fitch,* appeals to teens with an interest in name brand casuals (featuring a Californian surf look). The company presents a model example of lifestyle marketing directed toward 14- to 18-years olds. *Hollister* launched its first store in 2000; amazingly, it presented a good tale regarding its history until recently, claiming early 20th century South Pacific sailor John M. Hollister as its founder. As the story goes, he would establish the first store in California in 1922. Of course, none of this is true, and its target audience knows that the company is relatively new. Image is part of the consumer culture. Clothing and everything counts: from the in-store atmosphere and company's web presence to its image (even if it is fiction). Inside some of the *Hollister* stores, as well as online, customers should anticipate seeing lifestyle video clips of teens hanging out, wearing *Hollister* clothing, in various beach scenarios. Its web site features company-sponsored music, formerly a one-time record label. Video, music, and a strong online presence definitely fit within the teen lifestyle. A certain image is projected online that speaks to a youth culture that wears its heart on its designer sleeve.

No longer do traditional media and commercials provide the competitive impetus to reign in the marketplace. The trend is to market 24 hours daily to consumers and reach them online. *Advertising Age's 360 Media Guide* (2006) is a compilation of articles and trade advertisements that boast of the never-ending sales ploys (omni marketing, 360 marketing, etc.) that have been successfully aimed toward consumers, especially the youth market. This omni environment is demonstrated through the wealth of media and marketing that intersects with daily life and purchases: web sites, in-text messaging, ambient marketing, virtual communities, video games, media on demand, and so forth. Increasingly, consumer culture is expanding beyond web purchases and infomercials to interactive transactions within virtual communities, such as *Second Life* (SL). *Reuters News Service,* reporting on trends in *Second Life,* revealed in January 2007 that 85% of SL consumers (with an average respondent at 33 years old in real life) spend more than $250 in Linden dollars per month on clothing. *[Editor's note: at the time of this writing, L$250.00 is approximately equivalent to US$1.25.]* Specifically, 24% spend more than $1,000 Lindens and another 25% spend more than $2,000 Lindens on name brand fashions (Reuters, 2007). Shopping is now a 24/7 activity, if one has the time and money – and avatar.

Hooked on Commercials

> *TNT aired a five-episode mini-drama about a young woman, with viewers directed to a web site — plastered with the sponsoring credit card company's ads — for the finale. Fox created an animated taxi driver, Oleg, who would appear during breaks talking to his passengers. Next month Court TV offers a mystery about an unsolved murder with clues dropped in commercial breaks, online and via text messages; the game's winner gets $25,000. Fans of NBC's "Scrubs" were asked trivia questions at the beginning of a commercial break, the answer appearing in between ads. (Bauder, 2007).*

Content wraps have been inserted into *7th Heaven, America's Next Top Model, Smallville,* and number of sitcoms like *Girlfriends, The Game,* and *All of Us,* mainly targeting women (Listerine, Herbal Essence, and Cover Girl) and teens (Activision's *Guitar Hero II*) (Consoli, 2007). Nielsen Media Research, as of a few months ago, offers rating services for commercial breaks, in addition to the regular programming (Bauder, 2007). In another instance, *CW Television Network* (http://www.cwtv.com) inserted a three-part commercial series entitled Date Night within two of its most popular shows for young women, Gilmore Girls and Veronica Mars. Advertisers are clever, in a strategic sense, to make commercials as entertaining as the programs in which they run. The CW Network - CBS' UPN merger with Warner Brothers - is moving away from traditional commercials, and experimenting with sponsored content wraps and short 5- to 15-second commercials (Bauder, 2007; Elliot, 2007).

These commercials are often segmented into three parts to play out like a soap opera, and thus dissuade the viewer to tune out. Short teasers invite viewers to keep watching for these advertisements to find out what will happen next in a commercial plot or to discover a certain beauty secret of a top model, and in essence these ploys create the sense of a

show within a show. What is the real show? The short teasers, beckoning the viewer to find out more by staying tuned or clicking on a Web site while watching a show, are called TV banner ads, a term borrowed from online marketers (Elliot, 2007).

The concept of integrating commercials as strategic programming elements, however, is as old as the early days of radio: "Some of the most creative thinking in television these days has nothing to do with comedy or drama. It's about the commercials. Fueled by a growing sense of desperation, networks are inserting games, quizzes and mini-dramas into commercial breaks" (Bauder, 2007). The lines between media are quickly dissolving, and marketing to consumers should be designed to initiate multi-mediated experiences for them. No longer are they conceptualized as single media events or in terms of linear programming. It's not a matter of choice between media as much as a way to reach consumers in all aspects of their daily lives.

Companies are seeking online venues to direct viewers to their products while making site content relevant to users. Both long form ads (delivered in manageable chunks) and short ads bring back repeat customers, if a site is deemed practical to them. HGTV, for example, provides building and design tips for the consumer, and it so happens that its web site also serves as contact for several product ads – all relevant to getting the job done. Ad inserts within video content (i.e., a mini-commercial pre-rolled into a how-to demo) create a hall of mirrors for the consumer, unless the company carefully manages its online space and the viewer's time (Miller, 2007).

Viral Marketing

YouTube has been credited as one of the most effective means to add life to television commercials (LaMonica, 2006; Leonard, 2006). *YouTube* videos are probably the best example of viral marketing to date, with viewers tuning into funny commercials intentionally, and sending links to their friends. From personal communication devices to mock movies to company-sponsored independent record labels, the ways to reach consumers, especially young adults, are innumerous. Earlier this year, David Verklin and Bernice Kanner (2007) reported on the army's latest marketing campaign toward recruitment: online reality video games. To locate the youth of America, one simply heads toward *MySpace Video, Face Book, YouTube, Google,* and *Yahoo,* to name a few sites. As the youth culture spends more time online, they have found new diversions there as well, apart from traditional media. *YouTube* and similar services provide hours of entertainment for viewers and media makers. Viral ads are often the funniest or weirdest TV commercials that scream for another look on the web, or they are made intentionally for online viewing (with marketing hopes of creating a buzz across the Internet on *YouTube* and other video services). *CNN Money* published a series of articles in 2006 on viral advertising; one headline read, "Viral Ads: It's an epidemic. Hit videos reach millions." Another *CNN Money* headline exclaimed: "You create our Super Bowl commercial," in reference to Doritos' call for viewers to tape their own ads. Leonard (2006) explains,

> Madison Avenue has always tried to create infectious ads. Think of those beer commercials with catch phrases that some of your more tiresome coworkers repeat around the water cooler. But viral marketing truly came of age with the Internet…And here's an intriguing question: Can *YouTube* and *Google Video* figure out a way to make this a business? If so, could they become the web's equivalent of the broadcast networks?

Among the most watched viral ads is *Specialized Bikes' Police Chase* – a mock video news report of police in pursuit of a cyclist. Other viral ads are merely worthy of another showing (see http://www.funnyplace.org), and increasingly many are styled as reality videos (although fake like this one from Xango). In another instance, Federal Express' Super Bowl commercial featuring Burt Reynolds pokes fun at its making, and cites 10 elements proven successful to attract viewers' attention: celebrity, animal, dancing animal, cute kid, groin kick, talking animal, attractive females, product message (optional), famous pop song, and bonus ending. Alas, traditional expectations regarding advertising content and placement are being challenged by a growing consumer culture that feeds off television and the web for information, entertainment and interaction – increasingly and often simultaneously.

Whether consumer culture is viewed as the outcome of product marketing and/or the force behind this 24/7 vision, industry trendsetters are calling for new approaches that fit within audience lifestyles as well as more opportunities for users to share testimonies. The synergy from user experiences – experiencing the product in various contexts - might be that added value that leads to buyer loyalty. Sometimes it is a matter of knowing your audience so well that you can

have fun with them. Take for example the hype around *Smirnoff's* rap commercial, which played the *YouTube* circuit, spoofing the lifestyles of wealthy New Englanders. The plot had an innovative twist that captured the attention of young adults, as it redefined the concept of taste.

- Knowing your audience so well that you can have fun with them.
- Using technology in an appropriate manner (targeted online campaigns)
- Planning for residual impact

The Tea Party: Smirnoff Campaign

In the November 14, 2005 edition of *Chief Marketer,* New York advertising consultant Simon Williams, chairman of the Sterling Group, defines successful brands as those that influence culture (i.e., *Google, Nike*), have a point of view *(Fox News),* generate consumer creativity (for example, *Converse Gallery* where consumers are invited to create a 24 second film to stream online), encourage customization (i.e., *iTunes, Starbucks*), provide customers with "an experience" rather than a one-time purchase, make buying decisions simple for consumers, ferret out product weaknesses, accept social responsibility as a mantra (*GE's* Citizenship Report, *eBay's* Giving Works, *Target* Gives Back to the Community), respond quickly to trends and technology ("pulse, pace, and passion"), and push toward innovation: "Brands are inspired by *Apple* more than anyone else. They transformed the music business, and people are taking what they did seriously. *Procter & Gamble* and *GE* are driving this and have made innovation the core of their corporate strategy" (Williams, cited in Parry, 2005).

Socially Conscious Marketing

Jean Kilbourne (2007), renowned advertising critic and lecturer, has stated that Americans watch about three years of commercials in their lifetime:

> Advertising is an over $200 billion a year industry. We are each exposed to over 3000 ads a day. Yet, remarkably, most of us believe we are not influenced by advertising. Ads sell a great deal more than products. They sell values, images, and concepts of success and worth, love and sexuality, popularity and normalcy. They tell us who we are and who we should be.

As for who we should be, that is a consideration rising among young adults (and some baby boomers), who have fostered allegiances to sponsors with social agendas that fit their lifestyles and ideals. Images of the coveted audiences begin to develop: socially conscious baby boomers who want their children to fit into the consumer society. To the youth generation, truth is relative, but corporate responsibility is mandatory. Those companies that fail to connect to their communities may find themselves alienated from some customers.

"Commercial culture is now inside our intimate relationships" is the cautionary message from Media Education Foundation's (MEF) *Advertising and the End of the World.* This documentary warns that we are moving from "cognitive" to "emotional" consumer choices, at which point advertising is unavoidable and truth and integrity become conceptualized as opportunity and challenge. *The Dove Campaign* is an example of a company's attempt to position itself as standing for truth and integrity. Its latest series of campaigns have revealed the truth behind the model industry, featuring ads and a mini-commercial documentary on how beauty is constructed for television and magazines.

Marketers have little incentive for launching long-term "collective interests" over corporate interests. Moreover, as we become a global consumer culture, expectations for corporations and brand labels become as significant to one's identity as other loyalties, such as those associated with national affiliations. It has become more difficult to distinguish advertising content from other programming, especially when product placement, commercial soaps, and user stories have become an acceptable part of entertainment. New media does not guarantee a more or less ethical experience for the consumer; it merely provides the interactivity to complete the marketing process.

Behind the Scenes

Iron Chef America made headlines when one frame of a *McDonalds'* ad ("i'm lovin it") appeared cloaked inside its program. *YouTube* replayed the segment for those who missed it the first time. The Food Network and the sponsor claimed it was an accident, while others remain suspicious of the incident. Advertising has become so influential to our culture, its viewers expect it to be evasive, and deceptive practices, when they do occur, are often considered intriguing, acceptably hidden and mysterious, to consumers. The occurrence becomes just another form of entertainment. Subliminal advertising to many consumers and academicians seems as absurd as aliens; however, new research exists which suggests that such practices "do have an impact on brain activity – but the question over whether this influences consumer behaviour remains unanswered" (*Subliminal,* 2007). A number of authors purport that the impact of subliminal advertising on our buying decisions should not be readily dismissed (Bullock, 2004; Reichert, 2004; Rosen & Singh, 1992; Smith & Rogers, 1994; Theus, 1994; Watanabe, 2003). The very idea that some advertisers dabble in subliminal messages should be worth some concern or attention. A series of subliminal commercial abuses in the Russian media were reported by the *Los Angeles Times* (Dixon, 2002), including split-second messages for soft drinks, soap, and music. These messages are illegal in Russia, but not in the U.S. One Pepsi message was embedded in a local Russian beer commercial and Secret deodorant was featured for hardly a blip on Russian MTV.

Futurama, with its keen insight on the business world, satirized the concept of subliminal advertising in one of its episodes. Philip Fry, a relic from the 20th century, who was cryogenically frozen in the year 2000 only to wake up nearly 1,000 years later, is alarmed by an advertisement for Lightspeed Briefs broadcast during his dream in the middle of the night. The next morning at the office, he is still disturbed about the intrusive ad.

Philip: So you're telling me that they broadcast commercials in people's dreams. Turanga: Of course.

Philip: How is it possible?

Professor: Very simple, the ad gets into your brain like this liquid gets into this egg. Although in reality it's not liquid but gamma radiation.

Philip: That's awful – it's like brain washing.

Turanga: Didn't you have ads in the 20th century?

Philip: Well sure, but not in our dreams – on TV and radio, in magazines, in movies, and in ballgames, on buses, milk cartons, T-shirts, and bananas and written in the sky – but not in dreams – no siree.

A Few Closing Words about the Near Future

For many of us, we cannot escape the buzz from a great commercial, and our friends are the likely ones to send us the links to *YouTube!* Truth and ethical advertising practices are not easily defined, as technology challenges physical and mental space. Taking advantage of cell technologies, store displays have included phone numbers that connect customers to an accompanying soundtrack for an advertisement. Hyper sonic marketing is a technology that beams messages and commercial information through sound frequencies. When these beams come into contact with potential customers, product information is transmitted into their hearing range: "The sound only becomes apparent to the listener when the traveling sound waves have made impact with a surface, be it material, organic, or human" (*Hyper Sonic,* 2007). In the near future, Sony's patent to transmit full sensory information into the brain promises to change the way we experience media (Reuters, 2005). Americhip already produces sound chips that can be found in books, magazines, packaging, and displays. The company believes its "Twix" magazine insert was the first sound ad, which voiced the slogan, "Twix, Two for Me. None for you." Trends can be regularly followed on *AdvertisingLab.Blogspot.com* and *MIT's Advertising Lab: The Future of Advertising.*

Sponsors have found creative ways to tap into virtual communities as well, everything from featuring brand name cars for avatars to brand name clothing. The idea is that if you like it in-world, you will want it in RL. Take a test drive! Try it on! Wallace (2007) reports on Calvin Klein's in-world experiment where its "virtual perfume bottles enable[d] SL users to spray each other with bubbles that 'initiate dialogue'" The company's rationale for its campaign was that "ck IN2U" related to a new generation of customers called "technosexuals." This group is plugged into the language of technology, and is "the first generation to be defined more by their means of communication rather than fashion or music.…the strongest force affecting the culture of the developed world at the moment" (Wallace, 2007).

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About the Author

Dr. Phylis Johnson is an associate professor at Southern Illinois University (Carbondale) who specializes in radio and sound studies. She has 25 years of broadcasting experience, primarily in radio. She has authored a book, and numerous articles and chapters in her field with her research focusing on various aspects of radio, sound, and new media. She has presented her creative work and research nationally and internationally. She is an avid participant in Second Life.

Stereoscopic Visualization of Scientific and Medical Education

Albert William | Indiana University-Purdue University Indianapolis

Many students today are faced with learning and understanding increasingly complex subjects such as science and health. How best to educate these students is a challenge for educators. One approach that we have taken to expose students to a dynamic learning system is to use a stereoscopic display system to help visualize complicated concepts of health and science in a more visually appealing manner. Using off the shelf hardware and software, and developing a production pipeline that caters to stereo movie production, we have created a curriculum that appeals to students more than traditional teaching methods of similar content. This paper focuses on the problems associated with creating stereoscopic media for education, and the methods involved in producing non-traditional content in a user friendly environment.

Introduction:

As we live in an increasingly sophisticated world, it is apparent that many students today are faced with ever more complex subjects. How best to inform these students is a challenge for educators. One approach we have taken to engage students is to present materials on a stereoscopic display system. With this system, we are able to describe complex concepts of health and science in a more visually appealing manner. We have adapted commercially available hardware and software, and developed a production pipeline that simplifies stereo movie production. These movies form the cornerstone of a curriculum that appeals to a student's natural curiosity more than traditional teaching methods with similar content.

Learning and teaching science and health has traditionally been viewed as a difficult subject by both students and teachers alike at all levels of learning. This difficulty has been associated with complex terms and concepts, and also a lack of visuals that are intriguing enough to inspire students. Science has sometimes been lacking in the sophistication of graphics to help students to visualize the structures, functions, theories, and concepts involved in science and health education. Many students are intimidated by their inability to grasp these complexities, and therefore science is often perceived as not being fun. The average science textbook typically has many illustrations associated with it but often fails to get a student's attention- whether long term or short term.

The focus of our research has focused on how to utilize computer graphics and stereoscopic delivery systems to enhance learning experiences.

The Problem

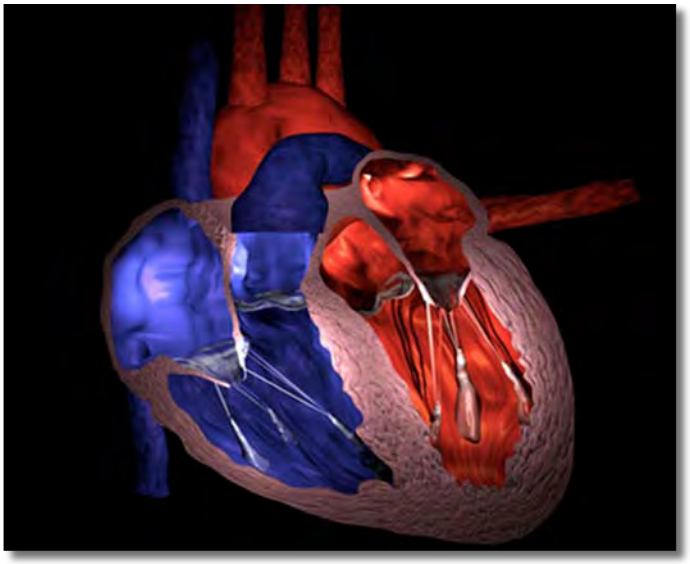
Many science textbooks are filled with illustrations, graphs and drawings that are designed to enhance the content delivered in the text. Often these illustrations are not adequate enough to help students to understand the intricacies of the topic being presented. One problem we often see is varying representations of processes. Often the artists used for these textbooks are not well trained in science and therefore do not understand the process which they are portraying.

Students wear polarized glasses to experience stereoscopic educational animations of various health topics at the Ruth Lilly Health Education Center in Indianapolis, In.

As a result, inaccuracies result from this lack of understanding, and while it is often possible to see very beautiful images, the representation is not precise. On the other hand, scientists who do truly understand these processes usually do not have the artistic skills, or time, to express the concepts which they are trying to convey, and the result is that the scientist's accurate portrayal of a specific concept, structure or function may not be aesthetically pleasing.

The world of science lends itself to technologies that will help describe complex functions and often indescribable interactions to those who wish to be enlightened on such subjects. To this end, our experience echoes the cliché: "a picture is worth a thousand words." Indeed, artistic illustrations, visualizations, and computer generated animation have played a significant role in helping professional scientists, novice science students, non-scientists, and lay people to further understand all disciplines of science. The development and use of the stereoscopic display system provides us with yet another medium in which to present our visions of science.

The rich visuals that are easily produced using software packages, such as Autodesk's Maya, and the immersive environments related to stereoscopic displays, allow students the chance to experience and perceive content that is more engaging. The mission of these educational materials is to bridge the gap between the artist and the scientist, resulting in a learning experience that is both scientifically accurate and artistically pleasing. We hope that learning using stereoscopic display introduces a "wow factor" that helps students assimilate information at a higher rate than traditional learning. Indeed, witnessing a room full of elementary school age students engaged in a stereoscopic movie is confirmation that there is value in this sort of educational experience. Many students are reaching out for objects as they "float off" of the screen, and there is an audible excitement among the students in their reaction to the event.



Using computer graphics rendered from a program such as Maya allows us to depict subjects that are not easily portrayed by traditional means. For example, we are able to model, texture, and animate a heart in cross section, showing how blood flows through the valves and chambers. This permits students to gain a deeper understanding than seeing the same content in a textbook. Another example of this relates to the process of protein synthesis. This process contains many enzymes, chemicals, and operations that make up an incredibly difficult subject for students to understand. Using computer graphics to portray protein synthesis is a perfect use of technology, in that we are able to tell a complete and simplified story on an incredibly complex subject.

Often, it is a challenge to determine what to leave out, versus what to show or include, helping give clarity to a given subject. Our goal is to show a process, structure or function as accurately as possible but not always as realistically as possible. This allows us to re-purpose the same visual elements with new narrative pieces to re-direct content at different target audiences. Graphic elements can have the same visual impact to different audiences by merely providing an audience-appropriate narrative.

The stereoscopic display medium is now in use at the Ruth Lilly Health Education Center (RLHEC, http://www.healtheducationcenter.org) in Indianapolis, Indiana where it helps to educate over 100,000 students annually. One of the theaters at the center has been outfitted with a permanent stereoscopic installation that allows students the opportunity to view selected pieces of curriculum in stereo. The stereoscopic display is helping to revolutionize traditionally difficult subject matter for students K-12.

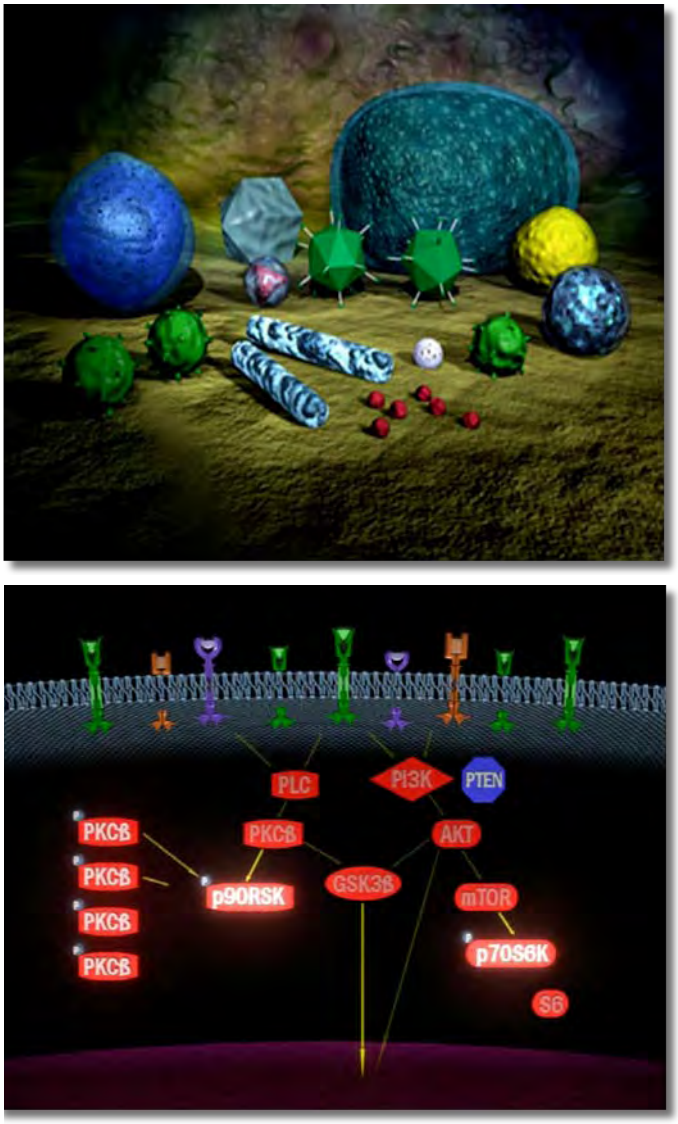
Content created by the research team at the IUPUI School of Informatics has been implemented to fit into the curriculum of the RLHEC. This process consists of the curriculum committee interfacing with the developers to establish program goals. All scripts and pre-production are reviewed by various sources including experts in the given subject to make sure that all information, both the visual assets and the narrative content, is as accurate and up to date as possible.

The stereoscopic computer generated content that has been created for the RLHEC, includes subjects such as "The Cell," "The Circulatory System," "The Nervous System," "The Immune System," "The Respiratory System," "Diabetes," and "What is Cancer?" These custom animations are produced under the direction of the center's curriculum committee

and designed specifically to be integrated into the RLHEC's programs. A large part of our mission is to develop a story and not to just show the science without a good narrative.

We have also created subject matter for other needs related to education. Eli Lilly and Co. in Indianapolis is one of the world's largest pharmaceutical manufacturers. They have a constant need to educate their scientists and marketing staff about drugs that are being developed and the diseases that those drugs act on. They have found that using computer generated imagery on stereoscopic displays has had tremendous benefit in reaching these audiences, and has led them to a new method of discussing these incredibly complex foundations of discovery. One of the subjects that have been explored was biochemical pathways in cancer cells. Traditionally, this has always been a very difficult scientific theory and very hard to visualize because of the number of interactions of enzymes that make up a pathway. Conventional methods to illustrate biochemical pathways always used static, basic geometric shapes to inadequately convey this complexity. Using advanced modeling and animation tools available with Maya allowed us to bring new life to the description of how a biochemical pathway functions, and let us also show how dysfunctions can occur.

Stereoscopic content can also be created using video. We have created a number of video pieces that are useful to show varying content. One of the most interesting is a thirty minute total knee replacement surgery that shows all of the intricacies of this medical procedure. Feedback that we have received from surgeons indicate that this format permits them to see the surgery better then viewing multiple live surgeries, because they are able to move forward and backward through the material at their own pace. Also, the depth of field is greater than a standard video, thus allowing them to see much greater detail.



Representation of biochemical pathways

Methods

The content of a movie is established through traditional production meetings with the clients in which their needs are determined. The School of Informatics has created media for many different clients and educational scenarios and audiences. Those clients include Eli Lilly and Co., BioMet, the Indiana University School of Medicine, AMPATH (The Academic Model for the Prevention and Treatment of HIV), The Davis Clinic, Operation Walk, and the Ruth Lilly Health Education Center (RLHEC). In working with all of these organizations, the production team from the School of Informatics meets with the clients to determine the subject, the audience, the length of the program, and any special considerations. Pre-production consists of thorough research on the subject using traditional textbooks, journals, and internet resources. On many scientific subjects, a vast and sometimes conflicting quantity of views and information are available. Thus, it is often necessary to not only conduct extensive research, but to have that final information checked for accuracy by an expert scientist or review panel in the subject area. A preliminary script is written and approved by the client. Often, as in the case of the RLHEC, the script needs to be changed to age appropriate language so that the narrative content speaks directly to the target audience, and so that the narrative also meets state mandated standards of education. Storyboards of the visual content are prepared from the approved script and then approved by the client. Pre-visualization then commences on the project. Using Autodesk's Maya, models are created, animated, and textured, and lighting and other effects are applied. Low resolution renderings, or playblasts, are created to show the animation along with high resolution stills. These are put into an animatic with scratch narration to synchronize the entire movie. This low resolution animatic is then submitted to the client. Upon final approval of the animatic pre-visualization by the client, production rendering begins.

To create computer generated animations, Maya is used to create the frames. All modeling, texturing, lighting, and animation are done as would normally be done to create a standard 2D animation. Traditional movies are generally animated using a one camera viewpoint. For our stereoscopic animations, a stereo camera rig has been specially created to simulate the ocular separation of two eyes and give two slightly offset views with which to render (Figure1). The separation of these two cameras determines the amount of stereo that the viewer ultimately sees in the final animation. The stereo camera rig consists of a group that has a manipulator handle that allows the rig to be transported and rotated as a standard camera. Parented to the group are the two cameras, one for each eye, the zone of exclusion and the point of parallax. All attributes of the cameras are locked with the exception that the right camera can be translated on the X axis; this function adjusts the ocular separation. The zone of exclusion, a non-renderable object, is an area in front of the cameras that helps to establish when objects are too close to the cameras to be recognizable in the stereo field. A point of parallax is also a non-renderable part of the rig and helps determine the point, or plane, at which the stereo field is neutral. All objects between the zone of exclusion and the point of parallax are in negative parallax and appear to be "floating" in front of the display screen. Those objects beyond the point of parallax are in positive parallax and give the appearance of depth to the scene (Bourke, 2003a). Custom expressions have been written in Maya that directly control the ocular separation distance and the distances to both the zone of exclusion and the point of parallax (Bourke, 2003b).

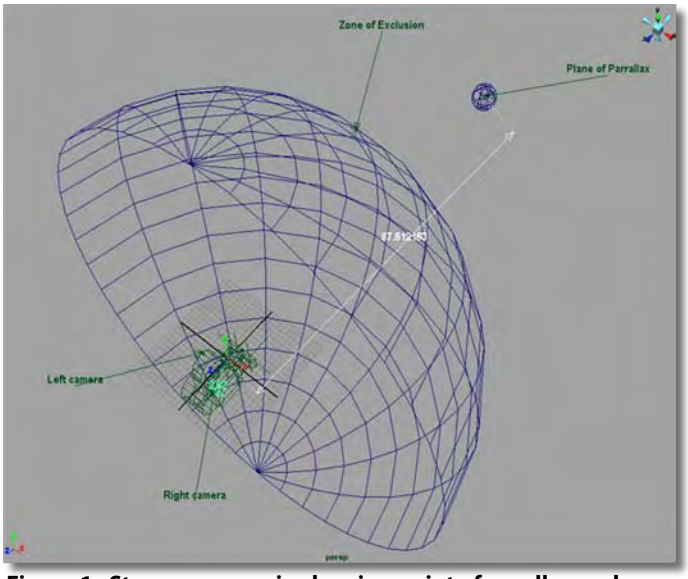


Figure 1. Stereo camera rig showing point of parallax and zone of exclusion

The render output consists of two sequences of frames that correspond to each camera. The output for production renders is generally uncompressed Targas (.TGA) at a frame size of 1056 by 768 pixels for each camera. At 30 frames per second, this data can add up very quickly. For a five minute movie, this data set will be around 45 GB.

To edit these frame sequences, Adobe Premiere Pro 2 is used. A project is started with a frame size of 2048 by 768 pixels. This will allow the two image sequences of rendered images to be displayed side by side. Since the images were rendered at a slightly larger size, each image has an extra 32 pixels that extend off of the sides of the visible project. This allows for a final tighter stereo image. All video clips of images rendered with the left camera are assembled into one video track, transitions are created, and any title, graphics or credits are added. All of these clips are positioned to cover the left side of the display monitor window. On another video track, all of the video clips of images rendered with the right camera are assembled, synchronized with the corresponding left video track clips, and exact transitions and other assets are created to mirror the left video track. The right video clips are positioned to cover the right side of the display monitor and both right and left video clips meet each other exactly in the center of the display field. Once all of the clips have been synchronized, positioned and transitions have been made, the sequence is output as a series of bitmap (.BMP) images. Each of these images is 2048 by 768 pixels in dimension and is approximately 4.6 MB. For a typical five minute animation, this amount of data will be about 30 GB.

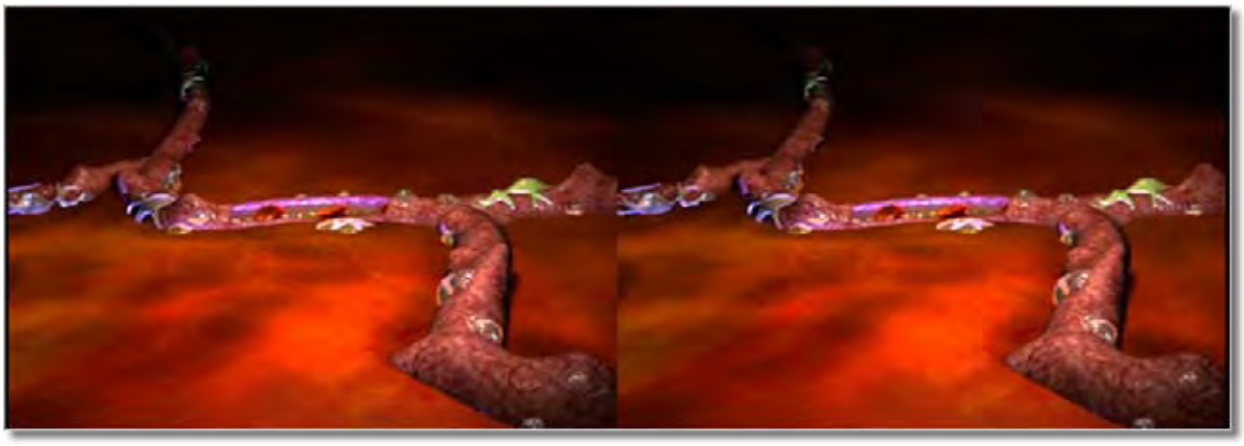


Figure 2 Stereopair image with dimensions of 2048 x 768 pixels

To convert the bitmap sequence to a playable movie, the sequence is loaded into Virtual Dub (www.virtualdub.org). This software will output the movie in an AVI format which will play well in the stereoscopic player. Since the pixel dimensions of the movie are so large, a suitable compression codec needs to be utilized in order for the stereoscopic player to playback the animation at a smooth and consistent rate. Our research has led us to use the codec Xvid (www.xvid.org). This codec was chosen to provide very few compression artifacts with smooth playback. Since the amount of data that needs to be viewed for such a large movie can reduce playback quality, Xvid was chosen because it allows us to create a small movie with a good data rate output without a large file size. Additionally, Virtual Dub is used to add sound as a WAV or MP3 to the video. A typical five minute AVI movie with sound will be compressed to around 140 MB.

Passive polarized light is utilized to view the content on the stereoscopic display. We are using a system that consists of a shuttle computer running Windows XP with either an NVIDIA Quadro FX 1100 or 1300 graphics card (see http://www.nvidia.com/page/qfx_mr.html) with dual outputs. These outputs are set to clone mode and send signals to two standard multimedia projectors. Each projector transmits through a linear polarized filter and on to a silver screen that has been specifically designed to preserve polarized light. The observer then wears glasses fitted with polarized lenses in the same orientation as the filters through which the projected images are sent, and the images are seen in stereo. Movies are AVI format and are played with Stereoscopic Player (www.3dtv.at).

Creating content from video sources follows the same production techniques as those utilized for computer generated animations. High definition cameras (SONY HDR-HC1 Handycam 1080i) are positioned on a custom rig placed on a tripod that provides a stable platform. The amount of physical separation of the cameras determines the point of parallax and zone of exclusion mathematically, as was accomplished with software for the virtual stereo camera rig. This allows the video feed from each camera to comprise one half each of the stereo field after the images are captured. Often the clips need to be scaled down to fit in the desired playback field. High definition video allows the scaling process to be performed without loss of resolution.

Conclusion

The use of stereoscopic displays to educate students on the complex subjects of science and health holds great promise. Traditionally, students have not been able to easily visualize concepts using standard textbooks, and stereo displays fill a role that will allow these students a greater insight to the materials that often have gone misunderstood. The technologies used to create, and display, stereoscopic content are becoming increasingly economically feasible and user friendly. All of the hardware and software used are off the shelf and readily available. The end result of this situation will be to permit a more fascinating, accurate, and dynamic learning environment that can be available to anyone interested in exploring science and health.

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About the Author

Albert William is a Research Associate in the School of Informatics at Indiana University Purdue University, Indianapolis (IUPUI). His Bachelors degree and research work in biology led him to pursue a Masters degree in New Media in order to create and stereoscopically display scientific concepts. His goal has been to bridge the gap between art and science to better educate people of all ages and backgrounds to help them gain a deeper understanding of the world around them and their health. He has created numerous animations on various scientific topics and has displayed them in museums, art exhibits, print media, and television nationally.

Student Video Projects: Supporting the Beginning, the Middle, and the End

Susan Simon | Instructional Technology Specialist, Dartmouth College

Robert Barry | Media Center Supervisor, Dartmouth College

At Dartmouth College, the department of curricular computing, the library's media center, and the peer tutoring center work together to give seamless support to faculty and students who are involved with video project assignments. This paper will illustrate how we've "de-silotized" the pedagogical and technical support as well as provide students' feedback about their experiences.

Dartmouth faculty in diverse departments including Government, Art History, Arabic, Writing, Native American Studies, and Architecture were excited to assign video projects and wanted to give students a more active and engaged learning experience. However, they didn't have previous experience nor did they understand the processes involved to support it. To insure success, we needed to develop more ambitious, comprehensive and seamless support services between curricular computing, the library's media center, and the peer-tutoring center. From the very beginning of the process faculty did not have a clear comprehension of what was involved.

They didn't know how time consuming it would be for the students and they didn't know how much training students required. Faculty members also didn't have other video project assignments to refer to when designing their own assignments.

The question was how could we create seamless support for faculty in designing the assignment and assisting their students with the video project?

Video project assignments, while perceived by students as 'fun,' meet curricular outcomes and create a rewarding student experience. Students use videos to visually articulate their understanding or interpretation of a particular topic, issue, or argument. In preparing for the video, students learn about the topic, develop research skills, conduct interviews, and record and edit their own video projects. Video assignments provide students with the opportunity to develop skills in collaboration, critical thinking, planning, organization, and time management. The video creator also learns to express and organize her ideas through a treatment plan and storyboarding as well as through the video. Students are more involved in the learning process and are engaged in the assignment using video technology that is in tune with their world. In some cases students with different learning styles learn concepts more clearly through this medium than through reading text only.

To bring together the appropriate people and to point out what is needed for success, we created the 'Video Projects at Dartmouth' website which includes a multimedia assignment form.

The site and form helped us to:

- Share examples of video assignments from across the curriculum
- Give faculty a better understanding of what is involved when assigning a video project
- Reassure faculty that they had support throughout the process
- Freely distribute instructional hand-outs
- Open the channels of communications
- Establish a team to work with faculty members
- Produce a fine-tuned training program

Jones Media Center (JMC)

When students are assigned to do video project most of their work is done in the Jones Media Center.

Jones Media Center (JMC) opened in 2000 when two Dartmouth College departments merged. Jones Micro Text, a branch of the Berry/Baker Library at Dartmouth College, and the Film and Video Department, part of Dartmouth Instructional Services, blended and moved into a new wing of the Berry Library.

Our mission statement was to provide state-of-the-art hardware, software and multimedia for students, faculty, and the community. We promoted our center as "The principal multimedia viewing and development facility for the Dartmouth Community."

Jones staff members visited several other institutions, compiling information about current equipment and services. Time was spent sharing plans and recommendations with the architects and librarians at Dartmouth College. The plans were put into action.

As soon as Jones Media Center opened, it was clear that immediate adaptations were necessary in response to exponential growth from faculty and student requests. Not only was the space quickly out-grown, additional equipment, training, and personnel were needed to meet the growing demand.

The Center began with 16 viewing carrels. Each carrel was a viewing station, complete with VHS and DVD decks, a 20"TV monitor with cable TV, and a computer. The carrels were split equally between Macintosh and PC computers. Initially, students utilized JMC for viewing VHS and DVD from the media library. Faculty began using the center, requesting clips to show in the classroom. Once Apple computers came equipped with non-linear editing software (iMovie) and DVD burning software (iDVD), a greater percentage of faculty and students began using JMC for class projects. In those early days it took a long time to burn DVDs and many projects took overnight to complete. We only had two machines (iMacs) that could do this. As the demand grew we added more computers over time. We now have 20 carrels in our Mac lab that specialize in multimedia editing.

Jones Media Center received its first camcorders from the college Media Production Center. Since Jones was a student-oriented service center, it was thought camcorders could be loaned to students more easily. Our task was to plan how to loan these cameras to students in a fair and efficient manner. The expanded public hours of JMC are more convenient for students, and the staff at the public service counter was trained to check equipment in and out.

Students check in at the counter and are assigned an appropriate carrel. Among the special equipment available to each student are headsets, USB microphones, and LaCie fire wire drives. Each carrel has specific software and hardware, such as music keyboards for arranging music with GarageBand software.

Jones provides twenty edit stations, each with a 20" Sony TV and equipment for viewing and importing media. VHS, MiniDV, and DVD formats are used along with Apple computers with increased RAM (min. 4GB – 8GB) and hard drive capacity for running software able to handle multimedia files. There are also specialty stations with older analog equipment. Formats like 16MM film

projector, 3/4" umatic, BetaMax, 8MM, Hi8, VHS and foreign standards PAL and SECAM all may be converted into digital formats or input into computers to be edited. While some Apple computers are iMacs, others are more powerful Intel Mac Pro's with larger monitors. Increased screen space aids the editing process using Final Cut Express.

JMC utilizes all the iLife applications (iMovie, iDVD, iPhoto, iTunes, and GarageBand), Final Cut, and Photoshop on all machines. Some specialized machines are loaded with Adobe CS2 and flat bed scanners or slide scanners for importing photos into multimedia projects.

The media center loans LaCie fire wire drives (80GB-250GB) to students for up to seven days to store their projects. Student projects are not saved on computers in the lab. This worked well at first, but as demand grew the center soon ran out of space to store 40+ drives. JMC still uses these portable drives, but have moved to server-based storage, a more effective solution. Server space is arranged through another department, allowing both students and faculty greater accessibility to the projects from anywhere on campus and after JMC is closed.

Jones provides camcorders, digital still cameras, and audio recording equipment (analog and digital) for students, faculty, and staff. Students use an on-line form to request equipment (camera and tripod) for a loan of up to three days. Equipment is loaned out on a first-come-first-serve basis Monday through Friday from 10AM- 4PM. The students may apply up to a week in advance, and, when pre-arranged with a class, up to 1 month in advance. When a professor has formally requested a primary shooting schedule for a class, those students have priority over all other requests. This does lead to the loaning out of all equipment during peak times, and some requests go unfilled.

JMC Training

"Tuesday Afternoon in Jones" is a series of digital media workshops for students, faculty and staff. These sessions provide an overview and some hands-on training in the use of digital media software and techniques. They are part of a multimedia education program that includes Quick Reference information sheets, online tutorials and consulting assistance.

Student technicians are trained by JMC staff and work each evening from 6-10PM. They are available to advise students and trouble shoot technical problems, which sometimes arise. The student techs also have been given background on the class projects and assignments.

JMC staff creates single-sheet "Quick Reference Guides" that describe a process and answer frequently asked questions (i.e. how to burn a DVD, or import a VHS clip). These instructions are also available online at the JMC website. These guides are updated with each new version of software released. JMC also provides a library of current instructional books and manuals. The website provides instructions along with links to online tutorials and references.

JMC Budgeting and Maintenance

Each camcorder kit cost $1,000 with bag and tripod, extra battery, and UV lens. The kits contain Panasonic 3-chip MiniDV camcorders, models GS200 & GS250 (models often change from year-to-year). JMC grew from three kits to twenty-one kits over about five years of providing this service. The center also expanded the loan program to provide six digital still cameras and twelve digital audio recording devices. As older models are replaced with newer ones, camera bags are re-used to hold the older model devices as back-ups until they completely die. Some items, such as batteries, are expensive ($80-$90 each) and do, over time, need to be replaced. JMC sells media (MiniDV tapes and DVD's), for the convenience of the students; these are sold at close to cost. Late fees are charged at $5.00 per hour per item. JMC cycles through camera equipment about every three years. Labor is a major factor in planning growth. Older cameras are used as back-ups in case a camcorder fails before the completion of a student project. This is a good practice in a situation with limited equipment and high demand.

JMC covers all expenses after warranties run out on new equipment. However, students are charged for any loss or damage to equipment on loan. Fortunately, loss or damage is infrequent. Students are charged for missing parts and the replacement of broken parts. Every camera returned is inspected for satisfactory function, clean lens and LCD screens, and settings reset to normal operation. Batteries are charged and kits are reassembled to go out the next day.

All of these efforts require substantial staff time: research, evaluate, plan, design procedures, write polices, train staff and students and produce training materials. JMC averages 50-100 loans per month. During peak times each term, one JMC staff member working an 8-hour shift can check-in/check-out up to sixteen cameras, given that it takes an average of 30 minutes to complete the process. Peak days consistently occur on Friday pickups and Monday returns.

JMC is researching the purchase of high definition (16 x 9) cameras using miniDV tapes and the additional ability to record in standard 3 x 4 mode. This would allow the center to move forward with new technology. Older cameras would be used for parts and back-ups.

The Student Center for Research, Writing and Information Technology (RWIT)

RWIT, the Student Center for Research, Writing, and Information Technology, is a peer-tutoring service that assists students with writing, research, technology (such as PowerPoint and iMovie) and new media compositions. RWIT also seeks to integrate writing, research, and information technology in theory and in practice, and to support the learning process in writing, research, and technology.

Students working on their video projects are encouraged to make an appointment with an RWIT tutor for help at any stage of the process or to get feedback on their final video project before they turn it in for screening.

Multimedia assistance includes:

- planning the project at the early stages
- putting together the pitch or script
- working on a treatment plan
- creating a storyboard
- basic editing tips
- finding and using images for the project
- importing images into a project
- creating PowerPoint presentations

RWIT Training

All tutors receive basic training in writing pedagogy, library research, and common applications such as PowerPoint, while subsets of tutors receive specialized training in technology, multimedia applications, or special client needs (e.g., English as a second language and professional documents like résumés and cover letters). New tutors attend a 16-hour basic training program before the start of fall term, and each tutor is required to attend four hours of ongoing training per term. Each member of the administrative team conducts basic and ongoing training sessions, with assistance from the junior staff. Each domain of the ongoing training program (research, writing, technology, ESL, and career services) generates its own topics, including but not limited to: style and grammar, special-needs clients, ESL, the "reference desk encounter," video project critiques, and resume review.

Specific IT ongoing training sessions or topics have included:

- prepare and respond to treatment plans for 1 – 2 minute video projects
- create and diagnose short iMovie projects
- get hands-on experience with on-camera student interviews
- diagnose and respond to Writing 5 treatment plans for a visual essay assignment
- respond to final video projects and discuss if the requirements were met and how the projects could be improved
- assist during a video project check-in session with a specific course
- makeup work: write a 3 page paper on the concept of Digital Storytelling

Examples of Video Project Assignments

A section of the website is dedicated to giving examples of video project assignments from across the curriculum. They have proven to be very beneficial for other faculty members who are in the early stages of designing their own assignment. Here are three examples.

Assignment Example #1

Course: Writing 2-3
Assignment: The Dartmouth Research/Documentary Project
Instructor: Karen Gocsik

Introduction

I make this assignment - a short documentary film about some aspect of Dartmouth life and history - in the middle of Writing 2. Using general resources, special collections, interviews, and perhaps the archives of the Daily Dartmouth, students (in groups of three) research a topic of their choice, looking not only for textual information but also for visual and audio resources. They then produce a 5 - 7 minute multimedia composition/documentary film. They also compose, collaboratively, a paper on the same subject as the film. I subsequently engage them in conversation regarding the similarities and differences of composing with different media. What skills are universal? Portable? Genre-specific?

My aim is to introduce students to finding and using primary and secondary sources, and to familiarize them with the challenges of composing an argument with multiple media. The project itself requires considerable writing and rewriting, including the proposal, the interview questions, the narrative voice-over, and the final paper. The project also requires that students research well, present their research ethically, and cite their sources when credits roll at the film's end.

Ongoing Work

I begin by introducing my students to examples of multimedia compositions, both professional documentaries and student films. We talk about how these films are constructed, considering the soundness and the ethics of their arguments.

We follow this with two sessions with a reference librarian in Rauner Library. For the first session, the Rauner librarian pulls documents, images, and artifacts from Dartmouth's history—for instance, materials on student activism through the ages. Students are encouraged to play with the resources, to comment on what they've learned, and to form questions for further research. In the second session the librarian discusses the Rauner resources more thoroughly and offers instruction in doing research with primary sources.

The students then meet with their groups to determine a topic and a plan. They take this plan to the RWIT Center, where a tutor reviews the plan and makes suggestions about its focus and feasibility. Students then go to Jones Media Center to discuss technology options/needs. Finally, they create a proposal following these instructions:

- State your topic and the questions you intend to pursue
- Offer a detailed plan regarding how, precisely, your group intends to explore these questions (For instance, do you intend to conduct interviews? With whom? Will you need to film something on campus? What? Do you intend to make use of special collections? Which ones?)
- Provide a timeline for your project
- List your technology needs
- Raise any questions that you have regarding the process

Students write their proposals, and then meet with me in office hours, to "pitch" their ideas and discuss their strategies. Students meet several times amongst themselves to do research, to refine their plan, and to write their scripts. They must submit scripts and reports to me according to deadlines that I've outlined in the syllabus.

Finally, they begin shooting. They bring clips to an iMovie workshop, run by Susan Simon, who offers instruction in how to use this software. Students edit their films in Jones Media Center, with the support of the Jones Staff and, ideally, an RWIT tutor. They also invite me to Jones to take a look at their rough cuts. I offer my critique, and they continue editing.

We screen the films on a movie night in the last week of class. Students assess their peers' work and defend their own in a Q&A following each film. I provide popcorn.

Assessment

I assess both the product and the process of this project.

Product

Because film is a public medium, I invite the entire class to screening nights. At the screenings the filmmakers are asked not only to present their own films but also to assess their peers' work. Before the final screening—before students cut their films—I invite them to join me in constructing criteria for assessment. I ask them to consider global and technical issues, and to determine whether or not the argument was ethically made. Here is one example of the criteria we've created. I average the group assessment numbers to determine a grade for the film. Student filmmakers share this grade, regardless of their involvement in the film.

Process

Whenever you have students work in groups, it's a good idea to give them an opportunity to assess their classmates, and to assess themselves. I've therefore developed a series of questions that I ask students to complete as part of their group assessment. Here's an example of this process assessment. I use this assessment to determine a process grade, which I sometimes express as a letter grade and sometimes as a plus or minus. Students are awarded these grades as individuals, depending on their individual performances.

What I Hope to Achieve

This assignment accomplishes many things, in terms of research, critical thinking, composing, and so on.

Research

- introduce students to the research process (in a way that is new to them and fully engaging)
- give students the opportunity to work with primary sources
- familiarize the students with Rauner resources
- expand students' sense of viable source materials, to include audio and visual
- teach students how to evaluate, use, and cite these kinds of sources

Critical Thinking

- teach students how to read and to interrogate visual texts
- enable students to better analyze whether or not a visual text is "ethical"

Composing/Editing

- teach students how to structure arguments in new ways (documentary films do not typically have explicit thesis sentences; they are sometimes not structured linearly; they are often polyglossic; etc.).
- teach students to edit carefully, especially by heightening their awareness of transitions and connections between ideas within the piece.
- require students to write a group paper on the same topic, so that they can discover the similarities and differences in composing with different media

Additional Benefits

- build the class community (students work closely in small groups)
- familiarize students with Dartmouth culture and history
- expose students to Rauner Library, the RWIT Center, and Jones Media Center

Frequently Asked Questions

Why small groups?

I think students learn more from multimedia projects when they work collaboratively. First, film is a collaborative medium. But even more important, groups allow students to discuss each step of the composing process. Students have reported that they've argued for an hour over a single transition! This level of discussion doesn't happen when students write papers. And it cannot happen if they work alone.

How much class time do I devote to this?

I devote four to six classes to this project: one or two to a discussion of visual arguments, two to Rauner, one or two to the iMovie workshop. Several of these classes are x-hours; four are run by colleagues. I spend out-of-class time with each group, especially when they pitch their ideas to me and when I view their rough cuts.

How much time do the students devote to this?

It depends. Students will spend several hours researching, shooting, and editing. Editing is, by far, the most time-consuming of all the processes. Students are often surprised by this; instructors need to remind students again and again that it takes a long time to "shape" their films. If you're concerned about the amount of time this project requires, ask students to create their arguments from existing photos or video footage. This will keep them from spending considerable time on shooting.

What do I give up to accomplish this project?

Not much. This project proceeds not in place of, but alongside the other course assignments. We continue to read and discuss course materials as students work on their films. Instead of four books, I teach three; the film and group paper replace one paper - but this project, as designed, is far more demanding than a single paper.

What do students gain?

Students gain several things from this project:

- Students' visual literacy improves, as they sharpen their understanding of how visual texts are constructed.
- Students learn to do research with primary sources, including archival sources and interviews.
- Students practice collaborative composing as they conceptualize, research, shoot, and edit together.
- Students develop a keener understanding of composition, learning how to create an argument without offering an explicit thesis; how to use multimedia resources to support an argument; how to create effective transitions between their ideas; and how to develop a visual "voice."
- Students consider the ethics of their visual arguments.
- Students have fun collaborating together, a process that improves, incidentally, the community of the class.

Assignment Example #2

Course: Writing 2-3
Assignment: iStory, A Digital Composition
Instructor: Stephanie Boone

Instructions to the Student

You will produce a digital composition, or film, based on your Homestory and/or the Place Essay (whole or in part)—pieces you composed in fall term, but which now you may revise for the sake of this assignment, and which makes a claim about yourself, or some issue of place and memory in your life.

While this film will be inspired by personal experience and use material you produced in fall term, it should be constructed with the conventions of an academic argument in mind. Your composition should assert and support a claim about you, and should observe kindred matters of style and structure, such as transitions, unity, grammar, and mechanics. Yes, you will make the same sorts of rhetorical decisions for this film, as you would for a traditional paper. In pursuit of your claim, you will work with images and sound. You may indeed use written text in this film, as well. The paper is not forgotten, or subverted in this assignment; rather it achieves new dimensions. The geography of the traditional paper has changed. Argument can be visual.

A caveat: Though this assignment may ultimately "feel" useful to you personally inasmuch as it uses the personal as its primary source material, still you should construct a film that is appropriate for public consumption in this college classroom—your peers, tutor, and professor—and which you can be comfortable "showing" to your public audience, whether here or elsewhere, now or later. The assignment calls for an argument, not a confession. So, choose your material wisely. Make this an E3-rated film. Exercise discretion.

The following restrictions apply to your film—no exceptions:

- Length: 2 minutes minimum to 3 minutes maximum (running time includes any element of the film- audio or visual).
- Visual: 1-10 images and 25 discrete words (excluding credits), maximum, you may not use any animation.
- Audio: any kind of audio (voiceover, song, sound effects). Consider the 3-minute limit when you include audio.
- Medium: use iMovie. You may use video in your iMovie, but you are limited to one minute of video, however you choose to use it (as a block or in discrete segments).

Caveats:

- Use video advisedly. It does not insure a better film or grade.
- Cite secondary sources and images or audio recordings of others that you use in making the film.
- Be ethical.
- Keep it simple.

To assist you in making your film, we will hold several workshops with a technology specialist that will address how to use images and audio in iMovie. You should consult Jones Media Center tech specialists when necessary, and to schedule equipment.

You should set about conceptualizing your film and collecting images and audio elements as soon as possible. Planning is critical to producing a successful film. To that end, you will complete the following steps in your filmmaking process:

Treatment Plan

Complete the "video treatment plan" that I will provide in class. You may get this template early in the term, if you would like to. In your plan, you will have to consider your audience, purpose, production schedule, visual content, audio, and structure. Use a working title for your film.

Storyboard

Complete the storyboard template that I'll provide in class. The sooner you develop your storyboard, the better. As you make your film:

- Consult the personnel and schedule equipment in the Jones Media Center.
- Schedule time with RWIT tutors for extra tutoring.
- Learn more about iMovie at www.apple.com/imovie.

i/I/Movie: A Digital Composition, film and commentary, 3 minutes

You will submit your film in DVD or CD form to the class and to your professor, for in-class screening. To your professor, you will submit your final treatment plan and storyboard, plus a one-to-three page commentary on your filmmaking experience. In this commentary, address the problems you encountered, the solutions you found, the resources you used, and the afterthoughts you have about your process and product.

Response to iMovie Screenings

Write a one-page essay in which you nominate a film as best film and post this nomination essay to our discussion board. Based on these essays the class will determine the Best Film and the Best Essay.

Assignment Example #3

Course: Government 83
Assignment: Communicating Politics: A Dartmouth Classroom Simulation
Instructor: Deb Brooks

The start of the simulation involved a detailed campaign communications strategy memo, which was jointly developed and written by the team. Each media team was responsible for producing 4 campaign advertisements, along with appropriate press releases for their candidate. The first 3 ads were each 30 or 60-second radio ads and/or direct mail, and had to include a specific strategy for targeting a particular group over voters given hypothetical budget constraints. Each individual within a team was assigned to take ownership for one of the first three ads, with the final ad produced collectively by the team. Each student wrote a paper on their "owned" ad, describing their strategy for the creation of the ad in light of related readings from the course.

Student Feedback

After the completion of the student video project assignments, students are asked to complete on online survey. 76 students have completed the survey so far. Here are some of the results:

70.7% were assigned group video projects
33. 3% were assigned individual video projects

When asked where the students found images for their projects:

57.3% used their personal images/photos
49.3% got them from Google Images
44.0% attained them from Dartmouth's special collection library
32.0% downloaded them from Corbis
10.7% from other resources
4.0% from ARTstor

When asked if they used RWIT (the Student Center for Research, Writing, and Information Technology), 67.1% did not, 32.9% said yes and 15.8% did not answer the question.

Comments from Students

"Making a visual essay forced us to not only learn about the material, but to put it together in a logical, coherent manner using not only words but images."

"I had hinted toward this argument in my writing but I never fully said it. In this project I did."

"Working in a group with a challenging assignment is amazing. I learned so much about myself, my group-mates and iMovie. I am totally satisfied by the project!"

"Doing the voiceover for this project helped me with my German pronunciation."

"The interviews were the most interesting part to me. This was the portion of the project where the thesis actually took shape and that was exciting."

"The sense of satisfaction afterwards, having completed our OWN videos. The result is much more visible than other assignments and we were very proud of it."

"Well, it forced me to do a lot of research and to really know what I was talking about."

Outcome

Collaboration and communication among the faculty, curricular computing, the media center, the peer tutoring center, and the students is what enables seamless support. It is also important for faculty to understand what is involved when assigning such projects.

- Faculty need the guidance to make sure the project doesn't become technically overbearing, taking away from the pedagogical goal.
- Students need to know that they have many resources for assistance.
- Students are given instructional handouts during the workshops and are navigated to a website with those same handouts in case they are misplaced.
- Peer tutors can help students develop their research skills, composition, and some editing issues.
- The media center can help with all technical questions.
- Creating a website with sample assignments from across the curriculum helps faculty to design their own assignments. The site also contains testimonies from students and faculty, information on how to prepare for the entire process, handouts on the applications, storyboarding, treatment plans, and a gallery full of final student projects.

The curricular computing and the media center staff are better able to support faculty who assign multimedia projects in their courses. A faculty member now fills out a multimedia assignment form in which she describes the assignment and answers questions designed to give her a clearer understanding of the training her students will require to successfully complete the assignment. The faculty member, curricular computing and media center staff meet as a team several times to discuss the assignment, plan the training, introduce the resources, and the incorporation of treatment plans and storyboarding. Training sessions are now designed to meet the particular technological and pedagogical requirements of each assignment. Because of the successful collaborations we have created more enthusiasm for faculty to embrace active learning assignments such as video projects.

For more information please contact Susan.Simon@Dartmouth.edu or Robert.Barry@Dartmouth.edu.
Or visit our website at: http://www.dartmouth.edu/~videoprojects.
All presentation materials are still available at: http://www.dartmouth.edu/~ssimon/nmc07

About the Authors

Susan Simon is in her 8th year as an instructional technology specialist in Dartmouth College's Office of Curricular Computing. Susan works to encourage the incorporation of student video projects into the curriculum. She teaches workshops on the processes involved, works closely with faculty to create video-based assignments, trains students in production and editing skills, assigns RWIT tutors to help classes, and even brainstorms with students as they work on their projects. Susan is also a senior staff collaborator supporting the Student Center for Research, Writing and Information Technology (RWIT). In her spare time, Susan teaches middle schoolers improvisation with a media-literacy twist.

Rob Barry has worked at Dartmouth College for 10 years, developing plans and procedures to facilitate digital media capturing and manipulation. Prior to that, Rob worked in the San Francisco Bay Area in Broadcast and Cable television production for 13 years. He is an award-winning independent producer and consultant on many projects.

Supporting Authors of Digital Case Stories to Engage Faculty with Innovative Teaching Practices

Lou Zweier | Center for Distributed Learning, California State University

Tom Carey | Office of the Chancellor, California State University and Department of Management Sciences, University of Waterloo

ELIXR digital case stories use 1st person narratives about teaching practice to engage faculty in the adoption of innovative teaching practices. Teams creating ELIXR case stories utilize digital storytelling and video editing techniques to create compelling narratives that are both effective and efficient. In this paper, we focus on two aspects of the emerging ELIXR processes: i) the team roles of Author, Editor, and Media Expert , and how they work together during case story development; and ii) processes to integrate expertise in storytelling and traditional video editing.

1. Overview of the ELIXR project

The MERLOT **ELIXR** project (elixr.merlot.org) is intended to develop and test new collaborations amongst faculty development centers and online resource repositories. The goal is to create innovative models for the development, sharing and use of discipline-oriented resources which illustrate exemplary teaching practices and which also support faculty with exemplary learning objects to help implement those practices with their students.

In September 2006, the Fund for the Improvement of Post-Secondary Education, a program within the U.S. Department of Education, provided partial funding support for **ELIXR** to a team of MERLOT partners and affiliated institutions. The deliverables center around 96 case stories of exemplary teaching, grouped into theme areas for faculty workshops with discipline-specific cases. For example, two of our current themes are Universal Design for Learning to align learning resources and activities with student capabilities and needs, and Course Redesign to enhance student learning while containing costs for instruction. The case stories involve video of both teachers and students to engage other faculty in trying new approaches, and they will be applied institutionally in faculty development workshops for the theme areas and also accessed by individuals through the MERLOT network and other online resource repositories.

The MERLOT ELIXR project team includes the following partners:

- The CSU Center for Distributed Learning and seven campuses of the California State University–where the initial pilot studies were launched in 2006;
- three MERLOT state system partners: Minnesota, Georgia and Oklahoma; and
- several leading campuses from a range of institutional types, e.g., Coastline Community College, Indiana State University, and the Ohio State University.

What is an ELIXR case story? An ELIXR "case story" is a recounting of the experiences and reflections of faculty and students throughout the implementation of the instructional strategy. It includes reflections on both the product and the process of the instructional change (Hoogveld, Paas and Jochems, 2005), as well as the personal impact and significance of both. The case stories include multimedia records of both teachers and students reflecting on the process of designing and implementing new learning and teaching activities, and will be accessed in faculty development workshops and also through MERLOT and other partner online resource repositories.

For examples of ELIXR Case Stories, check the Products page of the ELIXR website (elixr.merlot.org).
For more about digital storytelling, Seven Things You Should Know About Digital Storytelling (http://www.educause.edu/ir/library/pdf/ELI7021.pdf) is a good overview with descriptions of course designs to engage students.

2. Overall Structure of an ELIXR Case Story

Default Case Story Structure

ELIXR Case Stories are autobiographical: faculty authors tell a story about developing and implementing an innovative teaching approach. While each story is unique, the elements of each case story should have some consistency to support easy consumption by the user. Within this case story structure, the uniqueness of each story will still come through via the personal voice of the faculty author as story teller and reflections about the personal impact for faculty and their students, as well as engaging visual examples from the course.

The current default Case Story Structure has five parts:

- The Trailer
- The Story
- Personal Reflections
- More on this story
- Instructor's Guide

The Trailer is a 1 minute or less thumbnail of each case story designed to quickly give the viewer an understanding of the content and drama of the case. It helps them decide whether they want to explore the case further. This is usually the last part of the Case Story to be created.

The Story - presented as "Pat's Story" etc. so that the faculty members are identified as the authors – it is their story about why they adopted the practice that is the subject of the case, what it is that they do differently now, how the students are responding to what they are doing, and what evidence they have, if any, that it is making a difference in student learning. (It is also important to personalize the authorship so that faculty going through each story get the sense that their own story will be equally distinctive as a reflection of their strengths as teachers, the context for their students, etc.). Also critical to the story is what difficulties the faculty authors have had along the way.

The intent of telling these stories is to engage a teacher-to-teacher communication about the advantages and limits of innovative strategies that exemplary teachers have implemented…as well as lessons learned in the process of the design and delivery of a new approach in their teaching.

The Personal Narrative/Reflection is the faculty author's personal reflection–video and text–on what making this change in their teaching has meant to them. Authors can also add commentary on aspects of the story which have not been fully revealed in the rest of the content, especially since the text of this reflective part is not limited in duration like the video components.

The section for **More on this story** is a place for diving deeper into parts of the story told in **The Story.** The elements here will vary depending on the unique parts of each story that are worth emphasizing. The current elements we have been using to reveal **More on this story** can include any of the following elements:

Students-at-Work: A fuller demonstration of the innovation being used in the course. Because the clips in **The Story** are relatively short thumbnails of the process, a fuller demonstration allows the viewer to understand more fully and authentically how the innovation is used and how it works. The video clip or series of clips in this section can be longer and more complete. Reflection by the instructor on what is seen in the clips is also very useful to include here.

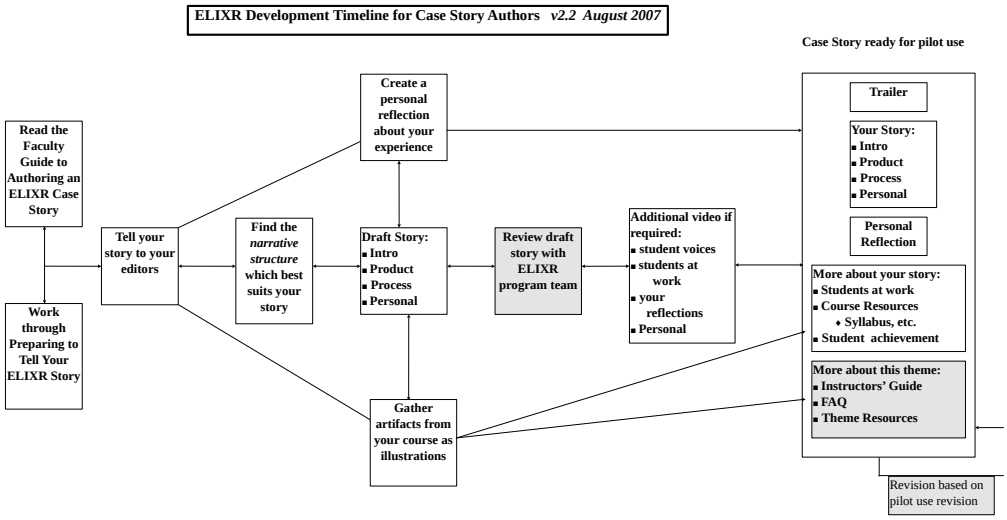
Resources: This is the place to put documents, links, or other resources that are supports for anyone wanting to understand the new approach in the course more fully, in order to utilize the methods demonstrated in the story. Examples would be the syllabus, sample questions, assignments, links to outside resources and scholarship, etc.

Student Achievement: This is where faculty authors put the evidence about student achievement. This may be empirical or anecdotal data, or actual examples of student work. Different screens may be used for this depending on the amount and type of information to present.

Exemplary Practices: Instructor's Guide: This is where tips and tricks and the expertise of others who have used this technique are brought together so that the reader who wants to dive deeper into understanding the technique, and maybe even other techniques that support it, can find additional information. There could also be theoretical background and research studies here. Creating the resources here is not seen as the responsibility of a faculty member telling an individual story, and will most likely be generic across a discipline's case stories.

3. The Roles of Authors, Editors, and Media Experts

Figure 1 shows our current ELIXR Case Story Development Timeline. Within this process, the roles of Authors, Editors–one role with expertise in Faculty Development and one with expertise in Digital Storytelling–and Media Experts have evolved as an important advance within the ELIXR program. In this section we outline how the Editor roles complement the work of faculty authors. In the next section we describe specific approaches to video editing which support the work of Digital Storytelling editors.



Most authors of an autobiography need an editor, especially first-time authors or anyone working in a new medium. Editors support authors in making the transition from a personal reflection–written for their own learning–to a case story which will support the learning of others.

Editorial guidance for ELIXR varies in scope, and can include:

- mapping an appropriate structure for your story
- selecting critical story elements
- including student voices
- choice of language and tone to best convey what happened, and how it felt for the faculty and students.

A good editor's work never gets noticed by the readers or audience–they will experience it as the faculty author's story, with the added bonus of student reflections and insights.

In the case of ELIXR, faculty authors are writing for an audience of their peers, not just as a personal reflection. The editors' role is to support the authors with specific expertise in the areas such as the following:

- Talking about instruction in ways that will communicate across contexts;
- Providing a story for use within a workshop plan for faculty development;
- Using digital story telling as an interactive medium.

Usually it will require more than one editor to assist faculty authors in these areas—in particular, we have used two Co-Editors in the Ken's Story prototype: one of us [Tom] helped frame the story for use in faculty development, one of us [Lou] provided the support for digital storytelling. You are reading the guide to supporting faculty authors as the Faculty Development Editor; there is a parallel guide to supporting faculty authors as the Digital Story Editor. Although we anticipate that in most cases there will be different people in these two roles, it is of course possible for one person to take on both roles, or each role may involve a team of people.

Ideally, each faculty author will have two co-Editors for support, although on occasion a single person could fulfill both roles: a Faculty Development Editor who understands the context in which ELIXR Case Stories are used, and a Digital Story Editor who can help them use the digital storytelling medium most effectively. Our goal for this Author –Editor relationship is like that of the **'as told to'** autobiography. Since we did not have a model story to demonstrate in our 2006 pilot studies, the process there was more of an 'as told by' story with the ELIXR program team taking more responsibility. The case stories now under development are more 'as told with' stories as we work toward the goal or an 'as told to' relationship between authors and editors.

Each project team will also have support from Media Experts, e.g., in preparing video clips of instructors and their students, recording audio files, creating graphics, etc. For some authors, the Digital Story Editor will also provide other media expertise. We also expect that some of the media work may in time be undertaken by student assistants.

4. Video Editing for ELIXR Digital Case Stories

This section is intended to share the process we have developed for editing video for ELIXR case stories and the lessons we've learned during that process. This information is offered to assist others in the video editing process for ELIXR Case Stories and may be applicable to other educational video projects as well. Of course, editing video is a creative process and as such, there are a number of ways to approach the work. What is offered here is one way that has worked for us.

Finding the story

Video editing is done in the service of telling the story of the case, so the process by which we find that story is an important context to start with. For us, finding a story that is compelling and important to tell is an ongoing process throughout case story development. It starts with the first conversation between the team members about what the topic the case will focus on and who the subject of the case will be. It continues with the first conversation with the subject.

We usually make contact with the case subject and have a preliminary conversation about what they are doing in their teaching that is the subject of the case. In this conversation, we try to get a sense of who they are as a person, what they have done with their teaching, what it has meant to them, and what it might mean to others. The question of "what is the important story to tell here" requires agreement among team members, and it is also something to be revisited at each stage of case story development to confirm or adjust as needed.

Getting agreement among the case story team on what story we want to tell can be a challenging task. This is because each person holds a personal vision of the case in their internal imagination and they may or may not be able to describe this to others. For us, a helpful strategy to expose these internal models was to create artifacts that were concrete representations of the case. This helped clarify what each person thought was important about the case, and provided something tangible to be discussed, debated, and modified.

Activities we found useful in creating such artifacts were: developing interview questions, reviewing and discussing footage before editing, drafting introductory text for the case and the main story points, gathering support documents and/or resources for the case, developing a mock trailer for the case, and even developing an evaluation instrument for use of the case.

The editing begins

Once the video has been shot, the editing can begin. There are many different ways to approach the process of editing. Below is a description of the methods that are working well for us.

The editing process starts with selecting segments from the raw footage to assemble into clips. We have experimented with two approaches to doing the segment selection: 1) Having the editor select primary and secondary segments and present these to the team, 2) having all members of the case story team participate in the segment selection process. Method 2 is much more time consuming and resource intensive then method 1, but gets group members more involved in the case development process.

Pursuing method 2 involved making DVD's with on screen timecode and distributing them to group members. Then we asked them to select moments in the video where they felt "others have to see this, or hear this" and to write down the timecode for these segments. We also experimented with having the case subject review footage and select segments too. All segments were then posted to a web page for review by all team members, and a subsequent discussion was held. The goal of the discussion was to understand, from each person's point of view, the strengths and weaknesses of various segments relative to the story we were trying to tell. The video editor and story editor would then use this input to create draft clips for the case.

One of the problems with this whole group approach was that sometimes team members did not have time to review all the raw footage. Another was that sometimes incomplete notes were made about segments that were identified as important, making it very time consuming or impossible to extract the segments for viewing by the group.

In retrospect, we think it is probably best when trying to get group input to view the footage together, stopping when anyone has a comment to make and have someone taking notes on the segments and their importance to team members. This may not always be practical, but when it is possible, we believe it is the best way to capture the richness and diversity of everyone's points of view.

The other solution to these group process challenges is to use method 1, and just let the video editor select segments for the group to review. This can be much more efficient, but relies on the media professional/storyteller's understanding of what is important to the team and their selection of the elements that will tell that story.

One other note about selecting moments from the raw footage: research shows that people's learning is supported by seeing and hearing practitioners talk about what did NOT work as much as what did work. So it is very important to gather footage and include footage that includes what the practitioner has learned about what NOT to do, or what to stay away from. Helping the subject of the case understand the value of this information will make them more likely to be willing to share it and have it included in the case. We believe that including both "positive" and "negative" experiences also gives greater credibility to the case with viewers, and that this kind of vulnerability on the part of the subject makes it more likely that the viewers will be reflective about their own teaching practices.

Aligning the clips with the story elements

Once the most compelling moments have been selected out of the raw footage we assemble them into clips that align with the main points to be told in the story. There may also be strong moments in the footage that don't fit the story as we have conceived it. This is an opportunity to re-think the story, or to find a way to include the elements in some other way. The principle at work here is to build the case out of the most compelling material we have and not be constrained by our original concept of what it should be.

Collapsing the narrative of a clip for efficiency

The process of assembling a clip usually starts with taking the relevant interview segments from the raw footage and cutting them together to construct a narrative for a particular story point. As we do this, we collapse together points being made by the subject, regardless of the jump-cutting that may be needed to accomplish this. This cutting helps to focus on the specific story point to be made and collapses the footage into an efficient narrative. However, we are cautious when doing this editing not to change the meaning of what the subject said, or or to totally remove the character of the person's speech.

We aim to make clips 1 to 3 minutes long for each story point if the clip only contains a single person. If a clip contains multiple people, we may stretch this time to 5 or 6 minutes. These lengths are only a rule of thumb however. In the end, we are guided by how long the clip remains compelling, erring on the side of brevity. If a clip exceeds the rule of thumb significantly, we consider breaking it into two clips. This approach has been validated by consistent feedback from users that they like the length of the videos, and that they are grateful for the efficiency of the storytelling. Everyone's time is precious.

Reviewing clips and getting feedback from the project team

Once the clips have been assembled, and before we proceed with illustrating them with classroom and other visuals, we circulate the clips to get feedback from the case story team. Do the clips make sense? Do they tell the story we want to tell? What's missing that's important? Are the clips too long or too short? We use feedback from these questions to make adjustments in the clips.

Illustrating the clip with b-roll footage

After adjustments are made to the rough assembly clips, the process of illustrating the ideas expressed in the clips begins. We do this by using footage from the classroom or other settings. The goals in adding these visuals are to 1) actually demonstrate what is being described in the narration: see not only what the instructor is doing, but how they are doing it; 2) provide a visual context so the viewer can better imagine what is being described; and/or 3) see how the students participate in and respond to what the instructor is doing. We do this with a mixture of visuals over the voice of the instructor's interview, and segments where we fully enter the classroom and experience what is happening there. This rich detail of seeing and hearing the way an instructor does something, how students respond, and how they interact together is what video can provide that still images or text cannot do as completely.

Review and revision of clips

As the clips are illustrated, we pass them on to team members for another round of feedback. We do this by posting clips to a threaded discussion page on the internet. Team members can view the clips and post feedback in the discussion area, or send feedback by email. Conference calls have also been used to get feedback on clips.

Viewing the clips in context—draft assembly of the Case

Something that was a surprise to us was how much of a difference viewing the clips in the context of the case story structure made for team members. How the clips came together to tell a story, and how each clip contributed to, or detracted from the story seemed to become much clearer for team members when viewing the clips in the context of the case story structure. For this reason, as soon as we have completed drafts of several clips for a case, we will use the Pachyderm authoring system to put together a prototype of the case and put whatever pictures, video, and text we have into it. Pictures can be easily grabbed from the draft videos, and text can be roughed in with a few sentences or drawn from draft documents. After this prototype is "published" from within Pachyderm the url is passed to team members for review and comment.

5. Applying and Sustaining Digital Case Stories in Faculty Development

This paper has focused on one of the key goals for the ELIXR program in 2007: to develop and demonstrate processes for digital stories of exemplary teaching which will be valuable for faculty development in both institutional contexts (such as workshops and faculty learning communities) and for personal access within an online Teaching Commons (Taylor Huber and Hutching, 2005).

In future developments, we are targeting the following additional goals:

- 2008–disseminate this expertise to partners, through tools and resources which enable a sustainable development and application process for ELIXR digital case stories; and
- 2009–create organizational structures and processes to enable an ongoing community which will develop, use & renew the ELIXR resources.

We will continue to update the NMC community on these ongoing developments.

More information, including opportunities for additional institutions to participate in ELIXR, is available on the ELIXR program website (elixr.merlot.org).

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About the Authors

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Teaching Field Research in a Virtual World

Ed Lamoureux, Ph. D. | *Multimedia Program and Department of Communication, Bradley University*

As a result of the NMC's *Virtual Worlds* initiative, "rolled out" at the 2006 summer conference in Cleveland, the author became interested in utilizing *Second Life* as a platform for distance education. In particular, *Second Life* seemed to be a promising environment in which to teach qualitative field research methods (ethnography) to undergraduate students. Despite various obstacles, an experimental Bradley University Multimedia course was completed in *SL* during the 3-week interim session in January, 2007. That experience led to the offering of a "regular" two-course sequence. This report will describe activities between summer, 2006 and fall, 2007.

You Can Teach an Old Dog New Tricks Some of the Time, But that Doesn't Mean He's Going to Catch on Real Quick

The author's graduate school training included a research specialty in qualitative methods, particularly field research and conversation analysis. As a graduate teaching assistant and as a faculty member in Departments of Speech, Speech Communication, and Communication, the author taught argumentation, communication research methods, interpersonal and small group communication, public speaking, and rhetorical theory and criticism. At a point about half-way through his Bradley career, the author switched most of his teaching load to the new Multimedia Program that he helped develop, eventually becoming the "theory guy" (as well as teaching introduction to multimedia production). In general, the author had opposed curricular participation in game development due to its regular association with violence and quest-based fantasy. As the program evolved, however (and as the faculty changed over time), a general interest in game development (on the part of both students and faculty) came to the fore. Faculty agreed to keep programmatic interest in game development focused on learning and simulations rather than commercial and entertainment game design--an informal agreement that helped the author be more positively oriented toward game development curricula.

In particular, the author's role in the pedagogy of new media theory suggested the need for him to "come up to speed" both with regard to virtual worlds and digital gaming. Both prospective and current Bradley Multimedia students often expressed an interest in game design and production; college youth culture is, of course, deeply embedded in gaming. It was simply not realistic (or healthy) for faculty in Multimedia to categorically oppose virtual worlds and gaming and hope to maintain credibility with students. The NMC virtual worlds initiative in *SL* provided a ready opportunity to break out of old paradigms and to examine new perspectives toward teaching and learning.

Additionally, a variety of curricular and departmental entanglements had prevented the author from teaching qualitative, field research methodologies at Bradley. The SL initiative promised the potential of re-connecting the author to key competencies and interests.

Further, there are multiple justifications for teaching field research methods to undergraduate Multimedia students. First, the cultural implications of new media are important foci in the author's "MM 250: Introduction to New Media Theory" course, a class required of all Multimedia majors at Bradley. One gains insight into cultural features of media use via active yet analytically critical participation in communities of practice oriented toward new media use. Field

research methods empower and sensitize student researchers to features of cultural participation. Second, qualitative (observational and ethnographic) methods are often important research strategies used by media-related companies to test products and evaluate audience use and reception. Multimedia students may later face professional challenges to collect qualitative data about clients and consumers in their professions. Third, a small but important group of Bradley Multimedia Program students go on to graduate school where previous experience with diverse research methods will serve them well. Finally, in line with the NMC initiative to increase understanding about teaching and learning in virtual worlds, the author, Bradley University, and NMC share an interest in examining *SL* as a distance education platform. Concurrent with that conceptual interest in *SL* as a distance education platform were the pragmatics of both interim enrollments and the nature of faculty employment at Bradley. Although 3-week interims are offered during January and May, few students take advantage of them. Since financial aid does not apply and tuition costs are out of pocket, many students can't afford interims. Further, Bradley's fall term ends the second week in December and the spring terms begins the last week in January. Many students return home and take jobs during that extended period. The winter weather in Peoria in January is usually severe; there are, then, a number of reasons that a distance education offerings (as opposed to on-campus offerings) appeal to some students. Faculty teaching during interim periods receive extra compensation. Further, the Continuing Education program at Bradley offered additional course development funding for the test; both financial incentives increased the appeal of the offering to faculty.

See You in the Boardroom, High above NMC Campus I

The first class, titled MM 490: Field Research in Second Life, was offered during the 3-week January 2007 interim period at Bradley. Syllabus and related materials for the course can be accessed at: http://slane.bradley.edu/com/faculty/lamoureux/website2/490/mm490.html

The class met 100% in SL, three hours per night, Monday through Friday, from 6-9pm US Central. 5 students enrolled in the course with 4 taking part in both the required activities/studies and completing a research project; the 5th student completed the required activities/studies and served as videographer/documentarian for the course. Students were recruited and enrolled under terms of strict requirements for having their own technological support (computers, quiet workplaces, and dedicated bandwidth) and with the expectation of their having completed entry into and acclimation with *SL* prior to the start of class.

#1 Problematic: Protection of Human Subjects

Bradley requires approval of a Human Subjects Protection Committee for all research and teaching that uses human subjects. Unfortunately, the committee has little experience with online research and even less with virtual worlds. Rather than merely submit a proposal to the committee, they were given a full demonstration of *SL* to help them understand what students would be doing in their research projects. However the nature of qualitative research, especially for beginners, is that one is not able to say much, front end in a proposal or application, about specifically what one is going to study. We were able to tell the committee that students would be doing qualitative observation of and interviews with residents as ways to understand the functioning of "communities of practice" within *SL*.

Although this sort of observational work would normally merit an exemption from full committee oversight and approval, the committee was particularly concerned about the fact that SL avatars carry their identification with them (in the overhead box).

This factor keeps observed subjects from being random and anonymous. In response, the committee asked that each student complete and submit full applications to the committee as to their intentions. Although the committee promised a fast turn-around of the proposals, their requirement jeopardized the course and its success. Were we to follow their admonitions, beginning students would have had to produce the rough equivalent of a research prospectus at the very beginning of a three week course, then risk having the project turned down well after they'd paid full tuition (and

were past the refund point). In a three-week session, rejection of a proposal would have meant disaster for students and the course.

The issue was resolved via additional negotiation between faculty and committee, resulting in a single application, filed by the faculty member, making the faculty member the principle investigator on all the projects (with the students as co-investigators) and issuing standard (and extensive) human subject protection protocols for all the work.

Students were taught about the protection of human subjects. Each student prepared (and submitted for faculty approval) a carefully drawn HSP protocol to be given to every SL resident from whom the student might collect data. The notecard described the class, the research, and sought informed consent as well as issuing contact information. When students actually began to collect data they were placed into a special SL group that resulted in their name box showing them to be a "Researcher." Students also gained the informed consent of all landowners on which their research took place. Details of the protocol are available at:

http://slane.bradley.edu/com/faculty/lamoureux/website2/490/ethicsfaq.html

At time of the conception of the course, Linden Lab also had an application process for researchers. However, just prior to the start of the class, Linden Lab removed that procedure from its activities, relying instead on their proprietary terms of service (TOS) and the supervision of campus subject protection committees to police research.

These Are Some of the Things that a Qualitative Field Researcher Learns to Do

The 3-hour class consisted of nightly lecture and discussion (50 minutes), oral quizzes over the material drawn from the lecture/discussion and the textbooks (10 minutes), student presentations about their research progress (40 minutes), and an hour's worth of supervised and unsupervised in-world research. Students posted the results of their exercises, and eventually, their final research reports, to blogs both for the purpose of historical record and as part of the process of "giving back" insight to the subject community of practice. The blogs can be found at:

http://slane.bradley.edu/com/faculty/lamoureux/website2/490/bloglinks.html

Students were exposed to material about the following activities:

- Entering
  - Casing, approaching, relationships, presenting the self & the study, reciprocal negotiations.
  - HSP/ethical practices/protocols.
- Getting organized
  - Mapping/tours (places, people/functions, action zones)
  - Establishing a sampling strategy (location, time, aspect/event, and amount)
- Data Collection
  - Watching/listening as passive presence or with limited interaction
  - Interviewing an informant
  - Data recording, data coding and data security (subject protection and physical security)
- Data Analysis
  - Developing theoretical leads from the data
  - Taxonomies and categorization
  - Constant comparisons
  - Drawing inferences from data.
  - Writing up results

In this first run of the class there was not much time for data analysis. Further, students received less training for and did less interviewing than one would do with proper time and more experience. The completed projects, then, were significantly less than full research prospectuses, let alone completed research projects. However, students did learn and actuate many of the key activities of ethnographers. Student papers and course evaluations both indicated a successful initial activity.

The student videographer, Jason Terhorst, completed a five-minute movie describing the course and its activities:

Next Steps

Initial offerings of experimental courses can serve as the catalyst for change and development. It was clear that MM 490 was "too full" to give adequate attention to either basic ethnographic method or to interesting and unique features of SL. During the spring term, 2007, two courses were proposed as replacements for 490. "MM 333: Introduction to Field Research in Virtual Worlds" and "MM 444: Field Research in Virtual Worlds" were proposed and approved through the curricula review process at Bradley. The classes are now on the books as electives in the Multimedia Program, though the classes are available to all Bradley students. MM 333 is being taught to three students, Fall, 2007 and will be repeated for up to 10 others during the winter interim in January, 2008. MMM 444 will be offered (to students with 333 or 490) during the spring, 2008.

"MM 333: Introduction to Field Research in Virtual Worlds" introduces students to *SL* in a much more thorough way than did 490 (which just required and expected familiarity and expertise). The course will lay the basis for ethnographic research methods through reading, lecture, assignments, and examples focusing especially on observation and interview techniques. Students will complete a research prospectus as the outcome of the course. "MM 444: Field Research in Virtual Worlds" will offer students a semester-long field research opportunity, giving the time to complete a project that should be equivalent to a "senior thesis." Additionally, MM 444 students will receive advanced field research methods instruction.

What's It All about, Alfie? Why Bother with Instruction in Virtual Worlds?

From the perspective of a teacher of New Media Theory, it is certainly the case that the most interesting questions about teaching and learning in virtual worlds has not much at all to do with Linden Lab's *Second Life*. Although *SL* is clearly the best virtual world on the market at the present time for teaching and learning, both the company and/or their infrastructure, software and/or platform could be sold or closed tomorrow. This really isn't about *SL*. In some ways, the principal issue is about the very nature of the Internet/web in the future. Forward thinkers suspect that before too long, the web that we now know, even though all tricked up in its so-called "interactive" 2.0 version, will pale in comparison to the immersively interactive virtual web that may well follow (perhaps sooner than anyone can imagine). Everyone involved in teaching and learning is at risk in this equation, as giving virtual worlds a "pass" now may well put one substantively behind the curve when the virtual web becomes the everyday web.

Further, even now, much theorizing about teaching and learning lauds the merits of immersive learning. For example, Arthur Chickering and Zelda Gamson (1987) note 7 principles of quality education, many of which are strongly supported by immersive learning in virtual environments [I am indebted to Sarah "Intellagirl" Robbins for bringing this article to my attention and that of other SL educators].

7 Principles of Quality Education (Chickering and Gamson, 1987)

- Encourages contact between faculty and students
- Develops reciprocity and cooperation among students
- Encourages active learning
- Gives prompt feedback
- Emphasizes time on task
- Communicates high expectations
- Respects diverse talents and ways of learning

Chris Swain, one of the curators at the UK Info Island in *SL* provides substantial argumentation in support of the benefits of immersive learning. Swain notes the following as positive features:

- **Learning Environment:** As an alternative learning environment, it:
  - Provides an alternative and potentially neutral space away from the 'traditional' classroom, which can be socially inclusive for those learners which the formal establishment has woefully failed
  - Enables real time interactions and global alliances which are not constrained by traditional 'location' based environments
  - In 20 years time, we will laugh at what we now call a CMS [Blackboard, WebCT, Moodle etc.] as being very quaint and 2D!
- **Support Networks:**
  - Formal and informal, multiple support networks - from peer to peer through to trusted intermediaries - through to synchronous and asynchronous communication channels
  - Collaborative space. One of SL's huge benefits is the collaboration - both for learners and educational practitioners
- **Learning & Teaching Dynamic:**
  - Enables all learners to experience a greater variety of teaching and learning styles--great for kinesthetic and audiovisual styles!
  - Different opportunity for greater range of interactions with the teacher
  - The traditional role of the teacher and the learner can become blurred, which potentially puts the learner more in control of their own learning
  - Allows different learning styles to be deployed and adopted - especially for kinesthetic and audiovisual learning styles.
- **Assessment**
  - Alternative environment to support formative and summative assessment - from RARPA [recognize and record progress and achievement in non accredited learning -http://www.aclearn.net/display.cfm?page=1290] through to virtual portfolios
  - Fabulous opportunity to showcase work in an interactive 3D environment rather than a 2D website, or though paper portfolios
  - Help learners to become more actively involved in designing and carrying out their own assessments.
- **Personalized Content**
  - Enables a 3D environment for curriculum areas from marketing and PR to fashion and design, languages to retail.
  - Allows another technology solution to be deployed [working on the premise that the technology should support the learning and teaching and not the other way around!] It is also 'just another tool' that a teacher [or learner] can deploy as part of any learning episode.
- **Flexible Curriculum**
  - Enables the curriculum to be more bite sized and delivered anytime - anyplace - rather than the institutional and non flexible 9-5 Monday to Friday
  - Can link home/school – home / college
  - Helps to provide flexible learning pathways
  - Enables learners to co-design, manage and access the curriculum in non-traditional ways.

Closing Thoughts, Especially for Those Considering Entry

As indicated by the numerous interviews and articles linked from http://slane.bradley.edu/com/faculty/lamoureux/website2/slstuff.html, teaching in SL can encourage positive attention to schools and programs. Over 250 schools and more than 3,400 teachers are "in" SL to one degree or another, at this writing. However, just as there are many good reasons to encourage teaching and learning in virtual worlds, there are a large number of arguments against "drinking the SL kool-aide." Perhaps the most needed innovations, at this point, are flexibly insightful assessment tools that can investigate and document successful teaching and learning in this interesting and promising environment.

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About the Author

Associate Professor **Edward Lee Lamoureux** (BA, Speech, CSULB, 1975; MA, Speech Communication, Washington St. Univ., 1980; Ph. D., Rhetoric and Communication, 1985) has been at Bradley University in Peoria, IL, since 1985, where he co-directs the New Media Center housed within the Multimedia Program. Ed teaches Introduction to New Media Theory, Introduction to Multimedia, Issues in New Media Theory (IP Law in MM) and Field Research in Virtual Worlds (in the Multimedia Program) and Theory and Literature of Rhetoric and Issues and Perspectives in Communication (in the Department of Communication). His research is concerned with rhetoric, intellectual property law, religious communication, and conversation; his creative production includes webmastering and communication training via digital embellishments. Lamoureux served as the editor of the *Journal of Communication and Religion* (sponsored by the Religious Communication Association) from 1998-2003, and as Director of the Multimedia Program from January 2003-January 2006. He is married to Cheryl and they have 4 children (Alexander, Samanatha, Kate, Nicole). Lamoureux plays golf and guitar, walks and runs, lifts weights, and paints with watercolors. He is an avid Los Angeles Angels of Anaheim fan. Ed is Professor Beliveau in Second Life where he teaches field research and performs (guitar and voice) as "The Professor" regularly.

A View from Second Life's Trenches: Are You a Pioneer or a Settler?

Cynthia Calongne | Colorado Technical University

The educational use of Second Life's online virtual world flourished in 2006-2007. By March of 2007, more than 250 universities, 2500 educators and the New Media Consortium, with over 225 member universities, museums and research centers, had a presence in Second Life. This quiz on education in a virtual world examines the roles of pioneers and settlers during a brief tour of virtual world education. Examples of youth education programs, such as Global Kids and Suffern Middle School on the Ramapo islands, as well as Colorado Technical University's class projects offer glimpses into education in Second Life and depict how pioneers and settlers promote learning in a virtual world.

Teaching in Second Life

Educators who teach in Second Life (SL) often are asked, "May I visit your next SL class and watch you teach?"

It is a reasonable question, yet it suggests that we teach in a manner that is observable. Many think that SL classes are similar to campus delivery, where students attend class at the same time and gather to discuss the material while completing class activities. Some educators do employ a more traditional approach, such as Ed Lamoureux's research class last Spring (Lamoureux, 2007; NMC Campus, 2007a) while others, such as Hilary Mason at Virtual Morocco, use a less formal teaching style in SL (NMC Campus, 2007b; NMC Campus, 2007c).

The choices made during course design and delivery in SL depends on the students, the professor, the learning environment and the course goals.

My CTU students in Second Life are like cats. They wander in and out of the virtual world, work independently, review the course content and ask questions as they work on their course activities, assignments and projects. More time is spent on discovery and applying the course concepts than on listening to the professor speak. Most classes have team projects, and students learn to partition the work into subsystems, model its behavior, and learn how to integrate, test and revise their work. As a mentor and facilitator, I ask questions rather than answer them and let students struggle before suggesting alternative approaches and offering insights.

After attending numerous educational meetings in SL, my tolerance for mapping real world activities directly into the virtual world fell into sad decline. Sitting in a closed classroom space while being silent, waiting to raise my hand to speak is in direct contrast to how I teach and interact in a virtual world. Many favor these practices, and perhaps there are more examples of traditional methods than is apparent at first glance.

My penchant for employing less traditional learning spaces does not mean that I advocate classroom chaos, but that I like to leverage virtual world capabilities beyond what we can do at our brick-and-mortar campus and in our online course management systems.

Pioneers and Settlers

Julie Bick's (Bick, 1999) discussion of how successful enterprises need both pioneers and settlers came to mind. This analogy characterizes the approaches to education in SL.

Pioneers are comfortable exploring new territory, willing to try new techniques and are willing to assume and manage risk to achieve their discoveries. Their educational spaces may look or behave dramatically different from the campus classroom.

Settlers are stabilizing influences in education, moving into a new area to colonize and apply established practices to achieve success. Their methods share elements in common with other educational environments.

Ah, but before we examine the roles of pioneers and settlers in SL, what is Second Life?

Brief Introduction to Second Life

Second Life (Linden Research, 2007) is an online virtual world that is populated with content created and owned by its residents. Users from around the world create an avatar to represent themselves while they shop, take classes, hear live music, create content and participate in social and cultural activities.

Due to the diverse population and wealth of user-created content, educators have access to free resources and tools as well as a strong community where they can exchange ideas.

In April of 2007, Gartner, Inc announced that 80% of the active Internet users will have accounts in a virtual world by the end of 2011 (Gartner, 2007). This number included Fortune 500 enterprises and seems quite prophetic as more companies establish a presence in Second Life and in other virtual worlds.

Settlers and Pioneers in Second Life

To avoid favoring pioneers over settlers, it is important to note that both pioneers and settlers are needed to maintain success in education. Both of them employ constructivist theory (Hein, 1991) to foster student-driven learning experiences.

Pioneers seek to offer learners new and unusual spaces and virtual world activities to enhance the learning experience. Settlers model real world learning spaces to help students create knowledge, both individually and socially, as an outcome of these during these virtual experiences.

Settlers map real world practices and apply them in SL and pioneers experiment with less traditional learning spaces, often favoring open space environments or context-sensitive scenes.

To further define them, settlers may have educational sites with traditional meeting rooms, desks and tables. Some of these sites include chairs with a hand raising animation so that avatars can raise their hands when they speak. In these environments, everyone faces forward to see the speaker who stands on a dais or at a podium. The classroom has the familiar look and feel of a real world classroom.

In contrast, the free-form learning spaces may be set outside or in enlarged amphitheaters to allow students to surround the speaker and stand, sit, dance, interact with objects, build and perform a variety of other tasks. They are open to support the construction of larger objects and to ease the student's need for precise navigation and camera controls.

These unstructured learning spaces may alternatively include a temporary scene that appears for use during class, then disappears when the class is concluded, similar to the holosuite technology popularized in the television series Star Trek: The Next Generation by Paramount (Star Trek TNG, 1987).

Students in a traditional learning environment sit around a virtual classroom and discuss a course topic, such as the Renaissance, by leveraging social networks and employing Socratic discussion. The pioneer designs scenes from history that immerse the learner in roleplaying settings, giving them simulated experiences. During class, students visit these scenes and re-enact significant events to understand the relationships and context of historical events during that time period.

The Quiz: Are You a Pioneer or Settler?

In the following examples, assess whether the example favors settler or pioneer behavior and reflect on your personal preference. Each section includes a short description, quiz question and a few examples from the NMC slide show presentation (Calongne, 2007).

NMC Promotes Education in Second Life

After the NMC Campus island opened, the NMC Teachers Buzz group, created by Nick Noakes (a.k.a. Corwin Carillon), started meeting in August 2006 to discuss how educators design and deliver courses in SL (NMC Campus Observer, 2006a). The meetings supported Euro-friendly and US meeting times, allowing a broad cultural base of scholars and instructional designers to gather and exchange ideas.

1. The NMC Teachers Buzz meeting in Second Life

Settler _____

Pioneer _____

In October of 2006, the NMC held an Impact of Digital Media symposium in SL that featured a session on "Are We Playing Games? Finding Legitimacy in the Academy" (NMC Campus Observer, 2006b). SL educators Tab Scott, Josephine Junot, Ali Andrews, Amaagariwah Kawabata, Intellagirl Tully, and Jeremy Kabumpo shared their virtual world class experiences and offered insights to teaching in a virtual world.

Figure 1. NMC Teachers Buzz holds its first meeting.

2. Meeting in a conference hall with stage and seats.

Settler _____

Pioneer _____

Later during the symposium, the MacArthur Foundation answered questions from the virtual audience at the NMC campus. An example is depicted of this blended reality session in Figure 3.

Attendees were able to ask questions about the future of games in education and get answers from the panel, including Katie Salen and Eric Zimmerman, the authors of the game design textbook Rules of Play (Salen and Zimmerman, 2003). Figure 3 shows Lyr Lobo asking a question in the backdrop while the panel answers it in the foreground.

Figure 2. Finding Legitimacy in the Academy (NMC Campus, 2006b)

3. Blended reality meetings permit real and virtual participants to share ideas.

Settler _____

Pioneer _____

Global Kids and the Human Barometer

Global Kids is a NY-based educational project in SL on the Teen Grid run by Barry Joseph, a.k.a. GlobalKids Bixby. At the NMC, Global Kids leaders Barry Joseph (GlobalKids Bixby) and Ravi Santo (Divine Spongiform) led several activities, including the *human barometer experiment* that asked participants to choose a position on an issue and show their commitment by standing on it (NMC Campus, 2006c).

Figure 3. Blended reality session with Lyr Lobo and the MacArthur Foundation.

4. Presenting at an open air amphitheater international teen research and activities on child sex trafficking

Settler _____

Pioneer _____

Figure 4. Global Kids are teens who chose to tackle child sex trafficking

As attendees participated in the *human barometer experiment* during the same NMC Symposium in October 2006, the activity made everyone think about their viewpoints before taking a public stance on an issue.

Depicted in Figure 5 are several notable personalities and educators, including Ramapo visionary Peggy Sheehy, a.k.a. Maggie Marat (top right), Best Practices in Education in SL organizer Fleep Tuque (center), mathematics scholar Seifert Surface (lower left) and several Linden Lab team members, including Claudia, Pathfinder and Cyan Linden.

5. The human barometer experiment is an example of _____ behavior.

Settler _____

Pioneer _____

Figure 5. Taking a stand on an issue during the Global Kids session at the NMC.

Ramapo – Life on the Teen Grid

Peggy Sheehy, also known as Maggie Marat in SL, is the founder of Ramapo's 8th Grade Islands in Second Life. Sheehy, with help from hundreds of volunteers, erected the schoolhouse for 400 8th grade students from Suffern Middle School in NY (Suffern, 2007). The islands were developed on the Main Grid, then moved to the Teen Grid in October 2006. Fred Fuchs from Firesabre Consulting is the mastermind for the Ramapo islands design, and my avatar, Ryl Redgrave, joined the team as a mentor.

Eighth Graders in the Courtroom

In February of 2007, eight courtrooms of Ramapo 8th grade students (Suffern, 2007) reenacted the courtroom scene from Of Mice and Men by John Steinbeck (Steinbeck, 1937). This novel was 6th on the American Library Association's list of 100 Most Frequently challenged Books of 1990-2000. (ALA, 2006).

6. Ramapo teens participate in a trial set in a virtual courtroom in Second Life.

Settler _____

Pioneer _____

Figure 6. Courtroom scene reenacted by 8th grade Ramapo students.

At their onset, the students had lenient opinions about the outcome of the trials, but these opinions changed once the facts were deliberated in court. Afterwards, some students expressed an interest in civil rights and careers in the judicial system (Suffern, 2006).

When the trials concluded, the courtrooms were converted into conference centers and the teens created visual displays with context-sensitive bibliographies of famous people. At least one student featured herself amid the famous personalities.

7. Ramapo teens host conference with biographies of famous personalities and some include themselves in the exhibits.

Settler _____

Pioneer _____

Figure 7. Teen conference center on Ramapo featuring famous personas.

A Tesseract-Shaped Home

Crooked House (Au, 2006) depicts an example of Seifert Surface's work in Second Life as well as a representation of a home that is shaped like a Tesseract, a fourth dimensional hypercube that was featured in the Robert A. Heinlein short story "And he Built a Crooked House" (Heinlein, 1940).

8. Mathematics and the fourth dimension come to life at the Crooked House.

Settler _____

Pioneer _____

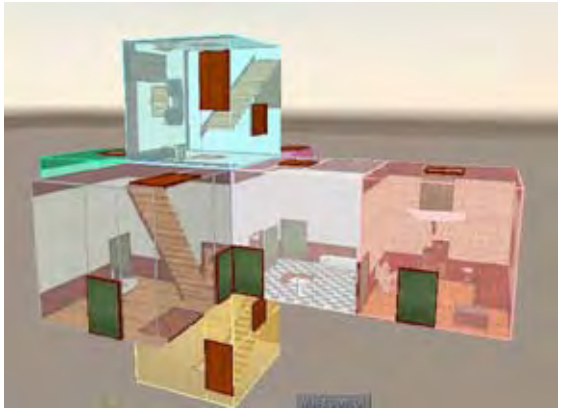

Figure 8. Crooked House gives visitors an opportunity to tour a four-dimensional home.

Conceptual Models in CTU's Virtual Classroom

Concepts are sometimes easier to visualize in SL with a simple demonstration. A windmill stands before a student, the blade slowly turning. As she unlinks, modifies, and links it in a different order, she notices that the entire windmill spins instead of the blade. The abstract concept of object-oriented behavior and inheritance becomes clearer.

In Second Life, CTU students learn virtual world building, texturing and scripting skills, learn navigation and camera controls, complete class projects, collaborate with peers, examine the course concepts in practice and attend virtual office hours. A variety of classes have completed projects in Second Life and some of them were featured during the NMC Summer Conference (Calongne, 2007).

9. Virtual office hours are held underwater as fish swim around us.

Settler _____

Pioneer _____

Figure 9. Virtual office hours in an underwater tea room.

When Philip Rosedale envisioned the SL architecture to support an environment for haptic interface research (Timeline, 2006). Today, Colorado Technical University (CTU) students use Second Life in systems engineering, software engineering game design, robotics and user interface design classes.

Two CTU classes, CS 672, Systems Engineering Methods, and CS 641, Software Requirements Engineering, completed amusement park and state machine projects in SL. Students demonstrated competency, applying the course concepts in their designs. All of them were new to SL building and scripting and these classes lasted 5.5 weeks.

10. Designing and developing amusement park class projects helps students understand state machines as well as software and systems engineering requirements.

Settler _____

Pioneer _____

Figure 10. Merry-go-round class project.

Figure 11. Amusement Park projects.

11. Designing prototypes, such as sensors, evolutionary trees and a duck shoot, helps students understand systems engineering methods and software requirements.

Settler _____

Pioneer _____

Figure 12. Class projects.

Figure 13. Duck shoot class project.

12. Designing a monorail, then roleplaying customer-engineer negotiations as the monorail evolves is a great way to define and study software requirements.

Settler _____

Pioneer _____

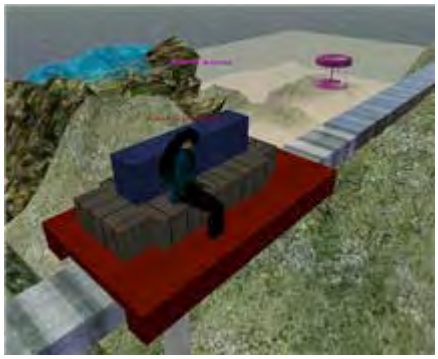

Figure 14. Designing a monorail.

Figure 15. Monorail becomes a rollercoaster.

A team of 12 students in CS 382, Software Design formed into one team to design and develop a maze and player vs. player capture-the-flag game. The team broke the project into subsystems, modeled the design using UML and other schematics in class, then prototyped their designs in SL outside of class.

13. The CS 382 Software Design class collaborates to complete a game design project.

Settler _____

Pioneer _____

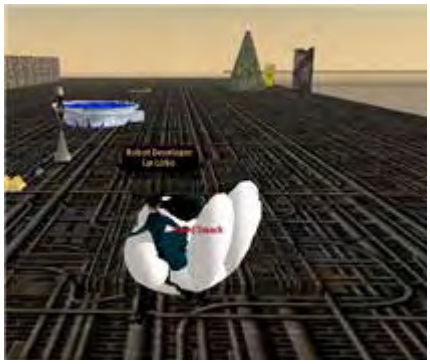

Figure 16. Designing a hand trap.

The CS 382 students integrated their flags, weapons, traps, treasure and maze designs with the game's teleporters within the game maze and play tested the game the last night of class. The flags had announcers that were sending game messages too frequently to the chat log, an event that was hard to detect on paper, but quite evident during prototyping and testing. Students were able to identify game improvements and trace them to the UML designs and other schematic diagrams.

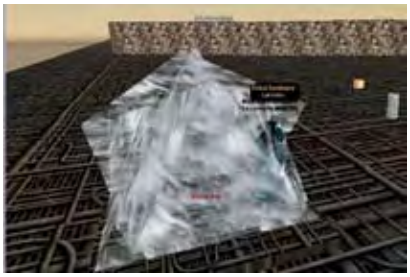

Figure 17. A freeze trap delays players.

14. Prototyping and testing a game design helps students to visualize software behavior.

Settler _____

Pioneer _____

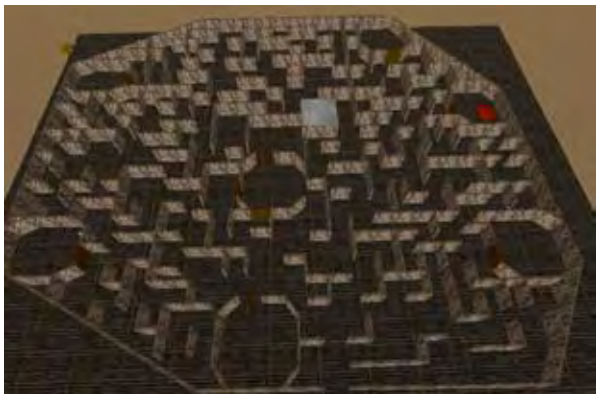

Figure 18. Game maze developed in CS 382 Software Design.

Critics of education in a virtual world say that it is easier to teach computer science than English in SL. A variety of examples are available, but this quiz concludes with an English Composition class that was featured during the NMC Summer Conference.

English Composition at University of Central Missouri

Bryan Carter (a.k.a. Bryan Mnemonic in SL), teaches English Composition in SL for University of Central Missouri students. His students tour the SL community to investigate and gather information for their compositions. Each student chooses three themes from over a dozen choices that include crime and punishment, social interaction, rituals, economics and subcultures (NMC Campus, 2007d).

In 2006, Carter used a variety of tools, including SL with Skype for voice, the Blackboard course management system and blogs. His students meet in Second Life at Northern Illinois University's Glidden campus.

Figure 19. English Composition class uses images with topics. Photo courtesy of Jeff Hiles.

15. Assignments for English Composition in SL stimulate the imagination and give students easy access to content during their investigations.

Settler _____

Pioneer _____

Quiz Summary

How many of these examples reflected pioneer and settler behavior? While they were very subjective, the two most likely candidates that represent settler behavior were Questions 2 and 15. Finding Legitimacy in the Academy showed educators sitting on a stage, addressing a seated audience, to English composition with its chairs and topics. Yet, they were describing the benefits of their pioneering efforts to a varied audience.

The English Composition photo shows the instructor and student standing amid some chairs in a casual grouping. The topic displays suggest a range of topics and interactivity that may extend beyond the traditional class subject areas and investigations.

The real question is which style best supports your students, the learning objectives and what will help your students gain the desired competencies. Many students find the traditional class setting to be comfortable and reassuring while others flourish in a freeform, creative setting.

By the end of this review, I concluded that a mix of styles and settings are needed to adapt to the needs of learners, instructional designers and educators. While I remain a pioneer at heart, here is a salute to the settlers who make our successes most notable and worthwhile.

Conclusion: Second Life Statistics

In closing, many ask why we would even consider being a pioneer or a settler in Second Life. SL is popular, feature rich, texture and object rich, and includes free software and free user accounts. The wealth of resources and the easy access to the product makes it very attractive for education. It continues to grow in popularity, as noted by the following statistics that further characterize it.

The economic statistics in March-June 2007 noted that over 120,000 people log into Second Life each day (Second Life - Economic, 2007). They spent about four hours in a single session online and approximately 15 hours a week. . When the New Media Consortium (NMC) held its grand opening in SL in April of 2006, SL reported over 230,000 accounts. The number of SL accounts grew to over 9 million by September 2007.

During a conversation that we had in March of 2007, Dr. John Lester, a.k.a. Pathfinder Linden, the education liaison from Linden Labs said that over 250 universities had a presence in SL and over 2500 educators were subscribed to the Second Life Educators (SLED) listserv (Second Life: Education, 2007). This is in contrast to over 100 universities that were reported with an SL presence during Lester's keynote and discussions during the NMC Fall conference in November 2006 (Lester, 2006).

To visualize the size of SL in March of 2007, it was two times the size of San Francisco with over 6500 servers and 40,000 simultaneous logins. The number of new islands and resident accounts continue to grow each month, making the results of these statistics subject to rapid change.

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Photos by C. Calongne; the photo in Figure 19 is by Jeff Hiles

About the Author

Cynthia Calongne, a.k.a. *Lyr Lobo and Ryl Redgrave in Second Life,* joined Colorado Technical University's Computer Science Department in 1996. She teaches software engineering, robotics, game design, usability and systems engineering courses using Second Life. For thirteen years, she worked as a software engineer in support of Air Force Space Command and on Capitol Hill in Washington, D.C. Her doctoral research specialized in the design of a PC-based easy-to-use, immersive virtual reality system.

Today, her research includes games and game-based rubrics in virtual worlds. She mentors over 400 8th grade students at Ramapo on Second Life's Teen Grid and supports a variety of research projects. In 2005, she completed an artificial intelligence project for San Juan College and the National Science Foundation.

The Yale Galapagos Project

David Hirsch, Chris Amelung, and Paul Lawrence | The Yale Center for Media and Instructional Innovation

Inquiry-based learning relies on three critical skills: observing, asking questions, and refining questions within a larger community of researchers. It also requires that students value their own curiosity and learn to take risks. In summer 2005, we accompanied a Yale biology professor to the Galapagos to document, in high-definition video and photographs, the Islands' unique wildlife and habitats. These media form the core of a web-based learning activity that hones undergraduates' ability to observe critically, to ask questions, and to then develop those questions into research proposals through peer collaboration

There's a fundamental disconnect between the way scientists work and the way many of them teach. The fun of doing science is the thrill of the chase: researchers feel a rousing sense of freedom in noticing something peculiar and pursuing its mystery, unafraid to go out on a limb to figure out what these strange observations may mean. Yet this sense of adventure is frequently missing in the scientific classroom, where even lab sessions can feel pre-cooked and canned. Children between the ages of two and five go through a stage where they frequently, even obsessively, ask "why?" But by the age of eighteen, many of our college students have stopped asking the question altogether.

You know you're in the presence of a stimulating teacher when someone like Stephen Stearns comes to you with a project idea that places more emphasis on the asking of questions than the answers to them. "A good question is one that you are passionate enough about to commit to getting an answer, even if it's hard," he explains. "And, ideally, a good question can actually change the way we look at the world."[1] Stearns is a Yale researcher and biology professor who believes that curiosity and the courage to explore the unknown are as central to science as a textbook full of fundamental principles. Science, in his view, is a process of pursuit as well as a body of knowledge: it is a verb as well as a noun.[2]

Stearns's idea for a project stemmed from a field research activity he organized for graduate students while teaching in Europe. They would travel to a location far enough away that students could not go home at night—Corsica, the Camargue, the Finnish Archipelago—where they would observe plants and animals, take notes on what provoked their interest, then write down 50 questions each in half an hour and discuss them in small groups, focusing on the characteristics that made a question a good one. They would then share their best questions with their teachers and, on the basis of these questions, together design a research project for the next day's work. Stearns learned this approach in an Organization for Tropical Studies course in Costa Rica in 1972, although in that context the experience ended with the generation of questions (students' projects were developed before the fact by the instructors). Stearns revised this activity in his own teaching by ensuring that students' projects were derived from their own questions. This entailed a pedagogical risk that some of the students' projects might ultimately "fail" (i.e., not produce an expected result), yet his insight was that constructive recovery from unexpected results is an essential part of learning to do science: coping with failure, and actually learning from it, are part of the normal process.

Now teaching at Yale, Stearns recognized that distant travel with a hundred Yale College students during the academic year was out of the question. So he approached our group to help him develop a project that might offer a comparable experience for students in his introductory-level class "Principles of Evolution, Ecology, and Behavior." Professor Stearns defined the core activities of the learning experience as follows:

> **Observing the natural world:** students should hone their observation skills, learning to be attentive to their surroundings and gaining the self-confidence to pursue what genuinely provokes their interest;
>
> **Asking good questions:** on the basis of their observations, students should develop rigorous questions that get to the heart of biological phenomena;
>
> **Refining questions within a community of researchers:** science typically is not done in a vacuum, and peer review can help students strengthen their research questions.
>
> **Valuing their own ideas:** by seeing how seriously faculty regard their questions, students develop the self-confidence and determination needed to take ownership of, and responsibility for, their own ideas.

Taken generically, these activities could be situated in any environment. Yet in the context of Stearns's teaching, it would be important to provide students with field data illustrating key concepts in evolution and ecology that form the basis of the course. Although we could not take students to the field, we could attempt to bring the field to the students.

We decided to develop a digital collection of audio, video and textual data that would stimulate probing questions relevant to the course focus. We would also build a database-driven web tool for composing, editing and sharing students' questions. Initial ideas of creating a web-based simulator of a field expedition were discarded as a bit hokey for our audience of Yale undergraduates: a Second Life version of a wildlife safari would not work. Instead we would present the digital resources as artifacts gathered from a previous voyage—which in fact they would be. Research into compiling relevant photographs and documentary video clips for the digital collection was discouraging: we faced high licensing fees for existing video footage, and found it difficult to locate truly "raw" visual data of sufficient quality to stimulate rigorous inquiry. So we decided to capture field material ourselves.

Ultimately we chose a site that was instrumental to Darwin's development of evolutionary theory—the Galapagos Islands, a natural laboratory for the study of speciation and the effects of microclimate variation on animal morphology. The weather there is good year-round; the islands are mostly dry, with an open habitat that makes it relatively easy to spot wildlife. Land animals in the Galapagos are also incredibly tame, which would allow us to approach very closely to get the strongest video and photographs. The documentary footage we'd collect there would also provide students something of a time capsule about an ecological system under threat by the effects of human incursion. (Since our visit, in fact, the Islands have been added to UNESCO's List of World Heritage in Danger due to the importation of invasive mainland species and the high increase in tourist and human resident populations.) After months of communication with the Galapagos National Park and the operators of a charter sailboat to secure our itinerary, we embarked for the Islands in June 2005.

The Yale Galapagos Project

Our documentary crew was small: one videographer (James Callanan); an audio technician/grip (Ilka Jarvi-Laturi); Professor Stearns and his wife Beverly, who served as our still photographer; and two of us from the CMI2 development team. Our mission was ambitious: in seven and a half days, we would visit eight locations, sometimes requiring overnight travel between islands. The exact itinerary appears on the Galapagos Project site:

At each location, we captured hours of high-definition video and scores of photographs documenting the wildlife and site geography. Professor Stearns taped a very brief introduction to the location that would orient students' observation of the

Itinerary of the Yale Galapagos Project

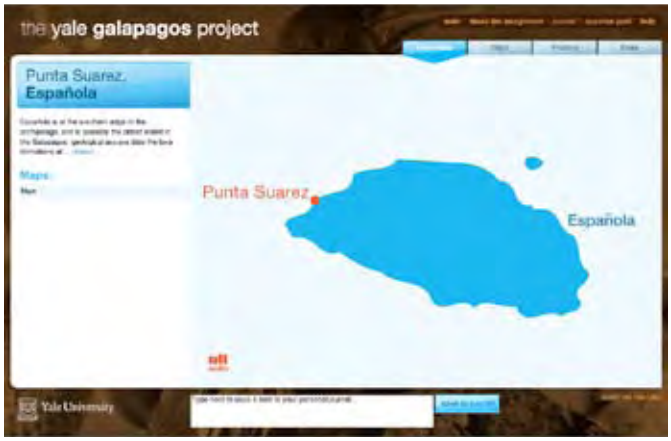
field data. These brief overviews would also help to personalize students' experience of the Project site: students in New Haven would see and hear precisely what their professor had seen and heard during his visit, and the introductions to each location would serve as audio diary entries from the field.

We returned to New Haven with over twenty hours of raw video footage, several hundred photographs, and some lingering sea-sickness after a week of tossing and swaying on the Sea Cloud. During the fall semester 2005, we catalogued our data, selected which footage and images to use, prototyped the first web interface for the project, and worked with a colleague to produce an alpha version of the tool used to collect students' questions. By early spring 2006, the site was ready for its initial beta release to students.

The completed Galapagos Project (available at http://cmi2.yale.edu/galapagos) begins with a video montage to provoke students' curiosity as well as transport them (visually and psychologically) into a new environment. The opening video transitions to a Flash presentation that situates the Islands' location off the Ecuadorian coast, while in voiceover Professor Stearns describes the purpose of the project:

> Welcome to the Yale Galapagos Project. This is Steve Stearns. We went to the Galapagos in the summer of 2005 to acquire images from nature that would present you with raw material on what is actually going on in the field that will stimulate you to ask good questions. We want to use this experience to help you learn to be good observers and to ask your own questions and to talk about what are the characteristics of a good question. And what we would like you to do is look at what we saw, make notes on what interests you and take your own tour of a unique ecological system that will then help you to direct your own study of biology. We want you to have fun with this. We want you to make it your own project, come up with your own questions and to use your own questions to discuss with your colleagues what are the general characteristics of a good question. Most of all, we want you to have fun. Enjoy.

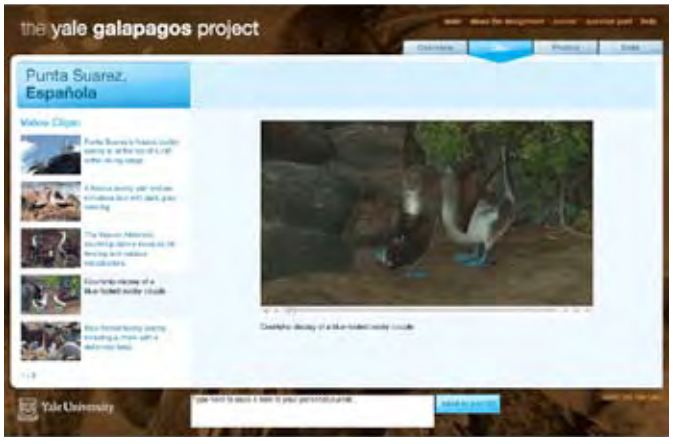
From the main map of the Islands, students may view the general topography and satellite image of the Islands; read the Data section that contains information about the Islands' geography, geology, climate and ocean currents, and wildlife history; and compare select photographs of 20 animal species observed during our visit. The map also serves as the primary navigation to the core materials of the site, which are organized by location. There are eight locations on as many islands; we also included some water locations where we spotted several species of whales (and an underwater "feeding frenzy," a somewhat rare phenomenon we were lucky to have witnessed).



Overview page for Punta Suarez, Española

The interface for each location is in effect a microcosm of the overall Project site, containing an overview page; video clips documenting the location, as well as a set of high-resolution photographs; and a data sheet with general information about that site. On the Overview page, the main map pans and zooms to the selected island while Professor Stearns speaks about what he experienced there. A slideshow of selected photographs accompanies Stearns's audio introduction.

Tabs at the upper right of the location interface allow students to navigate the materials for each location. On the Clips page, video selections focus on animal behavior and geographical conditions of the location:



Clips page for Punta Suarez, Española

The videos are 500 x 294 pixel embedded QuickTime movies, encoded in MPEG-4 format. We chose QuickTime because of its image quality and the flexibility of the QuickTime player controls, which make it easy for students to "scrub" through a clip to review points of interest or create a high-quality still image. This degree of control could be important to a student carefully studying the complex courtship dance of a blue-footed booby, for instance.

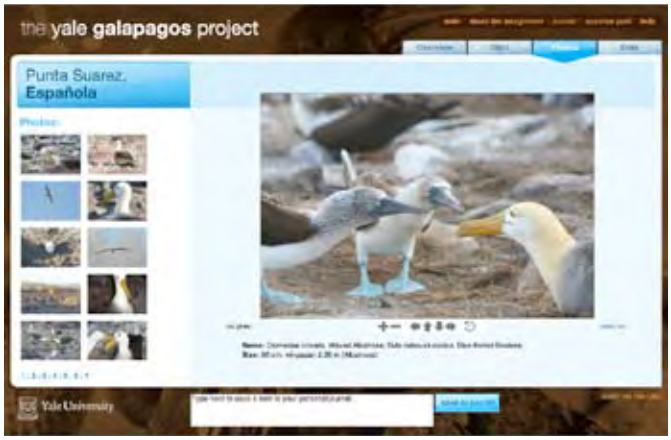
The Photos page provides students with dozens of high-resolution photos for each location:

While video was the most robust medium to capture animal interaction and behavior, still photography proved a stronger data source for highly detailed observation of animal and plant morphology. The photographs were processed with Zoomify, a Flash plug-in that provides excellent tools for zooming in and out of high-resolution images.

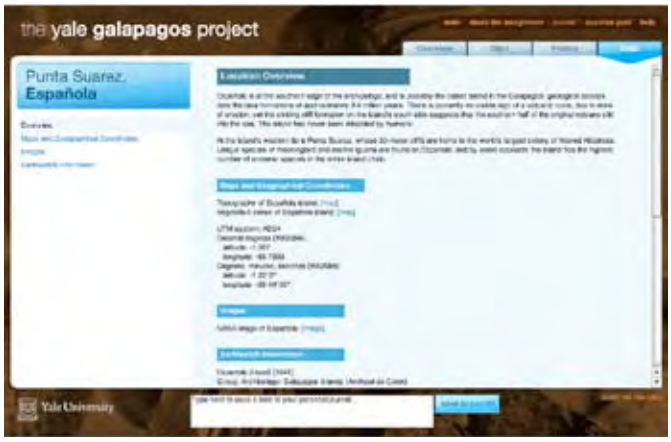
One challenge we faced when creating the Photos pages was determining the best way to manage such a large number of photos and associated metadata. We also wanted to develop a site that could relatively easily accommodate additional photos in the future. Our decision was to organize all of the images and metadata into a MySQL database, and then use AJAX to build the thumbnail menu dynamically on the left side of each Photos page. Now, we can simply add a new photo to the database and it will appear in the appropriate menu.

The final page for each location is the Data page, which provides a location overview, geographical information, NASA images and Earthwatch information:

At the bottom of each Project screen is a text entry box: this is the composition space for a Journal tool we developed to facilitate students' note-taking of observations.



Photos page for Punta Suarez, Española (photographer: Beverly Stearns)



Data page for Punta Suarez, Española

Project Journal tool

Each journal entry is saved in a personal database that captures the site location from which the student posted the note, as well as the date and time they jotted down their observation. AJAX was used to save notes to the Journal. This technology allowed the students to write and save notes while watching video clips or viewing photos, without having the page reload (and losing their place in the video).

The final component we developed for the Project is the Question Pool. The Galapagos research activity runs for three weeks of Professor Stearns's class. In the first week, students navigate the Project site individually, outside of class time, capturing their observations and drafting a series of scientific questions based on these observations. The questions are composed, edited and saved in the Question Pool:

Question Pool, Phase 1 (Write Questions)

The Question Pool is a web-application written in Java. During the planning stages for this project, we quickly realized the benefits the Question Pool could bring to other areas of online learning and work. Consequently, we decided to build it as a stand-alone tool. The Question Pool runs on an entirely different server from the main Project site, and can be used for other projects simultaneously.

From their general pool of questions, students in Phase 2 of the assignment select a subset of twenty to share in four- or five-member peer discussion groups. Each student reviews group members' lists and ranks the questions on a 3-point scale: 1 – Must discuss, very interesting question; 2 – Maybe, I'm willing to be persuaded; 3 – Not very interested in this question. (The writer of each set of questions also stores his or her own rankings, separately.) Group members' rankings are tallied by the application and in Phase 3 of the activity, each student may view the group's aggregate ranking of his or her questions:

Question Pool, Phase 3 (Review Questions)

These rankings form the basis of face-to-face group discussions about each member's questions. This peer review assists each student in the final phase of the activity: the selection and refinement of one research question which is ultimately shared with the course instructor for additional feedback. This question then serves as the primary option for students' final written project for the course: a paper of 15-20 pages that reviews current original scientific literature relevant to the question, and proposes directions for new research that may help define answers to the original question (or extend that question in new directions).

The Question Pool also has an administrator's interface, which allows course instructors to divide students into discussion groups, to monitor students' submissions, and to move groups through the sequential phases of the assignment. This last function was important to ensure that the first phase of students' activity—observing field data and composing their questions—would be done individually, without reference to their peers' questions.

Lessons Learned, and Unexpected Possibilities

The Galapagos Project was first piloted with a cohort of students enrolled in "Principles of Evolution, Ecology, and Behavior" in spring 2006 (taught that year by two of Professor Stearns's colleagues while he was on sabbatical). On the basis of student surveys, discussion with teaching fellows, and observations of the instructors and CMI2 developers, we implemented a number of changes to the Project site before officially launching it in spring 2007.

Students reported few technical difficulties using the Project site. Because most Yale undergraduates live on campus and have network access in their residence halls, downloading large QuickTime movie files and high-resolution photographs was not difficult. (We may have made different media format and delivery choices if the Project were aimed at an off-campus audience.) More significant than any technical challenge were some issues related to implementing a phased, group-centered activity involving over 100 students and several teaching assistants. Among the lessons learned in the beta and first official implementation of the Project were:

- Scheduling this type of assignment near the start of the semester is a tricky endeavor, when student enrollment is still in flux. Small discussion groups of 4-5 people may be decimated if a number of students drop the class, and phases 2 and 3 of the assignment are completely reliant on active feedback from group members.
- Submitting 20 questions for group review may be excessive: for a group of 5 people, each student would review 80 questions, which could mean less thoughtful evaluation of each question's merit. (Stearns will reduce the number to 10 questions when he next teaches the class.)
- If responsibility for moving groups from one phase of the activity to another is delegated to a number of administrators (e.g., teaching fellows), one person should have general oversight to ensure that all students and groups are indeed moved to the next phase. Group activity should be tracked to confirm that students are providing feedback to their peers in a timely manner during phase 2.
- An activity of this sort needs to be integrated carefully into the larger context of the course. The project site was not available to course instructors early enough during the initial pilot to consider the Galapagos materials when developing lecture plans. As a result, the activity became a stand-alone exercise with no clear relation to other course activities or requirements. When Professor Stearns taught the class the following year, he was able to integrate the activity and project site fully into the very core of the course.

Student and instructor feedback during the 2007 implementation indicate that the Project is successful in meeting its pedagogical aims. "Many of the term papers based on questions elicited by the Galapagos web site were excellent," Professor Stearns reports, "and the students who wrote them learned a lot about issues of which they had taken ownership." Students themselves seemed to enjoy the activity a great deal, and commented on how it deepened their curiosity about concepts discussed in class.

During the official launch, we also discovered some unexpected new possibilities for tools developed for the Galapagos Project. For example:

- Emboldened by the success of the question-asking exercise early in the semester, Professor Stearns decided to redesign the final examination. Students' understanding of assigned readings and class lectures was tested in two short-answer midterms covering the entire semester, so for the final assessment, Stearns asked students to engage in a second question-asking exercise late in the semester, after they had studied most of the content of the course. With feedback from their peers and teaching fellows, they selected a new "best question" that became a take-home final exam. In 2000 words or less, they were to answer their question through reference to 5 original scientific papers published since 2000. These essays were graded by both Stearns and one of the teaching assistants who had not provided feedback on the original question. Students performed exceptionally well: almost one-third produced an A-level essay.
- The Question Pool engine might easily be modified to serve other teaching and learning situations. Students in a writing-intensive class could use a similar interface to upload essay drafts for anonymous peer review. In addition to (or instead of) a three-point ranking, peer reviewers might be offered text forms to submit substantive comments on a draft.

- Faculty might use another variant of the Question Pool to review and vote on candidates being considered for graduate school admission or faculty appointments. Instead of submitting 20 questions, a department administrator could upload 20 curricula vitae for committee members' initial ranking. A suitable revision of Professor Stearns's 3-point scale for this purpose might be: 1 – Definitely interview; 2 – Potential candidate worth discussing; 3 – Not suitable. Such a tool could be a great time-saver for review committees with a limited amount of time available for face-to-face discussion.
- The Journal tool could be incorporated into any number of teaching and research contexts, as a convenient way to take notes without leaving a web-based learning environment.

Beyond these new uses for the Question Pool and Journal tool, the Project interface as a whole might be converted into a template-driven application that other instructors could populate with their own materials. For instance: art historians might upload a selection of images for comparison and close analysis, and students could submit final paper ideas through a modified Question Pool for peer input. Historians might organize collections of primary source material into study modules, each of which might be associated with a different question-asking activity. This type of re-usability was not part of our initial specifications for the project, and a significant amount of thought and re-building would be needed to transform the Project site into an easy-to-use template for other instructors. But if sufficient interest were shown, and production staff available, we would consider this possibility in the future.

The potential flexibility of the Galapagos Project format for other disciplines and learning contexts suggests that the core activities Professor Stearns defined for this project—observing critically, asking good questions, refining one's ideas within a larger social exchange, and valuing your own curiosity—are crucial for educating not only future scientists but indeed all students who will venture "out into the field" once they leave the classroom proper.

Inquiry-based learning and the seriousness of having fun

We began this essay with a reference to the unfortunate loss of young people's tendency to ask "why" as they progress through standard educational systems. This issue seems especially important in recent years, as the potentially negative side effects of programs like the "No Child Left Behind" Act of 2001 are noted by K-12 educators and U.S. policymakers. Critics of the Act point to its overemphasis on standardized test scores to measure the quality of teaching and learning in our classrooms. If a school's test scores are all that matter, critics argue, educators are effectively rewarded for "teaching to the test," training students to memorize facts and materials likely to appear on the standardized assessment. Critical observation skills, the courage to speculate and "think outside the box," and other important components of learning may be left behind as unquantifiable and therefore insignificant.

Six years prior to the passage of No Child Left Behind, the National Research Council took quite a different stance on the best way to achieve scientific literacy at the national level. The introductory "Call for Action" of their *National Science Education Standards* (1995) suggests that science is less a compendium of memorized facts than a way of observing and interacting with the world:

> Scientific literacy enables people to use scientific principles and processes in making personal decisions and to participate in discussions of scientific issues that affect society. A sound grounding in science strengthens many of the skills that people use every day, like solving problems creatively, thinking critically, working cooperatively in teams, using technology effectively, and valuing life-long learning.
>
> . . . Achieving scientific literacy will take time because the Standards call for dramatic changes throughout school systems. They emphasize a new way of teaching and learning about science that reflects how science itself is done, emphasizing inquiry as a way of achieving knowledge and understanding about the world.[3]

This emphasis on inquiry was deepened significantly five years later, in the Council's follow-up study *Inquiry and the National Science Education Standards.* Although these studies were targeted at K-12 schools, their lessons should also apply to higher education, as the National Science Teachers Association argued in 2000.[4]

Educators and instructional technologists must appreciate that *how* we teach affects what is learned. In addition to developing materials for teaching Yale College undergraduates, Stephen Stearns taught our development group some important concepts while working on the Galapagos Project. We learned a few things about the Islands and their wildlife, for sure, and were introduced to principles of ecology and evolutionary theory. Some of these things we'll remember, some we'll forget (use it or lose it, as they say). But among the most important things we will retain from having worked on this project can be summarized as follows.

Our job is to teach students how to learn, not only what to learn. The best teachers aspire to be unnecessary to their students, since they're training their students to become colleagues and independent thinkers. "Memorizing facts and information is not the most important skill in today's world. Facts change, and information is readily available—what's needed is an understanding of how to get and make sense of the mass of data."[5] Teaching students how to ask good questions, and equipping them with the skills to find their own answers to those questions, is among a teacher's greatest legacies. In Professor Stearns's words, "I want them to become independent agents. I want to make them full adult colleagues as rapidly as possible."[6]

Teaching and research are not two separate realms. Within higher education, we tend to separate the activities of research from what goes on in the classroom. Faculty review procedures at many institutions treat teaching and research as distinct, if not opposing, duties. Yet an activity like the Galapagos Project demonstrates that training students how to become good researchers can simultaneously teach them a great deal about a field of knowledge. Furthermore, inquiry-based learning teaches students that researchers are *themselves* perpetual students, students who chart their own learning trajectories by pursuing what intrigues them.

Good teaching often entails knowing when to bite your tongue, and what *not* to tell students. As teachers and instructional designers, we may be tempted to offer students all of the information at our disposal with the most generous of motives. Yet being too good of a provider can make students not only passive but ill-equipped to survive in a world where there is much ambiguity. In a survey about the Galapagos Project, a number of students said they would have liked more information accompanying the video clips and photographs, telling them what was scientifically relevant and worthy of their attention. Professor Stearns strongly resisted this idea: the activity would fail if students were spoon-fed. They needed to learn to cope with a world of ambiguity, using whatever skills they brought into the activity and strengthened through the activity. They also needed to take the risk of failure.

Building students' self-confidence is an important part of inquiry-based learning environments. One reason students stop asking "why" is that they're afraid to admit they don't know something. They have learned, as they've grown older, that admitting ignorance is a sign of weakness. One has to achieve a certain level of self-confidence not only to admit one doesn't know something, but furthermore to relish in that not-knowing, and to see it as a spur to growth. "When you begin an inquiry, you are deliberately setting out to search for what you don't know. You have to have the confidence—perhaps even the arrogance—to say that you might be able to figure it out for yourself."[7] Beyond this, it takes self-confidence to trust that what interests you is important. Phase 1 of the Galapagos activity forces students to jump into a foreign environment with few guideposts and a dazzling (but hopefully not overwhelming) variety of things to see and hear. They develop and select their questions in isolation from the instructor and their peers. This experience requires them to take ownership of their own curiosity, and to find ways of communicating to others what excites or confuses them.

Having fun is a serious matter. In Professor Stearns's introduction to the Galapagos Project quoted earlier, he repeats twice the importance of having fun. When he reviewed my group's first interface for the Project, which had a minimalist, almost austere design approach, Stearns commented, "It's very sleek and modern, but I don't know that this is the best way of pitching the project for my students. The look is almost intimidating in its slickness." Our designer was at first surprised by this critique (Dutch-school design had typically worked for him before!) but Stearns explained that he wanted students to approach the assignment with a spirit of fun, and to achieve that the design should be less standoffish in its coolly restrained aesthetic, a bit more colorful, and ultimately more inviting. The interface and the activity itself needed to permit students to let down their guard, to relax. "The most creative insights usually come not when you're strategizing," Stearns says, "but rather

when you are being curious and when you're open to anything that could occur to you. To come up with great questions that lead to important answers, it's important to be playful and emotionally engaged." If students (or any of us) lose that visceral, immediate, sometimes thrilling sense of open enthusiasm, our work will inevitably suffer. Without having fun we may not have the energy or motivation to push into new territories and to grow as curious and creative citizens of the world. A well-designed, inquiry-based learning environment should be able to spark each student's curiosity in a genuine way. First find ways of re-awakening students' childlike passion to ask "why," Stearns taught us. "After that, there's plenty of time to apply reason and sort it out."[8]

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1 Stephen Stearns, quoted in Yale Office of Development, "The Galapagos Islands come to New Haven." *YALE Tomorrow* web site. Retrieved September 20, 2007, from http://yaletomorrow.yale.edu/news/stearnsgalapagos.html.

2 See Amy Anderson and David Walbert, "Science as a verb," *Learn NC: K-12 Teaching and Learning* web site. Retrieved September 17, 2007, from http://www.learnnc.org/lp/pages/662; also Larry Yore, Marilyn Florence, Terry Pearson and Andrew Weaver, "Written Discourse in Scientific Communities: A conversation with two scientists about their views of science, use of language, role of writing in doing science, and compatibility between their epistemic views and language," *International Journal of Science Education,* Vol. 28, Nos. 2-3 (February 2006): 109-141.

3 National Research Council, *National Science Education Standards* (Washington, D.C.: 1996). Retrieved September 19, 2007, from http://www.nap.edu/readingroom/books/nses/action.html.

4 National Science Teachers Association, "NSTA Position Statement: K-16 Coordination." Retrieved September 19, 2007 from http://www.nsta.org/about/positions/coordination.aspx. See Xornam S. Apedoe and Thomas C. Reeves, "Inquiry-based Learning and Digital Libraries in Undergraduate Science Education," *Journal of Science, Education and Technology,* Vol. 15 No. 5 (December 2006): 321-30, for a broader history of inquiry-based learning in the science classroom.

5 "Workshop: Inquiry-based Learning," *Concept to Classroom* web site. Retrieved September 20, 2007, from http://www.thirteen.org/edonline/concept2class/inquiry/.

6 Yale Office of Development, "The Galapagos Islands come to New Haven."

7 Mark St. John, "End Paper: The Value of Knowing What You Do Not Know," in National Science Foundation, *Inquiry: Thoughts, Views, and Strategies for the K-5 Classroom, Foundations* Vol. 2 (January 2000). Retrieved September 20, 2007, from http://www.nsf.gov/pubs/2000/nsf99148/lcd/ch_13.htm.

8 Yale Office of Development, "The Galapagos Islands come to New Haven."

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