summer conference **2008**

sparking innovative learning & creativity

Conference Proceedings

Rachel S. Smith, Editor

2008 NMC Summer Conference Proceedings

Rachel S. Smith, Editor

Editorial Advisory Board

Mary Albert
Islam Elnaggar
Suzette Escobar
Karen Flamard
Jeff Guest
Lance Herrington
Barbara Hilton
David Hopkins
Paula Hulick
Laurence F. Johnson
Kris Kauker
Alan Levine
Ana Mailyan
Michael Muzzie
Stacey O'Brien
Evelyne Roach
Mike Standeven
Janet Temos
Sorat Tungkasiri
Henry Umansky
Rachel Varon
Carla Zimowsk

© 2008, The New Media Consortium

Permission is granted under a Creative Commons Attribution-NonCommercial-NoDerivs license to replicate and distribute this report freely for noncommercial purposes provided that it is distributed only in its entirety.

To view a copy of this license, visit creativecommons.org/licenses/by-nc-nd/2.0/ or send a letter to Creative Commons, 559 Nathan Abbott Way, Stanford, California 94305, USA.

ISBN 978-0-9765087-2-4

Foreword

In 2007, the first *NMC Conference Proceedings* were published. Each chapter is the work of an invited author or authors, selected by his or her peers at the NMC Summer Conference and asked to contribute a paper related to the topic of the session presented there.

The volume you now hold is the second in the series. The papers in the *2008 NMC Summer Conference Proceedings* represent the conference in microcosm: among these pages you will find a step-by-step tutorial; a case study describing an international, collaborative new media performance; informative introductions to current topics such as storytelling, digital media, and fair use; descriptions of special services, tools, and information technology support programs developed at member schools; and discussions of new media and pedagogy. Just like the Summer Conference itself, the *Proceedings* showcases the talent, the brilliance, and the innovative spirit of the members and colleagues of the New Media Consortium.

Each paper projects a taste of the energy and excitement of the conference. Some of the papers are very closely tied to the presentations from which they were derived. Others, less so. A common thread unites them all — the continuing power of new media, in all of its forms, to transform teaching and learning.

Rachel S. Smith

Table of Contents

2 Digital Storytelling: An Alternative Instructional Approach
Ruben R. Puentedura | Hippasus

8 Digital Storytelling: Old Ways, New Tools
Laurie Burruss | Pasadena City College

18 The Adding Machine: Remote Digital Storytelling and Performance
George Brown and James Ferolo | Bradley University

27 Building and Supporting a Large-Institution Digital Media Service
Chris Millet | The Pennsylvania State University

35 DAM if You Do! BlueStream Digital Asset Management Infrastructure
Louis E. King | The University of Michigan

49 A Call for the Corporeal 'cause Pixels Are Ephemeral and Archeologists Won't Find Them
Jared Bendis | Case Western Reserve University

55 Infrastructures in Virtual Learning
Holly Willis | University of Southern California

65 Learning 2.0: Who's in Control Now?
Wendy Shapiro and Lev Gonick | Case Western Reserve University

73 Why Walk When You Can Fly? Reflections from an Advanced Second Life® Preconference Session
Christopher Holden and Beth Sachtjen | NMC Virtual Worlds

81 Fair Use Ain't What You Think It Is: Copyright and Fair Use in the Digital Classroom
Mark J. Davis | Tulane University, CERT, and Loyola University

Digital Storytelling: An Alternative Instructional Approach

Ruben R. Puentedura, Ph.D. | Hippasus

Digital Storytelling has proven to be a powerful and flexible tool for a range of academic applications, from course design and development to construction of student narratives. However, in its traditional form, it is best suited to output of projects as non-branching digital video. We look at an instructional approach to digital storytelling that can accommodate multiple output options, as well as branching structures, and do so within a span of time comparable to more traditional alternatives.

Introduction

While multiple origins can be identified for the practice of digital storytelling, the work of Dana Atchley in the early nineties, and in particular, his work on *Next Exit* (online at http://www.nextexit.com/nextexit/nextframeset.html) was a key foundational moment. For *Next Exit,* Dana Atchley created a total of seventy short stories, each of them associated with a set of prerecorded digital elements. In performance, Atchley selected a subset of the stories, and merged them with his own live narration and audience interactions, resulting in different storytelling paths on different days. Subsequently, he teamed up with Joe Lambert and Nina Mullen to create what would become the Center for Digital Storytelling (CDS), which translated some of the original ideas into a systematic process to allow individuals to use the tools of digital video to tell their stories. My work builds on the foundation created by the CDS, extending it into media domains other than video, while at the same time reintroducing some of the elements of story branching and interactivity that were present in Dana Atchley's original work.

The Center for Digital Storytelling Approach

The CDS' approach focuses primarily on the process of assisting individuals in sourcing and shaping personal stories into a form suitable to the creation of digital video objects from a mix of still images, narration, and musical soundtrack. In particular, seven narrative elements are highlighted and discussed as part of the process of constructing a multimedia story - they are (Lambert, 2006):

- A point (of view)
- A dramatic question
- Emotional content
- The gift of your voice
- The power of the soundtrack
- Economy
- Pacing

These conceptual elements, coupled to some basic instruction in the use of digitizing and video editing tools, have proven to provide a solid basis for digital storytelling by individuals who are newcomers to both storytelling in general, and the technologies involved in particular.

An Approach Integrating Structure and Medium:

While the CDS approach has been highly successful, it opens the door to many questions. Among these:

- How should digital storytelling be approached for other, non-video media?
- Can greater interactivity on the part of the viewer be brought into the picture?
- Are there alternative approaches to the construction of the storytelling narrative that could match different storytelling goals, especially in the academic arena?
- Can some of the implicit assumptions made by authors, based upon their intuitive knowledge of popular culture be made explicit, so that alternative paths to storytelling might result?

In order to address these and related questions, I have constructed an approach that integrates a progressively deeper understanding of the structures involved in digital storytelling with a parallel progression through different storytelling media. In turn, each of these stages corresponds to a particular toolset, suitable for use by a newcomer to the medium. The progression may be seen in Figure 1:

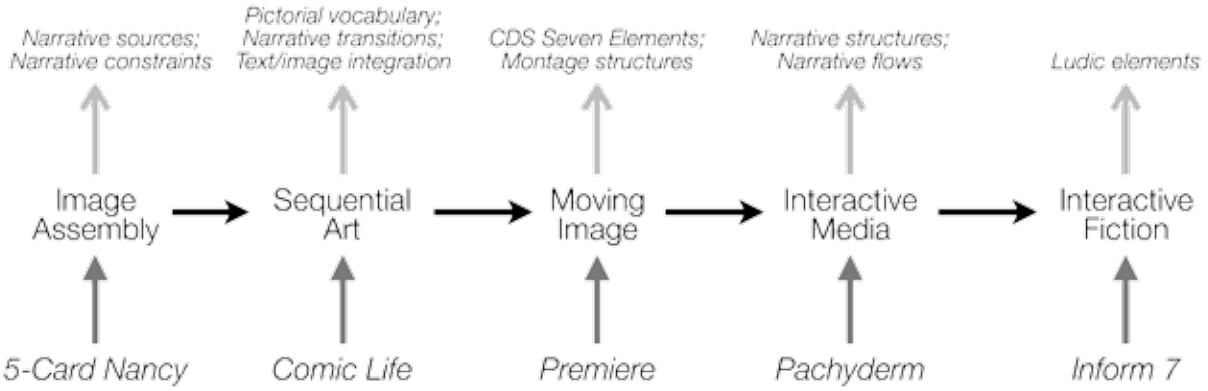


Figure 1: Digital Storytelling across media

The structures have been carefully selected with three goals in mind:

- They define an "optimal set" at each stage - i.e., exactly the right amount of theory is introduced at each stage for the task to be accomplished;
- They build upon each other, so that subsequent stages are informed by the work done at the earlier stages;
- They are flexible, so that a key subset of the information can be introduced usefully at stages earlier than indicated in the diagram.

Other constraints operate: stage one is designed to act as an introduction to any of the other stages, and stages 2-4 are designed to take no more than a day of instruction apiece (stage 5 is designed to take two days). Also, stages 2-4 are designed to be optionally offered as a standalone course of instruction, by merging in selectively elements from the preceding and succeeding stages. In the discussion that follows, I will focus on the first four stages, and I will touch briefly upon some aspects of the fifth stage.

Stage One: Image Assembly

The game of *Five Card Nancy,* created by Scott McCloud (McCloud, 1993) provides an excellent point of entry into digital storytelling. In its simplest version (Dave White, online at http://www.7415comics.com/nancy/), the rules are as follows:

- cut up a set of Nancy strips into their component panels, and shuffle them;
- choose five panels at random from the set;
- select one of these panels to be the first panel of a new comic;
- return the remaining panels to the deck, and repeat the process, until the new comic is complete.

At first sight, this might not seem to be the most fertile ground for storytelling — won't random panels yield a random story? However, the process of selection involved in the third step changes the dynamics dramatically: while the resulting strips have a certain surreal flavor to them, they also have a reasonably well-defined story behind them. In fact,

the process of asking participants to justify their panel choices allows them to more readily apprehend two key issues:

- the origins of storytelling in meaning-making activities: as they progress, they come to better understand how their panel choices correspond to both retrospective meaning-making activities (i.e., explaining what has come before), and prospective meaning-making activities (i.e., making choices based upon expectations of what story elements might come in the next draw).
- an intuitive grasp of the structural elements that make comics work: unlike movies, most people tend to have a rather limited experience of comics, in many cases limited to the standard three- or four-panel gag strips printed in their local newspaper. Having to explain their choices for panel selections helps them begin to develop an intuitive feel for some of the relationships of elements between and within panels that provide narrative continuity in comics.

Stage Two: Sequential Art

Having set the stage with *Five Card Nancy,* participants are ready to move on to the task of creating a digital comic. As already mentioned, intuition is not a reliable guide for most participants when undertaking this task: without any additional framework, the resulting comics tend to be disjointed and talky. This presents a challenge, however: time constraints do not permit covering all the source materials that would ordinarily form part of the education of a comics artist (e.g., McCloud, 1993; Eisner, 1985). After careful tests with pilot participant groups, I have identified three sets of concepts, derived from the work of Scott McCloud, that form a "just right" mix for digital storytelling workshop participants - they are:

- the conceptual triangle (picture plane/reality/language) that defines the pictorial vocabulary space of comics;
- the types (and corresponding uses) of panel-to-panel transitions in comics;
- the types (and corresponding uses) of word and picture combinations in comics.

With these concepts in hand, participants are ready to create a digital comic that tells a story of their choice. It is important to note that they are not directed to write a "script" for their comic: this tends to result in wordy comics with poor overall narrative flow. Instead, they are asked to write out the story as a rough draft, and then select key events from it to be illustrated by panels in the comic — the actual text to be used within the comic should only then be written, and only as strictly necessary. Since most participants lack drawing or painting experience, panel images are sourced either from materials brought by participants, or from Creative Commons-licensed images, such as are found on *Flickr*.

The final comic both serves as a digital storytelling object unto itself, as well as a point of departure for the next stage, providing a conceptual storyboard for a digital video project.

Stage Three: Moving Image

The approach designed by the Center for Digital Storytelling is still retained at its core here (i.e., the "seven elements"), with two important modifications:

- The voiceover for the story is not written from scratch, or derived from the previous rough draft, but rather based upon the existing digital comic. This has the effect of both "tightening" and focusing the narrative.
- While participants' intuitive experience of film and TV is relied upon, it is supplemented by a discussion of approaches to cinematographic montage. The reason for this is to provide storytellers with a broader palette of options than they might otherwise use, resulting in overall richer and more expressive narrative flow.

As is the case for comics, time does not permit a discussion as in-depth as might be found in an introduction to filmmaking, but a workable compromise can be found by examining a set of four approaches to montage identified in Gilles Deleuze's *Cinema 1: The Movement-Image* (Deleuze, 1986) - they are:

- Organic Montage (e.g., as seen in the films of Edwin S. Porter, D.W. Griffith);
- Dialectical Montage (e.g., Sergei Eisenstein, Dziga Vertov);
- Montage by Quantity of Movement (e.g., Abel Gance, René Clair);
- Montage by Quantity of Light (e.g., Robert Wiene, Fritz Lang);

Both classical and contemporary examples are examined for each of the approaches, and linked back to McCloud's analysis of panel-to-panel transitions. In turn, this sets the stage for participants to translate their comic into digital video form, using both their previously sourced images, as well as new materials of similar origin. Finally, participants are encouraged to review and enhance their comic in light of their work in video.

Stage Four: Interactive Media

Interactive media tools such as *Pachyderm* (see http://pachyderm.nmc.org) pose a particular challenge when viewed from the perspective of storytelling: in a setting where readers can choose to take any one of a number of branches at different points in the narrative, how can stories best be constructed? Answering this question requires special attention to two issues at a level beyond the intuitive:

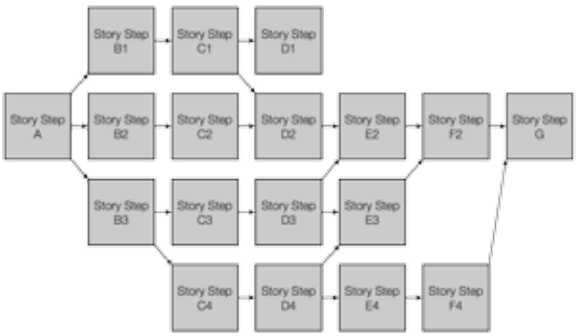
- The structures that underlie classes of narratives, and how they can be used to analyze a story and break it up into "chunks";
- The ways in which the same "narrative chunks" can be assembled into multiple coherent narratives.

In dealing with the first of these two points, Joseph Campbell's analysis of the components of the Hero's Journey (Campbell, 1972) provides a solid point of departure. The three-part structure of the monomyth (i.e., Departure, Initiation, and Return, with each part in turn containing five or six substructural components) allows for a clear first introduction to the structural segmentation of a narrative. Alongside Campbell, participants are also introduced to Vladimir Propp's more fine-grained formal classification of narrative units (Berger, 1999). Once they have adapted these approaches to a chunking of their own narrative, the second point must be dealt with.

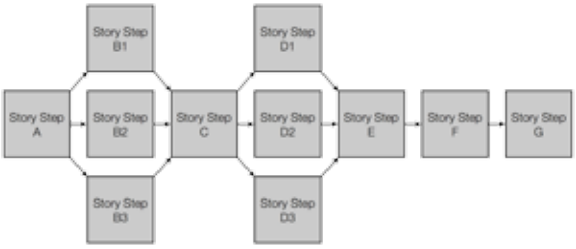
Videogames with a strong narrative component have had to deal with the issue of multiple paths through the story for years. While one solution is to simply have the story "run on rails", i.e., forbid any choices that would result in significant narrative deviations, gamers tend to resent this. Lee Sheldon has studied the issue, and identified a number of ways that narrative branching can be harnessed (Sheldon, 2004):

2a: Linear Storytelling

2b: Branching Stories



2c: Linear Storytelling



2d: Branching Stories

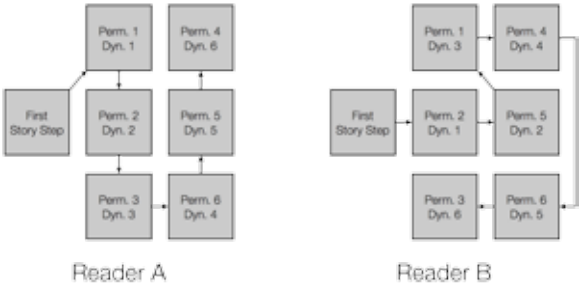


Figure 2: Some samples of narrative branching structures

Particularly interesting is his modular storytelling example (2d above), where the modules remain constant, but their significance changes according to the order in which they are visited. Thus, a module that played a role in the "Departure" segment in one traversal order, may instead play a role in the "Initiation" segment for a different traversal order.

Participants are asked to expand their original story so that it can accommodate branching points of exploration – it is rare that the original story as embodied in either comic or video format has the required flexibility – segment it according to a suitable adaptation of the Campbell/Propp models, and select one of Sheldon's frameworks for harnessing branching storytelling. At the same time, *Pachyderm*'s built-in templates correspond to different branching modes, and need to be selected accordingly. The resulting narratives can be viewed as a capstone of the process, incorporating what has been learned in the two previous stages, but accommodating a structure that is best suited to reader exploration.

Stage Five: Interactive Fiction

This stage is somewhat different from its predecessors, inasmuch as it involves the generation of a completely new story, with game-like overtones. Additionally, it involves mastery of a toolkit (the *Inform 7* programming language), which — while a good deal simpler than traditional programming environments — is considerably more complex than the tools used in the other stages. Finally, it also involves a substantial subset of the theory of game design. For these reasons, I will not discuss it in greater detail here, since to do it justice would require a paper of its own. Nonetheless, it is worthwhile noting that it affords flexibility and interactivity that goes beyond simple branching: puzzles, the construction of new narrative strands based upon reader input, and feedback mechanisms are all added to the possibilities for storytelling previously considered (for an introduction to the dynamics and potential of interactive fiction, see Montfort, 2003.)

Conclusion

The preceding approach is by no means the only way to expand the horizons of digital storytelling. However, it is a particularly effective way to do so, and one that can be further extended readily. For instance, it is possible to revisit the digital comics approach once the interactive media exercise has been completed, in order to explore the potential involved in branching comics, usually described as "infinite canvas" comics (McCloud, 2000). Finally, the broad outlines of the approach retain validity, even if the specific toolkit and media choices change: the selection process for "just enough theory" described here can be applied to a broad range of digital storytelling scenarios.

References

Berger, Arthur Asa. (1999). *Signs in Contemporary Culture — An Introduction to Semiotics, Second Edition.* Salem: Sheffield Publishing Company.

Campbell, Joseph. (1972). *The Hero with a Thousand Faces.* New Jersey: Princeton University Press.

Deleuze, Gilles. (1986). *Cinema 1: The Movement-Image.* Minneapolis: University of Minnesota Press.

Eisner, Will. (1985). *Comics and Sequential Art.* New York: Poorhouse Press.

Lambert, Joe. (2007). *Digital Storytelling Cookbook.* San Francisco: Digital Diner Press.

McCloud, Scott. (1993). *Understanding Comics.* New York: HarperCollins.

McCloud, Scott. (2000). *Reinventing Comics.* New York: HarperCollins.

Montfort, Nick. (2003). *Twisty Little Passages: An Approach to Interactive Fiction.* Cambridge: MIT Press.

Sheldon, Lee. (2004). *Character Development and Storytelling for Games.* New York: Thomson Course Technology PTR.

About the Author

Dr. Ruben Puentedura is the Founder and President of Hippasus, a 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, Harvard University, and the Vermont and Maine State Departments of Education, as well as other schools, colleges and universities, hospitals and arts organizations. His research includes the design of models for selecting, using, and evaluating technology in education, as well as new directions in Educational Gaming and Digital Storytelling, focusing on applications in areas where they have not been traditionally employed. He can be reached at rubenrp@hippasus.com.

Digital Storytelling: Old Ways, New Tools

Laurie Burruss | Pasadena City College

Digital Storytelling: Old Ways, New Tools discusses narrative voice and explores many ways to tell stories and how to teach others through storytelling in the context of a diverse and evolutionary palette of digital communication tools. In all creative endeavors, in searching for what makes art and life work, and ultimately discovering what makes people connect, the answers lie in a story. Relying on both personal experience and field research, Laurie explores elements of storytelling that employ interactive techniques such as collaboration, immersion, connection, and engagement. With the availability of digital media tools, the audience rediscovers the meaning of collective experience—the evolution from Lascaux cave paintings to the Facebook wall. The power of digital storytelling in defining a brand, communicating a message, or connecting users draws upon old storytelling techniques like memory, emotional content, and active involvement. Rewards afforded to participants in stories intensify, alter, and change the beliefs about "living in the moment" and "the idea that resonates." Narrative elements in combination with digital tools provide a structure for inventing an interactive design process focused on creativity and collective problem solving. Participants learn from shared stories, collaborate in making customized and individualized stories, and take away memorable experiences. Stories and their transformative powers, whether from a single voice or entire community, provide pathways to consistent, authentic, and successful creative communication.

Old Ways, New Tools

I have always loved a good story . . . Even as a child my memories of play were wrapped up in characters, plot, costumes, performances, and troupes of kids roaming the neighborhood. Kid's play was all about the dress up box, make believe, baby dolls, Barbie dolls, paper dolls, forts and tree houses, one-of-a-kind, home-grown Halloween costumes, hand-written plays, puppet shows for hire at neighborhood birthday parties, a brand new box of Crayola Crayons, Saturday morning art classes at Phoenix's Art Museum, and 3-day marathons of board games like Monopoly with the cousins at Grandma's—that even today, in my memory, rival "World of Warcraft."

Included in these childhood memories are stories read to me at home, in school, in movie houses. I grew up on these "old" stories: *Bible* stories, *Grimm's Fairytales, The Secret Garden, Old Yeller,* the Disney animated version of *Snow White & the Seven Dwarfs, The Wizard of Oz* shown but once a year on television, Gene Kelley dancing in *Singing in the Rain,* and my favorite quest story: *Around the World in Eighty Days.* I learned the meaning of romance in *Gone with the Wind,* the ideas of epic and larger-than-life in *How the West Was Won,* and the sheer joy of singing along to every song in *The Sound of Music.* My first viewing of Stanley Kubrick's *2001: A Space Odyssey* with only my Dad and myself was an introduction to the avant-garde.

Staple fare, on TV, included the kinds of worlds that only the most imaginative minds invented in classic but legendary shows like Rod Serling's *The Twilight Zone, Alfred Hitchcock Presents,* and *The Wonderful World of Disney* (the weekly Sunday night family ritual).

My mother introduced me to theater. Nothing was so special as tickets to a live performance for a 12-year old birthday or ushering as a summer volunteer in a local theater or actually acting my first role for a high school play. Whether the original cast of *Oklahoma, West Side Story's* contemporary take on *Romeo and Juliet,* Ethel Merman's blasting out songs

in *Gypsy, Cabaret's* dark look at a Germany between wars, the 60's idealism of *Hair* or the power of fear incited by a young woman's hysteria in *The Crucible,* these stories transported me to places beyond my tract home in Arizona, to worlds of ideals, cultural values unlike my own, and unknown complexities of human relationships.

These stories were as "real" as my own day-to-day experiences. I frequently "lost" myself in these stories and literally delighted in this set of "other" possibilities and points of view. Through stories, I came to know myself and to understand my position in relation to the world. I was "hooked" on stories because they brought meaning and purpose to my own life, a sense of inter-connectedness instead of isolation, and a world where "dreams do come true."

In all my creative endeavors, in looking for what makes art "work," what makes life "work," what makes people "connect," it always comes back to a story for without a story, I have nothing, no hook, no reason to live. Without a story, a culture does not live. Without a story, history is not written. Without a story, voices cannot be heard. To make an example of another story, it's *The Emperor's New Clothes* all over again; substance and emotional content connect us all and anything less has no authenticity — that ability to "feel" alive.

Fifty plus years later, I found my voice and a way to tell stories and to teach others to tell their stories. I tell stories with new tools. I revel in the ways we tell our stories, share our stories, listen and connect to each other. All I ask for in return is to engage me!

In the mid-nineties, in a workshop at the Center for Digital Storytelling (http://www.storycenter.org), in Oakland, California, I arranged for two college instructors — one a web designer, one an artist, a filmmaker, a musician and a non-profit administrator — to join together to tell stories using images, voice narration, and the new digital video editing tools available on the computer. Joe Lambert, our guide and critic and facilitator through this process, pressed for the story's voice, for its truth and the truth's power to communicate to others. Although this workshop was intended to prepare a diverse group of artists and educators like myself to teach digital tools, image making, and writing to junior and senior high school students in the Los Angeles area, I discovered my own personal voice in searching for the story of my father's captivity in a prisoner of war camp during World War II — *Bill's Voice*.

My father kept a diary during his internment but the entries amounted to his favorite songs, favorite meals cooked by his mother, gear he needed for camping trip, and a dictionary of commonly used G.I. slang. He never talked to me about this experience while he was alive and he died when I was 21. Indeed, I felt short-changed, but through the Internet, I found several community websites authored by ex-prisoners of WWII and retired Air Force Officers. These strangers, seeing my emails pleading for any information about my father, about his plane being shot down, and about his circumstances in the prisoner of war camp, not only researched his actual records in the Air Force but actually connected me to the Commanding Officer who witnessed and oversaw the operations of the bombing mission on the day my father's B-52 was shot down. Within 48 hours of sending out two emails, my father's story unfolded through the words of the men with whom he had shared these experiences. I even received an email from a Belgian gentleman who, as a child, lived in the small northern German village bordering my father's prisoner of war camp. He wrote "because of people like your father, I live in a free world today." He described my father as a "hero" and made me cry and changed my perception of my father forever. This story could not have been told 15 years ago because the Internet did not exist. These retirees brought my father's voice to me and demonstrated how the democratization of the Internet lends power to the voice of one and reinforces the collective spirit. I realized that I will never hear my father's words but with the digital tools of Photoshop, Final Cut Pro, and SoundStudio Pro, I found the voice — my own voice to tell my father's story. This incident prompted my research into answering the questions "What makes a good story?" and "What role does narrative structure play in the design and development of interactive experiences?"

What makes a good story? Ten essential elements of storytelling define the process for creating, making, and distributing digital stories. These ten elements establish a process for designing and developing story concepts, methods, tools, and distribution. A discussion of each element follows with "real world" examples illustrating the principles and actualization of "successful" stories. They include:

1. Point of View
2. A Dramatic Question
3. Emotional Content
4. The Voice
5. Juxtaposition: Text & Image
6. Rhythm, Tone and Tempo
7. Narrative Structure
8. The Audience
9. Immersion, Connection, and Engagement
10. Backstory

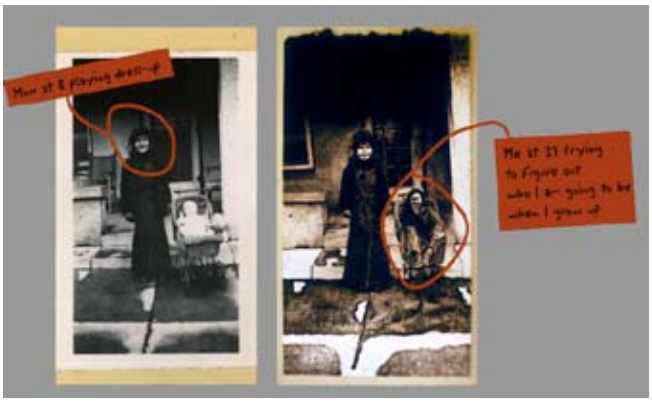
Element 1: Point of View

Point of view identifies the central premise; defines the specific realization you are trying to communicate within your story; services every part of the story; and clarifies the story's purpose. With an established point of view the goal of the story becomes clear. Point of view asks who is telling the story and what is the motivation or the "why" for telling this story. As Joe Lambert, from the *Center for Digital Storytelling,* points out *"…all stories are told to make a point."*

In understanding point of view, ask the question, who tells the story? Generally most stories are told by one of the following options:

- first person (the use of "I")
- second person (the use of "you" as though someone is speaking to the audience)
- third person (the outside voice uses the pronouns he, she, or it)
- dialog (more than one voice tells the story, multiple points of view)

Examples:



- A black and white photo of my mom at age 8 playing dress-up compared to a lithograph of the same photo of my mother but instead of a baby doll a portrait of myself at 21. The caption reads *Me at 21 trying to figure out who I am going to be when I grow up?* At 21, my mother had just had her first child, myself, but I at 21 was unclear and searching for my role as an artist and woman. I felt like I still belonged in the baby carriage in some ways.
- *Looking at Paintings: J.Paul Getty Museum*
  Second Story Interactive Studios, http://www.secondstory.com
  This instructional movie explains how the point-of-view held by Cezanne in his still life paintings is based on experience and memory rather than on realistic and physical reality. Cezanne's point-of-view connects the viewer to the objects emotionally and speaks to experience rather than pictorial accuracy.
- *Next Exit > Home Movies > Turn,* by Dana Atchley, performance artist and interactive digital storyteller. Dana's first-person story recounts the annual ritual of making a 360-degree turn in front of an 8mm camera. (http://www.nextexit.com)

Element 2: The Dramatic Question

What's my motivation? What question needs answering? Developing a dramatic question often defines the conflict, the reason for the story, the why and what and its resolution. Asking questions is a great way to brainstorm ideas for stories and see if they hold interest. Creating lists of questions whether the answers are known or not can start the ideation process. Many of the oldest stories answer questions such as Why is the sky blue?, Where does rain come from?, Who is faster — the tortoise or the hare? Most audiences want to hear a compelling story, one that uncovers a theme that powers that story, and then to be convinced of its value.

"What's the story?" is often the best thing and the first thing to ask in story development. Hillman Curtis points out in his book *MTIV (Making the Invisible Visible)* that . . .

> *In sum, listening is an activity. It's a matter of asking the right questions in just the right way and then fine-tuning your reception to the answer, however buried it may be. . .uncover what they want most. You really do have that kind of power.*

Example:

Falsies, by Daniel Weinshenker, writer and teacher, Center for Digital Storytelling, http://www.storycenter.org/canada/falsies.html

Daniel's story describes his mother's abusive relationship with his grandmother and her journey to reasserting her womanhood with the help of her son. The dramatic question that prompted his mother's story is "Why hadn't anyone ever told her she was beautiful?"

Element 3: Emotional Content

Emotional content is powerful but only if the emotion is truthful in its approach. Tragedy and comedy describe the full gamut of the emotional spectrum possible in storytelling. Seeing, feeling or hearing authentic emotional content effects the listener literally — like a tightening of the stomach, the eyes brimming with tears, and an unlocking of inner emotions and personal experiences. The power of emotion lies in its ability to resurrect, inspire, transform, express, and feel.

All of us have experienced being in the middle of a story, a novel, a film, a theatrical or storytelling performance and finding ourselves emotionally engaged. The story reaches inside our consciousness and takes hold of us. ". . Stories that resonate give us a reason to go forward" states Joe Lambert, Center for Digital Storytelling, http://www.storycenter.org/index1.html.

Example:

AIDS Decade: Looking for the Light > Venus Rising

Journal E 1999 http://www.musarium.com/aidsdecade/venus/index.html

Scott, a photojournalist, becomes involved with a drug addict who has AIDS but chooses death on her own terms. The story resonates emotionally in its simplistic and straightforward approach to discussing life, death, love, and friendship. Having watched this story multiple times, I am always brought to tears.

> *"Venus was one of the best friends I ever had. Venus was always there for me. We have very few people who are actually friends in our lifetime."* Scott Thode

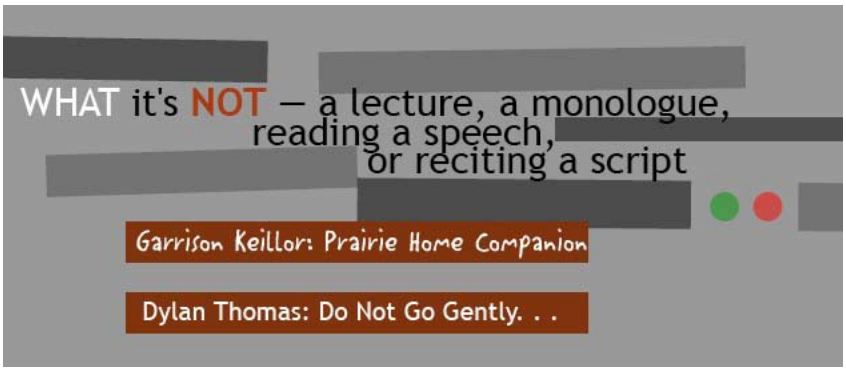
Element 4: The Voice

Two aspects exist in understanding voice — both the words that are spoken with various inflections as well as the different modes of listening. A good listener hears more than voice and sound but can identify "clues" that place the audience inside the story in terms of:

- Age
- Place
- Gender
- Emotions
- Patterns of rhythm
- Cadence
- Pitch
- Volume
- Character

To really understand "voice" is to understand what it's not! Voice in storytelling is not a lecture, a monologue, reading a speech, or reciting a script.

Examples:



- Garrison Keillor: *Prairie Home Companion* – the familiar voice of home, humor, and wisdom.
- Dylan Thomas: *Do Not Go Gently Into That Good Night* – The rhythm and cadence of the poetry, the drama of the tone, and the emotion of the voice's tremolo enhance the meaning of this poem recited by the author himself
- *Modern Man,* by Mike Goedecke, Belief (http://www.belief.com)
  In an experimental motion graphics movie, Mike Goedecke and his team record the voice of a schizophrenic homeless man in Venice Beach and illustrate his wild musings with animation and graphics.
- *Redheads,* as told by Dana Atchley's mother, Barbara French (http://www.storycircles.org/play.php?vid=271) Barbara's voice as an older woman contrasts to her recounting her early womanhood.
- *L.A. Dada,* by David Mascarina,Pasadena City College Block, Investigating the Los Angeles Landscape, (http://www.pasadena.edu/dmc-pcc/dada/html/dm/) David employs the voices of over 12 students to illustrate the poem's celebration of the diversity of Los Angeles.

Element 5: Juxtaposition: Text & Image

"Together, of course, words and pictures can work miracles. And indeed, words and pictures have great powers to tell stories when creators fully exploit them both!" *Understanding Comics,* Scott McCloud

As McCloud suggests, the juxtaposition of elements both visual and written opens up possibilities for new meanings, suggests new interpretations, and in storytelling particularly allows the storyteller to composite a variety of media and "paint" a picture with texture and contrast. Juxtaposition allows for sensory experiences. When the user sees the image and reads the word, the power of mental imagery housed within the brain adds a set of sensory experiences — feeling, hearing, touching, smelling, seeing, etc. Rich media experiences often trigger mental imagery with just a few images and words. This type of thinking draws conclusions and makes connections and new meanings between seemingly disparate elements. A storyteller's imagery and text acts as a catalyst for a richer experience.

The front of a black and white photo of my Aunt Betty hanging from a swing set raises the questions: What does this mean? When? Who? Why? Typically the answers, upon seeing only the photo image, are a young woman in an older time. However upon turning the photo over, one realizes the message, handwritten in blue ink, reveals more of the

Aunt Betty

character and the story. "There just is no explanation for this. I guess I just ran out of things to do and felt like 'showing off.' Where did you get such a ca – ra – zy wife — or at least why?" Now, the audience can assume that the young girl/woman is stir crazy, is married, and the husband is not around. The clues indicate she is possibly a war bride. The narrator adds that Aunt Betty who is now 88 upon seeing the photo of herself at 18 years of ages comments, "I had just found out I was pregnant and Jack was sent off to the war." With the text, the image, and the narration, the story becomes one about a defining moment: a girl becoming a woman and relishing her last childish act.

Examples:

- *Ceci n'est pas une pipe.,* Rene Magritte. Magritte's surrealistic humor is in play when the title and the image of this famous painting are "seen" together. The painting is not really a pipe but only a representation of a pipe.
- *Seven,* Kyle Cooper, Imaginary Forces. The motion graphic titles for the movie *Seven* offer clues to the seven deadly sins or in this case the seven murders that occur in the movie to follow. http://www.imaginaryforces.com
- Trailer for *Infinity,* Belief. The motion graphics company Belief attempts with animation, motion, text, and image to depict the concept of infinity for which no real pictures or documentation exist. The idea of depicting what we cannot actually see or experience makes this video so compelling. http://www.belief.com

Element 6: Rhythm, Tone and Tempo

As Ernest Hemingway suggests, "Write the story, take out all the good lines, and see if it still works." Great storylines have pacing and rhythm that move us through the story, quicken our breath, make us gasp, clench our hands, and sigh with relief as the credits roll. The pacing of a story controls the flow of action. This pacing, rhythm, tone, tempo, beat, filter in combination with animation and soundtrack suggest:

- A sense of place
- Ambiance
- Time period
- Inhale/exhale
- The beating of the heart – nature's own iambic pentameter.

Examples:

The following examples are masterful in their pacing and in creating and supporting dramatic structure and character development. Each example uniquely approaches timing and plot through animation, sound effect, special effect, art direction, or orchestration.

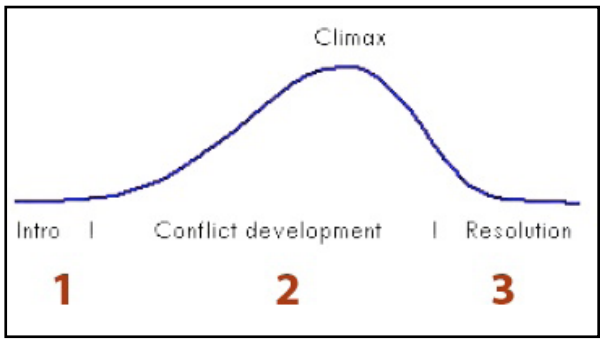
- *Toy Story,* the movie trailer: PIXAR, the new Disney
- *Let X* = X: Laurie Anderson, Artist and Musician
- *Twin Peaks:* David Lynch
- *Star Wars:* George Lucas, ILM (Industrial Light and Magic)

Element 7: Dramatic Structure

To see the best examples of narrative dramatic structure, view the TV Commercial with its 15/30 second time constraint in combination with tight editing and strict adherence to dramatic structure. Dramatic structure is about clarity, beauty, and focus.

Three is the magic number for creating contrast and creating a beginning, middle and end of a story. In art and design, the magic three elements are foreground, middle ground, and background and light, medium, and dark. Contrast (when it includes three elements not just two) tells the story and sets the stage by helping the audience. As a digital storyteller, in terms of the audience:

1. Lead them in.
2. Tell your story.
3. Then let them out.
4. Leave them thinking.



The classic dramatic curve in writing courses parallels the actions outlined above:

1. Intro
2. Conflict development
3. Climax
4. Resolution

In judging the success of a story's dramatic structure graph the structure in simple line drawings and ask the following questions:

1. Does the story graph look the most exciting (peaks)?
2. Does the story graph look boring in parts (flat-lining)?
3. Does the story graph have a "false" start (peak, fall, and try to resurrect itself)?
4. Does the story graph look like your favorite dramatic structure?
5. Should we throw out the structure completely and return to the drawing board?

Examples of dramatic structure:

- *Simon:* Hillman Curtis http://www.hillmancurtis.com
- *The Coca Cola Stories:* A Branding Strategy http://www.thecoca-colacompany.com/heritage/stories/index.html
- *Wizard of Oz:* Fed Ex/TV commercial http://www.youtube.com/watch?v=yy4_Dd-tmKQ&feature=related

Element 8: The Audience

In *MITV,* Hillman Curtis defines audience identification as the ability to "Zero in: Before anything else, we have to know who our audience is and what they want." Ask yourself who is listening. Then answer the question honestly to identify and target the audience. Targeting the audience also helps in identifying the appropriate distribution medium, and finally the message (Remember Marshall McLuhan's adage: The medium is the message!) Once identified and profiled, the target audience determines media choices that effectively communicate the story (for what else is brand if not a story about the company). Audiences typically relate to one or more of the following media choices:

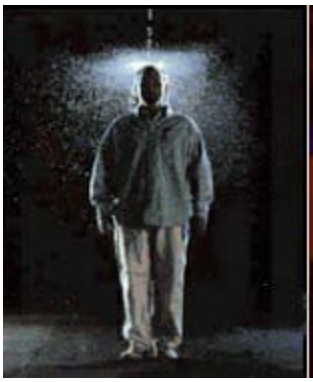
Speech	Writing
Art	Internet (email, IM, Facebook, etc)
Music	File sharing
Radio	Video conferencing
Television	Peer-to-peer networking communities (blog)
Movies	Cell phone, mobile devices, G3
Video Games	

Example:

- *Target* Painting: Jasper Johns
  Media Examples – TV, Radio, Movie Theaters, Drive-in Movies, Atavars in Second Life

Element 9: Immersion, Connection, and Engagement (suspension of belief)

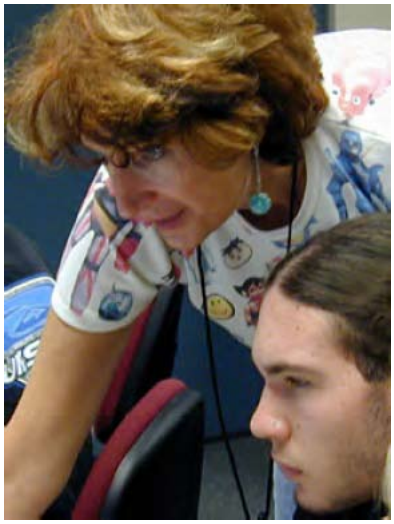
"Interactivity is based on fascination and captivation. It is how people get pulled into a process that continues to draw them deeper and deeper," states Mark Stephen Meadows, *Pause & Effect*. Compelling experiences immerse the audience, connect the audience with each other, and engage the audience in a way that makes them forget everything else but what's happening at the moment. Anyone who has attended an evening of Blue Man Group in Las Vegas, or seen a Bill Viola video installation, or watched a live magic show like Penn and Teller knows the feeling of complete engagement and the suspension of belief — when all that matters is this moment. The "gotcha" moment indicates the audience is enchanted and completely immersed in the interactive experience of the story. Pablo Picasso stated, "I begin with an idea, and then it becomes something else." The successfully engaging story follows suit; it begins as a kernel of an idea, then turns into something else — another reality for the user or audience over a temporal amount of time.



Examples:

- *Water:* Bill Viola
- *Magic:* Penn & Teller
- *The Sistine Chapel Ceiling (close up of God's and Adam's fingers touching):* Michaelangelo
- *Time to Start:* Blue Man Group (video audience performance)

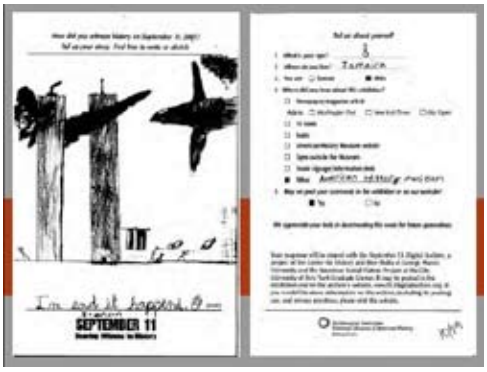
Element 10: Backstory



Backstory is the journey—the path to our stories. Sometimes it becomes the story, but generally backstory, the processes behind our storytelling that evolve into stories as the creator/designer collects assets, collaborates with team members, and connects with the targeted audience. The storytelling development process provides a rich set of experiences and opportunities for future stories and interactive experiences in the very nature of collecting, collaborating, and connecting, three of the most personally rewarding experiences for the interactive storytelling designer.

Examples:

- *They Need to Make New Words for This* (poem in response to 9/11): Pat Rees, PCC Web Producer, Flash Motion Graphics http://www.pasadena.edu/dmc-pcc Poetry in Motion > Class Projects > Poetry > Pat

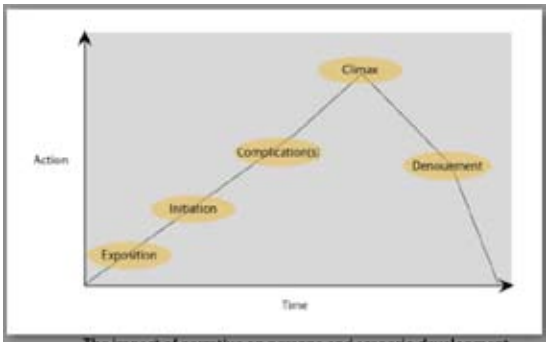


Some real world examples of back story as illustrated in the aftermath of 9/11:

- *September 11: Stories form Exhibit Visitors,* Second Story Interactive http://911digitalarchive.org/smithsoniancards/visitors_story.php?id=7
- *September 11: Bearing Witness to History: Pentagon Photographs,* by Michael Garcia http://americanhistory.si.edu/september11/collection/record.asp?ID=24
- *Mr. Beller's Neighborhood:* Manhattan Stories/Interactive Map and Stories http://www.mrbellersneighborhood.com/

Next Exit: Interactive Design & Story

"When we refer to digital, we are talking about a utility . . . a tool. We have been given a new set of tools to create and share our stories. The tools are extremely diverse; there are the software, the hardware used, and the actual publishing and dissemination media." Dana Atchley, Next Exit, http://www.nextexit.com With this set of tools what are some next steps in the evolution of digital storytelling?



The impact of narrative on persona and scenario development.

"By making a conscious effort to integrate narrative into our work, we are better able to support creative learning, problem solving, and task completion. At the very least, the experiences we create will be more engaging, both for the project team creating the experience and for the end users. While academic ideas have tended to be realized in immersive user experiences (think gaming, edutainment, and pure design), there has been little exploration of narrative for mainstream (think commercial) interactions, the kind of projects we . . . most of our time designing. The contemporary model of rising/falling dramatic action lends itself to the kinds of user experiences we are creating and helps us to convey those concepts to our clients and team members."

Use of Narrative in Interactive Design, by Nancy Broden and Marisa Gallagher and Jonathon Wayteck on 2004/10/28

http://www.boxesandarrows.com/view/use_of_narrative_in_interactive_design

Next Exit: Narrative in the Design Process

View the above website to see an excellent illustration of the impact of narrative on persona and scenario development, the application of narrative structure in the interactive design process.

Example:

- Where do ideas come from? How do we get ideas? How does we develop a creative process?

  CHAIN Reaction, Belief, Mike Goedecke and Kane Roberts http://www.belief.com

  Rube Goldberg, The Mouse Trap Game, The Honda Commercial – Side by Side Ideas

Next Exit: Future Storytellers — Areas of Growth

Current and future areas of most growth in the application of digital storytelling methodology are, as follows: game design, graphic and episodic novels, interactive mapping and tours, mobile applications, and community-based collaboration. Developing downloadable apps for the iPhone, designing casual games for mobile devices, new students are focusing on a whole new set of interactive experiences, applying episodic elements to storytelling, involving community and peers in collaboration, and creating messages and experiences that call people to solve global problems such as environment, world health, illiteracy, etc. Other areas of interest include storytelling as an interface device with mapping services, way finding, interactive tours, field research experiences, and interactive educational activities that are location-based.

The apt motto of the inspired digital storyteller is "To infinity and beyond. . ." — a theme found in *Toy Story*. These new students of storytelling have a hopefulness and drive that makes teaching and challenging them a learning quest in and of itself.

Next Exit: Memory — The Take Away

Memory: The important take away or free prize at the end of every story! Great interactive digital storytelling mandates that every user takes away a memory, an experience. Success of the story is measured in a story's gift — a memory, an interactive experience, a shared collective moment, a sense of immersion in a time and place. This gift cannot be lost, cannot be taken away or stolen, and cannot be bought. Memory is a user affordance that allows the user or the audience member or the listener to think, add, expand, and relate his/her experiences to all that has come before and will come after.

Conclusion

To complete the cycle of starting with the individual, moving out to the family, the friends, the community, the college, and the world at large and sharing stories that have meaning and have transformed my thinking and teaching and interactive design process, I end with a story. The title of this new story is *Where Now*. My work continues to address image and text, art and meaning, and all the new digital tools and communication technologies as well as the ageless storytelling forms. My focus continues on **collaboration, community and collective experiences.** In the future, I see possibilities in the following ideas:

- Larger than life and its magical effect — the whole is greater than the sum of its parts.
- Accessibility on the Internet — the great communication load leveler, democratization of the message and the voice.
- Immersion, Connection, Engagement — the real possibility of global communication.
- Memory & Experience — the unforgettable moment and its power to teach.
- Authenticity — the Truth that makes us free and gives us confidence to "speak."
- Living in the moment—the now factor.
- The ripple effect – ideas that "percolate" and "ripple" outward from the source.
- The ultimate human qualities – motivation, expectation, ability, flow, and culture!

A good story leaves you wanting more. A good story leaves you insatiable. A good story compels you to tell your stories, to listen for new stories, and to experiment with new tools and ideas of storytelling.

About the Author

Laurie Burruss is the Director of Pasadena City College's Digital Media Center (http://www.pasadena.edu/dmc-pcc). She has taught interactive multimedia design for over 15 years and developed an industry standards curriculum in Interactive Multimedia Design. Partnerships include Warner Bros, Inc., Disney, Lynda.com, Adobe, Apple, and NMC.org. Her program has received many awards and grants funded by NSF, CTEA, and the California Chancellor's Economic Workforce Development initiative in Multimedia & Entertainment. Laurie received her BFA and MFA from the University of Southern California in Fine Arts, and is currently authoring a project-based title for Dreamweaver CS4 @ Lynda.com.

The Adding Machine: Remote Digital Storytelling and Performance

George Brown and James Ferolo | Bradley University

During March 2007, an extraordinary creative event took place that encompassed the work of three universities, four outstanding artist/administrators, over 100 student collaborators from seven academic departments, over 2,000 attendees, a Pulitzer Prize winning dramatist, three high-speed advanced networks, and an unprecedented array of the most sophisticated rendering and communication technology ever assembled for an undergraduate theatre production. For this event, students, faculty, and staff from the Department of Theatre Arts and the Multimedia Program at Bradley University in Peoria, IL, USA collaborated with cohorts over a thousand miles away at the University of Waterloo in Ontario, Canada and the University of Central Florida in Orlando, FL, USA to develop and present a fully mediatized production of Elmer Rice's expressionistic play, *The Adding Machine,* that integrated virtual scenery, broadcast video via Internet2, recorded video, avatar performers, photographs, graphics and sound.

Why Intermedial Theatre?

The Adding Machine was the latest of many intermedial productions that have been created at Bradley University and broke through many story and technology barriers. Our goal was to create a theatrical experience that would extend beyond the physical bounds of the Hartmann Center in Peoria and create a virtual environment that was populated by actors in locations across the country. We believed that through the use of Internet2, we could create a performance fabric that would transcend physicality and location in a significant way that also allowed us to pursue a new style of storytelling.

Written in 1923 by Pulitzer Prize-winning playwright Elmer Rice, *The Adding Machine* is one of America's first expressionistic plays. From a dystopian perspective on technology, the play takes a funny and terrifyingly expressionistic look at the dehumanization of society in a technocratic age. The play's anti-hero, Mr. Zero, is a downtrodden wage-slave. Sacked after 25 years' loyal service as a bookkeeper, he murders his boss who wants to replace him with an (analog) adding machine. He is tried and executed for his crime. After his death, Zero reaches the Elysian Fields, an idyllic countryside, unbounded by the prison walls of human conventions. But Zero has no use for unlimited freedom so he blows his chances of happiness with a devoted co-worker and opts instead to work in a "celestial repair shop" for worn out souls. There he works diligently on a futuristic adding machine for what he expects to be eternity, but after 25 years he is again fired and is sent back to earth, albeit with "Hope," where he will become an even sadder cipher.

In our intermedial approach to the production, Zero is ultimately viewed as a subjugate of technology who is both impacted by and has impact upon the technology in his life and the effect it has upon his existence. Ultimately, the play is about choice and the technology used created a larger palette of "otherness" in a representation of heaven and hell. We believe that the use of technology in the storytelling process, particularly the use of interactive technology and remote performance, will lead to new narratives, more diverse casts, and distributed performance venues. It was this convergence of theatre performance, production, and dramaturgy with multimedia and streaming video technologies that motivated and allowed us to explore the creative potential of Internet2 in theatrical terms and achieve many other artistic, dramaturgical, technical, and educational goals.

The Players

Bradley University served as the creative center and primary performance venue for this production, where around 2000 audience members watched the performance unfold. There were two remote sites that fed telematic performances via Internet2 and our Canadian MOU Partners (the Orion and Canarie Networks) into the primary performance venue: the University of Central Florida, 1100 miles away, where John Wayne Shafer performed from his office; and the University of Waterloo, 800 miles away, where Brad Cook performed in a studio theatre with a wonderful technical support team. Rehearsals and production meetings for *The Adding Machine* were facilitated through various videoconferencing technologies; but for the actual performances, Digital Video Transport System, or DVTS was utilized to great success.

How did it all work?

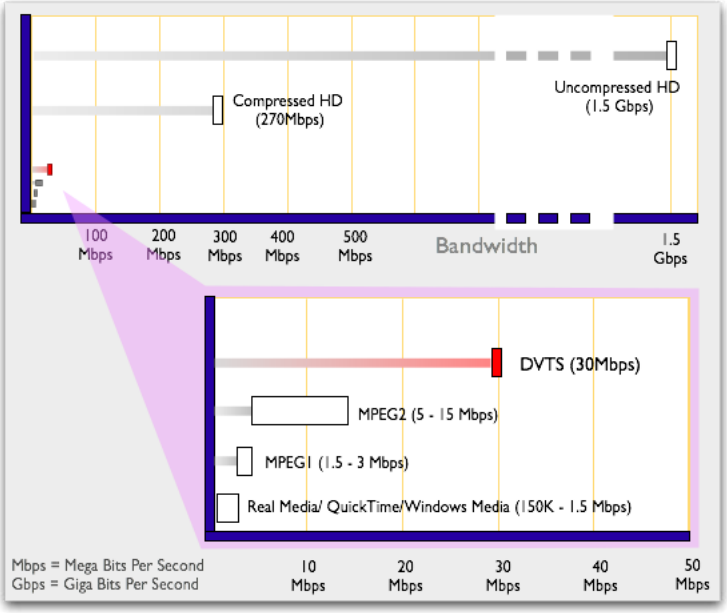
Internet2

This project truly exemplified Bradley University's commitment to the innovative use of Intenet2. The production team collaborated very closely with Chuck Ruck, Associate Provost of IRT and his network personnel who worked tirelessly to handle all the networking issues (at times we were pulling 120 megabits of bandwidth during performance and rehearsal). Through their support, this production became the most significant Internet2 project created at Bradley to date. In 2008, this production was awarded the Internet2 Idea Award, which recognizes innovative advanced network applications that have had the most positive impact within the research and education community.

DVTS and The Network

This project overcame two significant challenges through the use of Internet2 technologies. First was the elimination of geographic isolation. Internet2 and its Canadian MOU Partners (the Orion and Canarie Networks) served as the conduit for real-time collaboration and performance. Actors in some cases actually worked in their offices without any stage or support crews. This non-traditional use of performance space minimized logistical demands surrounding space and support personnel.

Secondly, the networks' bandwidth allowed for the use of uncompressed video transmitted through Digital Video Transport System, or DVTS, minimizing latency and heightening video quality.



DVTS Bandwidth Graph. Source: http://apps.internet2.edu/dvts.html

The integration of high quality video was an imperative for the aesthetics of this production. Actors were performing in real time for live audiences. Without the use of Internet2, the production would have suffered significantly from packet loss disrupting performances and corrupting visual elements.

Additionally, this fully mediatized production pushed the envelope in regards to performance, design, and media processes. Actors from multiple locations were synced in real time through Isadora software and integrated into virtual environments. Those environments were created in resolutions greater than high-definition and were presented in matrixed displays that measured 36 feet wide by 9 feet tall. To blend the real performer and scenery with the virtual environmental and procedural animation and compositing was utilized that would normally found in feature film and Broadway-type productions.

In terms of networking, *The Adding Machine* would not have been possible without the extensive use of advanced networks. Due to the high bandwidth demand for unicast DVTS, this production pulled 120 megabits of bandwidth over extended periods. While a single performance itself lasted only two hours, the production rehearsed 4 hours a day, six days a week for five weeks and the production ran for 6 performances. Total time connected via Internet2 for rehearsals, technical detailing and performances exceeded 100 hours. It also required significant coordination to facilitate the interaction of three separate university network administration systems as well as the interoperability of international partners.

World Class Effort

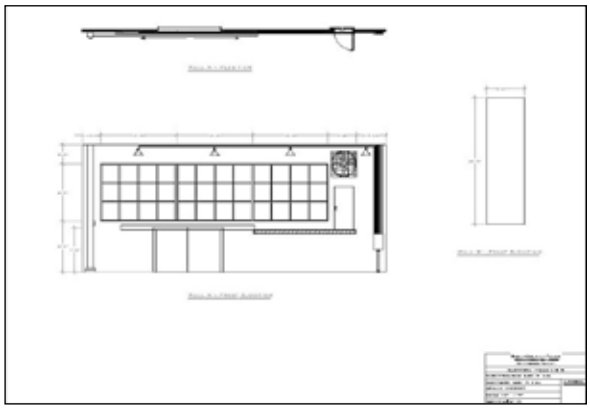
Bradley University's commitment to faculty-student interaction and interdepartmental collaboration, as well as the institution's drive to discover creative uses for Internet2, helped to ensure the success of the project. In her recommendation to the Internet2 IDEA Award Committee, Ann Doyle, Manager of the Arts & Humanities Initiatives for Internet2, wrote this about *The Adding Machine:* "Not since Case Western Reserve's *Kinetic Shadows* dance production during Internet2's 2002 Fall Member Meeting, have I seen anything as innovative in the multi-site performance genre as Bradley University's production of *The Adding Machine.* As Manager of Internet2 Arts & Humanities Initiatives, I am well apprised of efforts to create a unified performance environment across multiple venues. Bradley University's production, in addition to being visually compelling, was a remarkable collaboration of student, faculty, staff and inter-departmental expertise. The production combined virtual scenery, virtual (avatar) and live actors, sound imaging, and graphics across three campuses, with live audiences and gave innovative new life to Elmer Rice's traditional play." She continues: "… Bradley University's production bridged the wired/unwired gap with which institutions of higher education and faculty struggle so mightily. In this project, traditional classic canon was brought to life with cutting edge technology and advanced networking for live audiences experiencing traditional theater-going social engagement within their communities. I suggest this project serve as a model for successfully bridging across multiple domains, honoring both the past and creating excitement for the future." Ann Doyle concluded her recommendation with: "It is worth noting that Bradley University is possibly the smallest student body University Member of Internet2 and has accomplished more

with their Internet2 membership than many of our major research extensive campuses. It is with genuine pride that I strongly support this nomination and encourage the IDEA Awards committee to recognize the effort and innovation behind this amazing production."

The Design

The design process was a blending of traditional scene, lighting and sound design with new media technologies. Our goal was to create a seamless environment that would create a compelling and engaging performance space. Erich Keil led the stage design effort and created an amazing set and accompanying design. The Hartmann Center at Bradley was the main venue and Erich had some significant space challenges to contend with:

- No wings or fly system;
- Modified thrust sightlines;
- Steeply raked house;
- Limited lighting resources and shop space;
- Entirely undergraduate labor force; and
- Need for a large projection surface on a very limited budget.

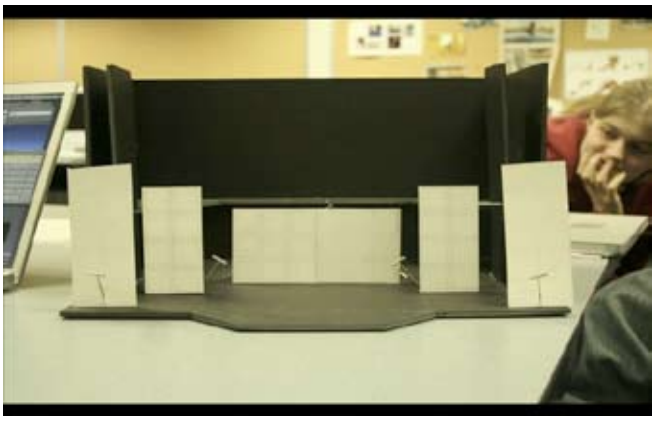


Set design by Erich Keil

Our solution to the physical design included:

- Extending the stage out over those seats with the worst sightlines, allowing for compressed depth of playing space;
- Walling off the upstage half of the theatre to allow for projection throws without esoteric lenses;
- Using Rosco Light Translucent RP which allowed for seamless integration into the scenery, high intensity for dark images, and 160 degree viewing cone;
- Compressing the space allowed for concentration of lighting equipment over a smaller area;
- Placing projector angles parallel to the house aisle to minimize the appearance of hotspots;
- Constructing a wall in simple sections with mullions, allowing for usage of 54" wide screen material at a significant cost savings; and
- Elevating the screen from floor level to minimize washout and allow for traffic patterns backstage.

Erich's design research resulted in a set with a clearly defined visual aesthetic that could support each act and create an environment in which Zero could evolve. The industrial design split the stage into two distinct performance spaces; one on the floor that also provided an entrance and exit to the back of house through split doors, and another platform level that put performers on the same vertical level as the projected media. The grid of windows provided a large span of rear projection surface for the media to play upon. The space was transformed from scene to scene and created a flexible and engaging visual set as Zero moved from life, to heaven, to hell, and ultimately back through the entire cycle again, perhaps not having learned anything at all.



Video: Set design iterations (no audio) *http://media.nmc.org/2008/proceedings/set-design-iterations.mov*

Final set design

Zero, Daisy, and Mrs. Zero

Zero confronts "The Boss"

Zero kills "The Boss"

Zero becomes an "Adding Machine"

Zero is awakened in the crypt by a hooker and her john

Zero and Daisy in the Elysian Fields

Media Design

There was a distinct stage of research and production while creating The Adding Machine that led us through a series of visual concepts that matured in tandem with the skills of the students who worked on the production. During the Fall semester, co-creators George Brown and Jim Ferolo worked with both theatre arts and multimedia students on a variety of visual tests combined with table read-throughs of the script. The process was documented by students and posted to a project website that can be found at http://addingmachine.bradley.edu. The earlier conceptual work provided a "safe sandbox" where students and faculty alike could try new technologies and see how they would integrate with the text. Nearly fifteen students worked on the research phase.

Video: Design and research (no audio) *http://media.nmc.org/2008/proceedings/design-and-research.mov*

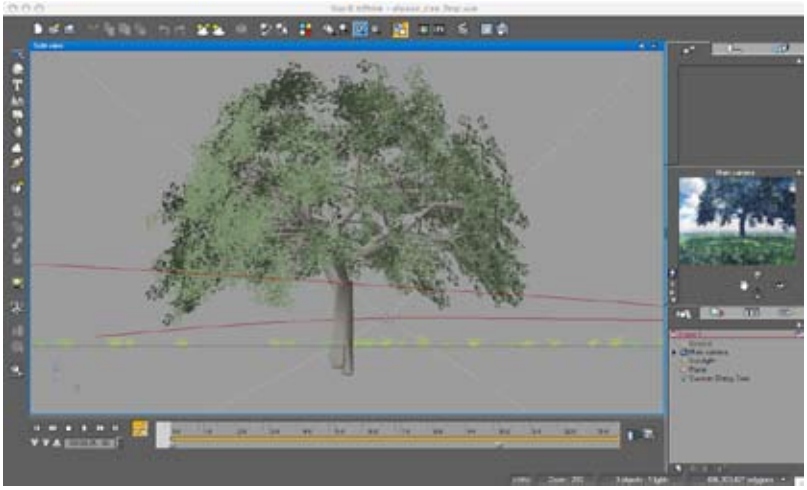
Design was completed over the Winter Holiday Break in 2006 and media production began the first week of the Spring semester in January 2007. Green screen shoots for still and motion graphics sequences were the first activities and provided crucial visual elements related to story plot points. All production was completed within studios at Bradley University on extremely limited sets using HDV and Canon20D cameras for acquisition. Media production elements were driven by a variety of originally created images, public use image databases (Morguefile, Prelinger Archives) and public domain imagery. Image types included video and still sources, composites built in Final Cut Pro and After Effects, 2D/3D CGI created in After Effects and Maya.

Picture editorial was completed in Final Cut Pro with motion graphics compositing in After Effects. The jury scene shows a composite of twelve performances from only 2 cast members.

The jury scene

Architectural CGI elements were modeled and animated in Maya. This scene shows the entrance to the crypt where Zero has awoken with another corpse.

Video: Entrance to the crypt (no audio) *http://media.nmc.org/2008/proceedings//ferolo/cryptintro.mov*

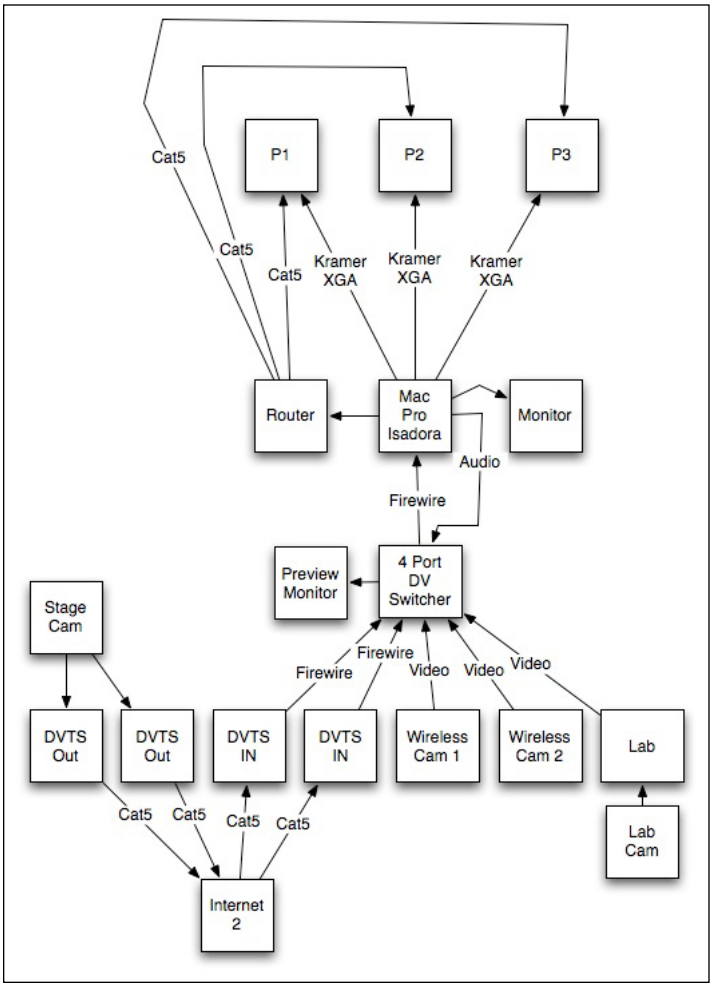


VUE software running a tree simulation

Scenes of Elysian Fields (Zero's Heaven) were designed and rendered as procedural environments using Vue. The software, while computationally expensive, is visually stunning. We used, modified, and credited pre-built stock scenes due to time constraints as show deadlines loomed. The post-production team regularly processed renders into the early morning hours and ended using nearly fifty computers in a "sneaker-net" render farm at Bradley University.

Playback and Display Systems

Media was integrated into the production through the use of projection surfaces, live cameras, and DVTS feeds all integrated through a DV switcher and Isadora show control software that was created by TroikaTronix (see http://www.troikatronix.com/isadora.html).

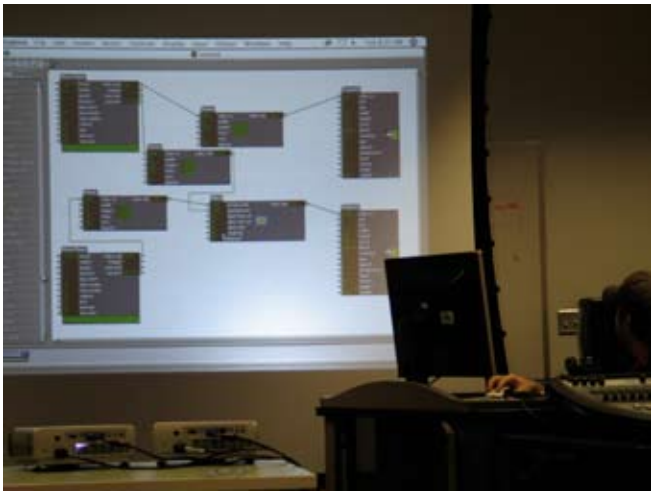


Playback and display diagram

Generally, there were three types of media inputs and one display area on the main stage. Incoming sources included pre-composed CGI and composites, DVTS feeds from Waterloo and Florida, and live DV feeds from studio spaces in Peoria. Overall, there were six PCs used for synchronous DVTS locations, one Mac Pro running Isadora for switching, and another show control PC for non-media house sound. Audio offsets were compensated for within the switcher.

Generally, there were three types of media inputs and one display area on the main stage. Incoming sources included pre-composed CGI and composites, DVTS feeds from Waterloo and Florida, and live DV feeds from studio spaces in Peoria. Overall, there were six PCs used for synchronous DVTS locations, one Mac Pro running Isadora for switching, and another show control PC for non-media house sound. Audio offsets were compensated for within the switcher.

Student operators Lee Flayton (left) and Dave Rogers (right) operate Isadora and DV switcher respectively



Basic Isadora patching test

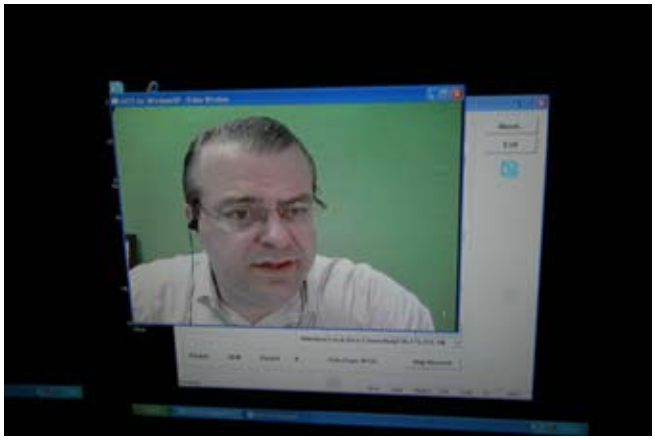
Isadora

Each individual scene required a different Isadora patching setup to accommodate the various sources and live keying components. Isadora is an object-based visual patching system that allows for an incredible amount of flexibility in design and application approaches. However, there were ultimately (3) video outputs from the Isadora system that fed the projection system, regardless of the number of inputs.

All input signals were matrixed together into a single 2400x800 pixel raster (a raster is essentially the overall pixel dimensions of the displayed image).

The full raster was built from three 800x600 display outputs running at 24fps. Composites were built at the full 2400x800 pixel size in After Effects, rendered in uncompressed format, and finally split into 3 distinct video files (left, center, right) using Compressor and Animation as a CODEC. The Mac Pro contained a Raid 5 array that provided the disc throughput and data security needed for the show. We found that there was a slight delay in the right video card because of clock sync issues between the two video cards that were in the Mac Pro. Manual offsets were used to align playback, however, sync errors continually surfaced and were never completely eliminated.

Studio feed in Peoria



Raw DVTS Feed from Orlando before live compositing

Sound Issues

The one DVTS issue that plagued us was sound due to the creation of audio loops. A performer at a remote site would speak into a microphone. That signal was streamed the 1000 miles to the performance site at Bradley via the DVTS. That signal was then amplified and broadcast though our house sound system so both the actors and audience could hear it. With this basic system design, the microphones at Bradley that were used to pick up our actors voices to send them to the remote sites also picked up the amplified voices creating a sound loop that repeatedly echoed across the continent. This issue was solved technically by having the actors in the remote sites use ear buds to break the loop (they still heard themselves, though) and then, with the assistance of local sound expert Rand Kuhlman, we utilized an array of audio compressors and gates to eliminate the problematic loops by making the microphones at Bradley sound-canceling. The solution worked sufficiently that the audience in Peoria did not notice a problem but again, the performers "acted" over several sound problems. Hours of telematic rehearsals helped ensure show timing and execution. Additionally, many of the performances were backed up by an emergency bat-phone connection that was kept open between stage managers at the various locations to troubleshoot and cue, as needed.

Intermedial Performance

Director George Brown and co-creator James Ferolo coordinated the rehearsals, media integration, and communication between the locations and worked to create a seamless experience for an audience that was, most of the time, completely unaware of the performance barriers that were being broken down, but instead enjoyed an engaging and thought-provoking story. Actors for the stage learned how to act for the camera and technologists learned how to improvise in a live environment that often had changing variables every night the show ran. George coordinated the performance and ensured that the technology continually served the narrative and that the many teams and visions came together in a wholly unique intermedial experience.

The Application Impact and Lessons Learned

As James Oliverio, of the Digital Worlds Institute, stated following his viewing of *The Adding Machine:* "This production truly pushed the technology envelope." A technological and artistic accomplishment, this production was also a significant interdisciplinary learning experience that transcended and exceeded national boundaries and academic disciplines; creating a dynamic experiential learning paradigm that opened students' minds to new possibilities of exploring the creative potential of Internet2. The lessons learned by the principals in the production, including all the various teams of students and professional partners, were leveraged into subsequent productions. *Alice "Experiments" in Wonderland,* produced by the same three collaborative partners in January 2008, broke new ground with a simultaneous multipoint performance with the three partner institutions both broadcasting and synchronously mounting their own stage productions. Bradley is currently producing a highly mediatized version of Greek tragedy *The Oresteia* in November 2008 that will utilize 3D projection technology, push SMS technology, and 5.1 surround sound. Additionally, we have begun work researching and gathering partners for a multi-continent telematic production called Voices, which will focus on genocide awareness and intervention, scheduled to be performed in 2010.

We look forward to more technological advancements and are continually searching for partners who are interested in pursuing and developing this exciting new creative form.

About the Authors

George H. Brown *(pictured, right)* has worked in professional and university theatre for over 20 years, filling a variety of positions from Director to Actor to Fight Choreographer. He has directed over 85 productions in theatres across the U.S., the Caribbean and Europe including *The Tempest, Cyrano De Bergerac,* and the world premiere of *Smile Natives, Smile* presented at Carifesta on St. Kitts. While serving as Managing Artistic Director of Island Center for the Performing Arts in the U.S. Virgin Islands, his production of Dance Bongo was awarded the 1993 Best Production Award at the Southeast Theatre Conference. George's production of *Woman in Black* at Fort Worth's Circle Theatre was named Best Production of 1999 by the Star-Telegram. His 2007 telematic collaboration with Jim Ferolo on Elmer Rice's *The Adding Machine* was awarded the 2008 Internet2 IDEA Award. George joined the Department of Theatre Arts at Bradley University in 2002, where he serves as Professor and Chair of the Department of Theatre Arts. He holds an MFA Degree in Directing from Penn State. You can see George's work by visiting his web portfolio at www.georgehbrown.com.

Jim Ferolo's *(pictured, left)* research and production experience has spanned the commercial, educational, and non-profit sectors. With an undergraduate degree in marketing from Northern Illinois University, his interests in interactive content provision and development were nurtured through early web-based advocacy in Chicago while working for the Illinois Arts Alliance Foundation. After completing a research fellowship at the National Endowment for the Arts in Washington DC, Jim returned to Chicago to complete an MFA in the department of Radio/Television/Film at Northwestern University with an emphasis on interactive design and telecommunications policy. Upon graduation, Jim took a position as a visiting professor at Northwestern and worked as a Creative Director at Mythryn, LLC, an interactive communications firm. Mr. Ferolo is an associate professor and director of the Multimedia at Bradley University and co-director of the New Media Center. He is also the creative director at the Iona Group. His research and application currently blends an understanding of traditional storytelling techniques, professional production environments and research methodologies in the development of interactive media systems; intermedial performance, computer-based simulations design and traditional/experimental audio, film and hi-definition video production/post-production.

Building And Supporting a Large-Institution Digital Media Service

Chris Millet | The Pennsylvania State University

In early Spring 2007 Penn State launched an ambitious project to build, within 2 years, 20 centrally supported multimedia production facilities designed for students and faculty across the statewide system. This was a unique venture in many ways, with unique challenges related to the size and geographic distribution of this institution. But surveys we conducted were indicating a significant rise in the need for such a service. As of 2008, 17% of incoming freshmen had created digital videos and 42% of instructors were assigning multimedia projects (Sonak, 2008). Demand at our two existing facilities reflected this change and underscored the urgency to act quickly.

The first phase of the project started in Fall 2007 with 5 facilities, and by Fall 2008 (halfway in) we were at 15 locations. The service, called Digital Commons, has been extraordinarily well received. This paper will discuss the design of this new service and provide practical information for other institutions evaluating a similar program.

The Digital Commons Service

The goal of the Digital Commons service is to provide both facilities and support for digital media production and educationally sound integration of digital media into instruction. This service is provided to both students and faculty at all Penn State campuses, and is managed by Penn State's Teaching and Learning with Technology (TLT) group, a division of Information Technology Services (ITS). ITS is the central IT organization at Penn State.

There are several challenges to offering the type of service we will describe at an institution on the scale of Penn State. They include ensuring the service:

- is equally available to every campus population
- addresses the needs of a very diverse audience
- is centrally managed but respects local expertise and relationships

Additionally, some of the factors guiding how the service was designed are:

- integration with existing infrastructure
- consistency of facilities across location
- scalable support

Integration with Existing Infrastructure

In order for a service like Digital Commons to remain streamlined and agile, we needed to design it around existing services and IT infrastructure. Many of the critical components already were in place within ITS, such as classroom and computer lab management, and distributed file storage and backup capabilities. Other components existed in other units across the University. It was important to identify these integration points early on so we were not duplicating efforts, but rather leveraging them.

Examples of this integration include:

- Classroom and Lab Computing (CLC) group for management of workstation configuration and software and management of shared storage and backup
- University Libraries for equipment lending and physical space for facilities
- ITS Help Desk for support request triage
- Local departmental instructional design staff to provide pedagogical support
- Campus IT staff to provide frontline IT support

Consistency of Facilities Across Locations

In order for a relatively small staff to support 20 locations, every installation needed to be almost exactly the same. This enabled us to prepare standardized support materials, and specialize in the operation and potential issues surrounding a known and limited set of equipment and software. Standardization also ensured that students and faculty would have the same opportunities at each location, with the ability to move between locations without having to adapt their skill sets.

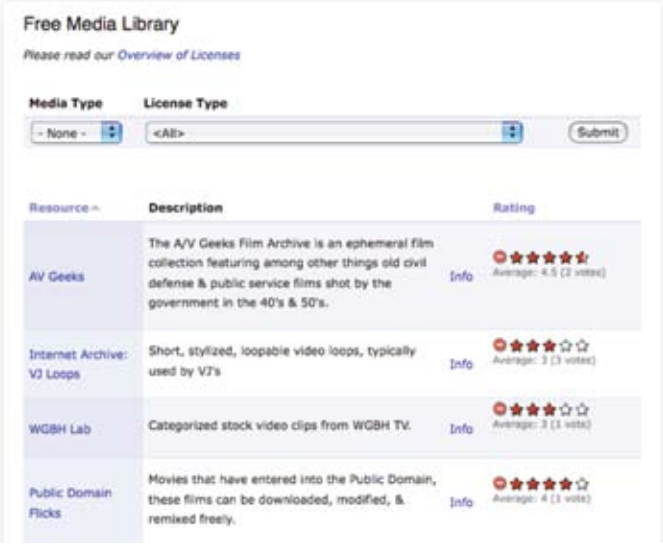
Scalable support

Scaling support is a theme that will be reiterated many times in this paper. Nothing we do moves forward unless we can ensure that it will scale. We define "scalable" as any aspect of Digital Commons that can operate under the upper boundary of predicted demand without sacrificing other aspects of the service. Scalability also assumes a fixed staff size and budget. Buying more equipment and constantly expanding the size of our staff is not sustainable. For example, when we add a new training format, we will project the staffing requirements for providing that format to several large-enrollment (300+ student) classes. If that will not work without significantly cutting back on another critical component such as availability of individual consultations, it will not scale. This is not a problem we have solved across-the-board, but it is behind everything you will read here.

Some Guiding Themes

Addressing Trends in Teen Media Use

The number of freshmen arriving at Penn State having some experience producing digital media is increasing every semester. Additionally, "39% of online teens share their own artistic creations online, such as artwork, photos, stories, or videos, up from 33% in 2004" (Lenhart, 2007). While students who have never authored this type of content still consitute the majority, one can project the trends and imagine a not-too-distant future where students are just as comfortable using technology to communicate visually and audibly as they are writing. As research continues to show the value of using this technology in the classroom, learning early how to effectively support its use as a tool for student content creation will prepare us for this future.



Media Literacy

In her paper "Student Content Creators: Convergence of Literacies," Joan Lippincot states that students from all academic disciplines should be prepared to be digital media authors. And university staff and faculty should promote media, technology, and information literacy in their curriculum "to assist graduates in becoming sophisticated digital-content producers in their professional lives" (Lippincot, 2007). Henry Jenkins, in a report from the MacArthur Foundation, suggests media literacy should not be treated as an "add-on subject" but rather as a shift in "how [educators] teach every existing subject" (Jenkins, 2006). At Digital Commons we hope to serve as a platform for this shift by ensuring instructors of all disciplines are confident about incorporating digital media into their course activities.

One example of our own efforts in this area is promoting the responsible and ethical use of media. Easy access to a global source of creative works via the Internet, much of which is copyrighted or whose use is restricted in some way, combined with the fact that "about one in five internet-using teens (19%) say they are content remixers" (Lenhart, 2007), reinforces the need to educate students on this subject. We do this by providing information about copyright law, Fair Use, the TEACH Act, and Creative Commons during consultations and other training. We also educate students on alternatives to illegally using copyrighted material in their projects, such as the many repositories of Creative Commons-licensed media.

Educationally Sound Use of Digital Media

It is important that sound teaching and learning practices be integrated into everything we do. Providing resources that are not just technical in nature but that inform instructors on subjects like how to engage students, how to design an effective video project, or how to design rubrics to help assess those projects is essential. There are some cases where learning the technology (or digital literacy) in and of itself is the goal. In most cases though, digital media is used merely as a means to help students learn concepts not directly related to digital media. Beyond anything else, for us to consider ourselves successful, the technology must be facilitating pedagogy.

Service Design

In this section I will explore some of the major elements of the Digital Commons service.

Facilities

Each installation consists of a studio, an editing suite, and networked storage. The studio space is designed for audio and video capture (equipment can also be lent out for field work). The editing suite is designed for post-production, editing, and publishing. Ideally a studio will be in a permanent dedicated space, although all equipment was selected to be portable and store-able for cases where dedicated space cannot be secured. Editing capabilities can also be incorporated into existing computer labs as it is primarily specially-equipped desktop computers.

Installations consist of the following equipment:

Studio

- (1) Large and (1) small collapsible green/blue screen (two-sided)
- (2) High-definition camcorders with integrated hard drive and SD-card slots
- (1) Studio lighting kit
- (1) Podcasting bundle (2 high-quality condenser microphones and pre-amp)
- (1) Digital still camera

Editing Suite

- (2) 24" iMacs, 750MB HD, 4GB RAM
- (1) Podcasting bundle (2 high-Studio
- (1) DVD/VHS Deck

Networked Storage

- (1) 2TB RAID5 networked storage server

Note: Additional equipment such as cables and adapters is not listed here.

Each installation is on a 2-year refresh cycle. At the end of a cycle new technologies are added to either augment existing or replace outdated equipment. Installations that see especially high usage will receive some additional equipment.

In addition to the equipment Digital Commons itself provides, studios are typically installed near existing computer labs. As most of the labs have standard software builds including multimedia-authoring software, they can serve as an extension of or primary studio and editing suite.

Personnel

Digital Commons personnel includes a dedicated core team as well as staff from other units who dedicate a portion of their time to the program. The core team consists of a small group of consultants, one instructional designer, and a program manager. Consultants train on A/V hardware and software and production processes, as well as provide best practices for applying this technology in an educational setting. The primary function of instructional design staff is to ensure that the work consultants do is instructionally sound and meeting the needs of students and faculty.

Additional supporting staff include those who maintain our IT infrastructure including workstation builds and our networked storage solution, campus IT staff to provide frontline IT support, and campus instructional design staff to provide both technical and pedagogical support locally.

Overview of Support Model

Consultations and training are conducted from our facilities at University Park and at individual campuses, and can be face-to-face or remote. Consultants responsible for supporting campuses regularly travel to those locations, and continue to provide remote support when they are not able to be physically present. It is a considerable commitment to travel this often, and get to each location frequently, but by training local staff and providing high-quality virtual support this issue is largely balanced out.

In order to address a wide range of learning styles, skill levels, course sizes, depth of training needs, and time and geographical constraints, we have attempted to diversify our support options as much as possible. We offer face-to-face consultations, train-the-trainer sessions, remote technical support, web-based tutorials, and small-group workshops.

Face-to-Face Consultations

One basic guideline of face-to-face consultations is that we try not to ever touch the user's keyboard or mouse. The interface and workflow of most multimedia authoring software can be daunting for first-time users, and it can be easy to get lost observing a very experienced consultant work through a long sequence of actions.

Training the Trainer

Local IT and instructional design staff at each installation site receive training on the operation of equipment and software. This training is continually updated as consultants travel to a location, and local support staff takes extensive advantage of remote support. They are also equipped with much of the same standardized training materials as our core team of consultants. So after receiving sufficient training from our consultants, they are soon able to provide their own local training.

Remote Technical Support

Remote support, done right, can approach the utility of face-to-face support. Typically this involves consultants sitting down with a user and walking through a software package with them to explain some aspect of its usage. These consultations are equal part software training and techniques for effectively applying features of that software to a problem. In these cases, online tutorials might not be sufficient. On the other hand, workshops or other intensive training might be overkill. The basic requirements of delivering effective technical assistance are that the consultant and user can both see the user's screen, and that they can verbally work through the problem together. Since many of the Digital Commons facilities are geographically dispersed, we achieve this level of support by using remote screen sharing via VNC (Virtual Network Computing).

When students or faculty call our phone support line, they are asked to enable screen sharing by clicking on an icon on their desktop. Digital Commons consultants can then connect to that computer, see the user's screen, and control the mouse pointer.

Web-Based Tutorials

The Digital Commons website hosts over 120 tutorials, both in text and video formats. These tutorials cover basic to advanced usage of every piece of audiovisual equipment and software we support. Each tutorial is highly focused and modular. Some examples would be: "Importing video from the Sony HD camcorder onto an iMac" or "Exporting for Powerpoint from iMovie."

Workshops

Digital Commons began offering small-group workshops in Spring 2008. This coincided with a period of increased usage and was as much a reaction to being saturated by one-on-one consultations as it was foresight into the long-term demands on the service. Group workshops were a straightforward solution to the need to increase the impact of limited resources.

One can look at our typical workshop as an exercise in bootstrapping, or getting a lot done with minimal resources. In terms of the support services Digital Commons offers, bootstrapping refers to the short (1 hour), intensive workshops we provide with the objective of motivating a student and providing them with enough instruction that they're confident to take the first real steps on their own. It's "just good enough," not in the sense of being low-quality – indeed our goal is to have exceedingly high-quality training – but of looking at the problem holistically, prioritizing how we'll spend our resources, being honest about practical limitations, and making certain concessions so we can focus on catalyzing a self-sustaining process: a student with the tools, skills, and motivation to be bold and creative.

This process will not result in a student with any depth of skill, which is of course not the intent. Our assumption is that without the initial interest and motivation, we cannot expect the sustained attention required to complete the rote process of working through steps sequentially to learn how to operate a new video editing software or high-definition video camera. In our observations, this isn't even the next step students take after leaving a workshop. They're not hungering to go home and watch a video tutorial online. They want to begin creating, and they now know enough to get started. And just as significant, they know enough to know what they don't know. They can form at least a rudimentary mental model of what they want to accomplish and self-reflect about what skills they lack to get there. This self-reflection might not yield any self-improvement behavior until they've initiated a project and worked right up to a roadblock, when the problems (and their limitations) are a little more defined. What we provide in this context via our web-based video and text tutorials is focused instruction that answers a specific need at a certain moment. Their skill-set can be further deepened by additional workshops or one-on-one consultations. Since our objective is quality that scales, this "a la carte" approach ensures that we can provide targeted support with little wasted effort.

Faculty may request a consultant to come to their classroom and train their students on a specific topic. Once again, this training is based on our standardized set of training materials. However, most classrooms are not equipped for hands-on workshops. In-class training sessions are instead preceded by an introductory overview of the target software packages. This overview is available online in self-paced tutorials, as well as modules which can be imported into ANGEL, our course management system, and can be included as assignments in a course. When consultants enter a classroom they can assume some prerequisite knowledge is in place. The in-class session then concentrates on higher-level skills such as media production workflow, time management, and teamwork strategies. Consultants will also answer questions, inform students on how to schedule individual or group consultations, and introduce them to other resources to further self-paced learning.

All workshops can also be presented online with Adobe Connect. Sometimes the remote location will use a projector in a computer lab so that large groups can work along with remote training like this. Most often, however, online training cannot be as hands-on as our typical training sessions and is geared more towards a higher-level overview of technology and best practices.

Strategies for Scaling Support

In order to streamline our operation, we implement strategies for ensuring the support we provide matches the needs of our students and faculty. For example, all Digital Commons consultants are trained on our standard set of software and are equipped with a standardized set of training materials geared toward a variety of presentation formats. When support requests are made, either via phone, email, or walk-in request, they can be responded to in the most effective way for a particular situation. For example, if a student comes to us for help with a class project, we first try to determine the course and instructor. This information allows us to contact the instructor and work with them to decide if an in-class workshop might work or if they can help us facilitate consultations in groups. This effectively reduces the amount of consultation time required, sometimes by orders of magnitude. It also removes a burden from the instructor knowing that all her students have the same baseline skills going into a project. In this case, we address the needs of the instructor and the class as a whole, and we continue to be available for more individualized help if that is still needed.

Reproducing The Digital Commons Model

We propose that it is possible to implement a program like Digital Commons with a modest budget at institutions with a wide range of population sizes and geographical makeup. In this section I will present a set of guidelines distilled from our experiences at Penn State. I will also provide a sample configuration for a low-cost studio that is designed to meet most faculty and student needs.

Best Practices

I have attempted to generalize our experience at Penn State and provide a series of guidelines that should be useful for any educational institution wishing to implement a service similar to Digital Commons, or to revamp an existing service to take advantage of some of the lessons we have learned. These guidelines are largely a summary of what I have expanded on in this paper.

1. **Standardize on *what* you support**
   Decide on a standard set of A/V hardware and software that meets most of your audience's needs, and build your support offerings around that. Do not get into the habit of bringing every esoteric piece of software a small handful of users might want to use into the mix. Standardization brings sanity to your operation and enables you to create and significantly reuse training materials.

2. **Diversify *how* you provide support**
   Standardization on what you support also frees you up to be creative about how you provide support. Adapting your training materials to different audiences and environments (even if they're virtual) is much easier than creating it from scratch.

3. **Learn about your audience**
   Conduct focus groups and run surveys. But consider more informal means of gathering feedback as well. Leave 5 minutes at the end of a workshop to allow users to fill out a 5 or 6 question evaluation. Keep detailed consultation logs in a content management system that will allow you to search, sort, and generate reports. Adapt to this information incrementally and continuously. The skill-sets, interests, and habits of incoming students change with every new class.

4. **Broaden staff skill sets to include pedagogy**
   Instructional designers usually have technical skills in addition to an understanding of educational theories and instructional processes. However, the opposite may not always be true for technical specialists, even those that are hired into positions in educational institutions. Since these people may provide most of the frontline support, make sure to provide professional development opportunities and time for interaction with instructional designers. Even if the service is highly technical, sound pedagogy should be part of everything you do.

5. **Build a high-quality, low-budget studio**
   Good media production hardware and editing software doesn't have to be expensive. Cameras and microphones are constantly dropping in price, and most consumer-level software can be acquired at academic prices or for free if you choose one of the many open source options.

Shoestring Studio Configuration

The objective of this studio design is to meet the needs of a large majority of potential users. The equipment in our shoestring studio was selected to balance several factors, including cost, ease-of-use, quality, and portability. Our overall goal was to create a single facility that offered a range of capabilities from "quick and dirty" multimedia production to something capable of nearly professional results, and to offer this to as many simultaneous users as possible. In our experience, this equipment and software is the same or equivalent to what is utilized in about 90% of the observed usage at Penn State.

Our shoestring studio setup consists of the following equipment:

Item	Purpose	Cost*
Studio		
Collapsible Blue/Green Screen	Chroma keying, digital background compositing	$99-$129
HD Camcorder	High-end video capture	$850
Mini-Camcorder	Low-cost camera for lending/field work	$139
Makeshift Studio Lighting Kit	Lighting studio and green screen	$200
Editing Suite		
Refurbished 20-24" iMac	Post-production, editing, publishing	$1000
Podcasting Mic	High-end audio recording, multiple sources (group podcasts)	$150
Headset	Low-cost podcast recording, individual	$17
Software		
iLife Suite (iMovie, iDVD, Garageband)	Basic video and audio production, DVD authoring	$0 (included with iMac)
Final Cut Express	Pro video editing, required for chroma keying	$69
Visual HUB	File format conversion	$23
Perian	Quicktime plugin for reading a variety of video formats	$0 (open source)
Photoshop Elements	Basic photo editing	$61
Adobe After Effects	Video compositing and effects	$128
Adobe Flash	Interactive media	$119
Audacity	Audio editing	$0 (open source)
Support Tools		
Chicken of the VNC	Remote screen sharing	$0
Drupal	Content management system for publishing support materials, community development, etc.	$0
Adium (Mac)	Multi-protocol IM for remote support	$0

**Prices as of September 2008*

Conclusion

There are many different models for student and faculty digital media services other than the one I have presented in this paper. The model for Penn State's Digital Commons addresses the need to serve a very large and geographically dispersed audience in as scalable a manner as possible. However it is my hope this overview of our service may serve as a guide to other educational institutions.

References

Jenkins, H., Clinton, K., Purushotma, R., Robinson, A. J., & Weigel, M. (2006). Confronting the challenges of participatory culture: Media education for the 21st century. MacArthur Foundation. Available at http://www.digitallearning.macfound.org/

Lenhart, A., Madden, M., Macgill, & A., Smith, A. (2007). Teens and Social Media. Pew Internet & American Life Project. http://www.pewInternet.org/PPF/r/230/report_display.asp

Lippincott, J.K. (2007). Student Content Creators: Convergence of Literacies. Educause Review, November/December 2007, 16-17.

The Pennsylvania State University. Penn State Fact Book. Retrieved from http://www.budget.psu.edu/FactBook/StudentDynamic/EnrollmentFallToFallComparison.aspx?SemesterCodes=200607FA200708FA

Sonak, B., Williams, V.S. (2008). Survey of Technology Use at Penn State By Faculty, Staff, and Students. Available at http://tlt.its.psu.edu/about/surveys/2008/

Additional Information

Details on studio configurations, as well as a recording of the original presentation and other resources can be found at: http://digitalcommons.psu.edu/nmc

About the Author

Chris Millet has worked in the field of eLearning and Educational Technology for 9 years. He is the Manager of Advanced Learning Projects at Education Technology Services (ETS), a division of Teaching and Learning with Technology (TLT) and Information Technology Services (ITS). His responsibilities include managing Penn State's Digital Commons and Podcasting services and exploring new technologies and their potential impact on teaching and learning. He is currently conducting research into the educational impact of student-generated multimedia.

About Penn State

The Pennsylvania State University is a statewide system of campuses, enrolling approximately 85,000 students and employing over 5,600 faculty members. The institution consists of 20 geographically disbursed campuses: 19 Commonwealth Campuses and an administrative hub at the largest campus, University Park. A chancellor provides oversight at each campus. Many aspects of campus operations function semi-autonomously from University Park.

DAM If You Do!
BlueStream Digital Asset Management Infrastructure

Louis E. King | The University of Michigan

Digital media is emerging as an essential component of modern discourse (Lessig, 2008). Rapid expansion of the digital universe (Gantz, 2008; Weber, 2007) is driving a shift in media creation from select producers to the general public. Evidence of this abounds in large online forums such as YouTube, Flickr, FaceBook, WordPress, and Blogger, as well as secured collaborative environments – such as Sakai, Blackboard, Drupal, Joomla, and MediaWiki.

High social and technical barriers frequently deter a broader use of media across multiple venues and hinder the ability of individuals to engage in meaningful ways. These barriers are no more evident than they are in higher education where the complex social construct consistently raises concerns regarding privacy, copyright, intellectual property, students' rights, and patients' rights. Technical issues further aggravate the landscape by isolating pools of digital information in segregated technical "silos" with no manner of management, interoperability, or reuse possible.

The University of Michigan's BlueStream Project is developing enterprise infrastructure to lower these barriers, to foster innovation, and to increase productivity in media intensive learning, teaching, research and service. Robust media services streamline the construction and collection of rich digital assets and extend the digital repository into the numerous and varied working environments of the community. Researchers, instructors, learners, and staff spend less time building technical platforms and focus their attention on advancing academic work in innovative ways.

Rich Digital Assets

It is helpful to explore the BlueStream concept by beginning with the basic building block – the digital asset. Many systems consider the digital asset as a single digital file. BlueStream redefines the digital asset in a more comprehensive way, similar to that described in *A Framework of Guidance for Building Good Digital Collections* (NISO, 2005). It consists of the original digital file, subsequent versions, alternate file formats, data generated through media analysis, file level metadata, time-coded metadata, and fine-grained access control (See Figure 1: Anatomy of a Digital Asset). A digital asset is not solely the original file. It is a construct that correlates the original to its associated versions, derivatives, analysis data, and metadata.

Figure 1: Rich Digital Assets

This data model provides a mechanism for accumulating and managing every version and format of a file in a single place through a common management interface. It truly streamlines the workflow and reduces confusion that can arise from storing multiple versions of multiple files in multiple places. In addition, once centralized, it is much easier to build specialized services for analyzing and transcoding digital media. Automating these processes eliminates a major barrier by shifting "heavy lifting" from end-user desktop machines to enterprise servers. This results in large productivity gains in media intensive work.

Extensible Digital Media Repository

The power of this data model is not in productivity alone. It supports the collection, organization, search, and retrieval of assets in BlueStream's working repository. The term "working" is used to differentiate BlueStream from the Digital Library and the Institutional Repository. Unlike these other repositories, the contents in BlueStream are the every-day working materials of the academy that have not yet been vetted and chosen for long-term preservation. In fact, many of these assets may have extremely ephemeral life spans. If they should be chosen for inclusion in the permanent collections of the University there is a BlueStream workflow to handle that. Interestingly, the Institutional Repository uses BlueStream to create and host the "circulation" copies of digital video while maintaining Library stewardship over the preservation copies.

It is much easier to derive value out of a digital repository if it is embedded in the working environment. No one enjoys the cognitive disruption of changing tasks to hunt down a needed resource (Buchanan, Blandford, Thimbleby, Jones, 2004). BlueStream extends the repository into any of the working environments of the institution through web services architecture. This provides a quick and easy way to interoperate. For instance, a simple query or selection can call the materials needed for a particular web environment, pare them down to the optimal components desired, and remix them into an existing or customized environment (See Figure 2: Extensible Repository). Web services architecture provides a simple method for easily building effective interfaces to shape the academic experience (Suleman, Feng, Mhlongo, Omar, 2005). The combination of an extensible media repository and easy to build interfaces represents a tremendous opportunity for innovation.

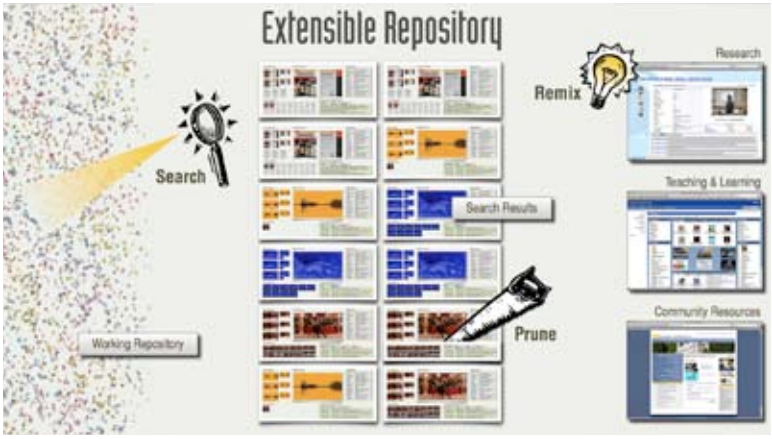


Figure 2: Extensible Repository

Bottom-Line Productivity

The academic environment is a sophisticated blend of face-to-face and technology mediated activities. The technology is ever changing and wide-ranging across physical facilities, communications networks, and the Internet. Customized environments are used to harness the power of human and information networks to support best practices in specialized endeavors.

The current practice in custom software development is for each application to invest in building a complete technology stack from the ground up. Every media-savvy application must develop its own software stack to store control, process, organize, and describe media objects. This translates to academic teams spending a great deal of time building technology at the expense of innovating (See Figure 3: Current Development Practice).

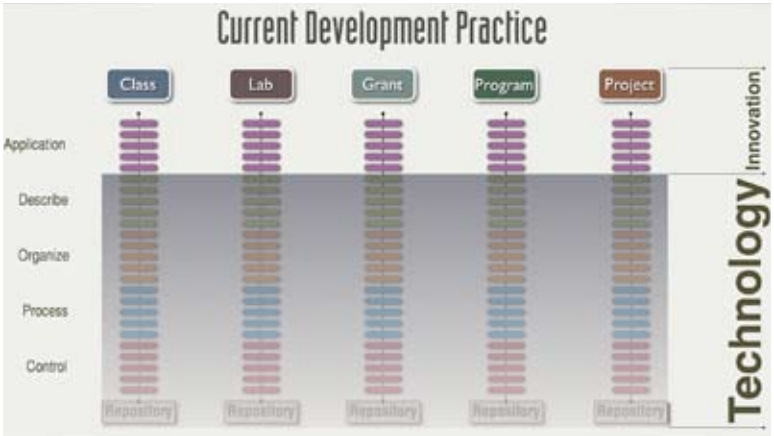


Figure 3: Current Development Practice

BlueStream provides a common digital media infrastructure for any application to build on. Developers can quickly and easily access these capabilities through web services and bring robust media handling to their own constituents. The whole community can coalesce around a common infrastructure to fulfill a common need and do so by applying sufficient resources to this solution rather than spreading resources thinly across numerous, weak, and partial attempts.

Scaffolding academic activities through a common media infrastructure drives technical development and academic production efficiencies that deliver sorely needed bottom line results in productivity to higher education.

Investment Assurance

The shift to "born digital" academic materials coupled with increasing productivity is swelling the collection of digital working materials to unprecedented levels with no end in sight. These working documents, rough as some may be, are evidence of a prodigious individual and institutional investment. Created, vetted, and used daily, by everyone in the academy, this is where "the rubber hits the road." As these digital materials amass within the institution, and they are, it sets an imperative to consider what needs to be done to protect this investment.

A number of factors make this difficult. 1) The academic work itself, distributed across thousands of classes, research teams, projects, institutes, museums, and libraries is enough to confound and confuse any effort to organize the digital workspace. 2) This environment has spawned hundreds and hundreds of computer systems each having independent software, hardware, and networking lifecycles to manage. 3) Academic technology is managed by a corps of experts loosely knit into a structure akin to the academic units they serve. 4) Academics and technical staff have sufficient transience to disrupt institutional memory, leaving orphaned works and inoperable systems behind.

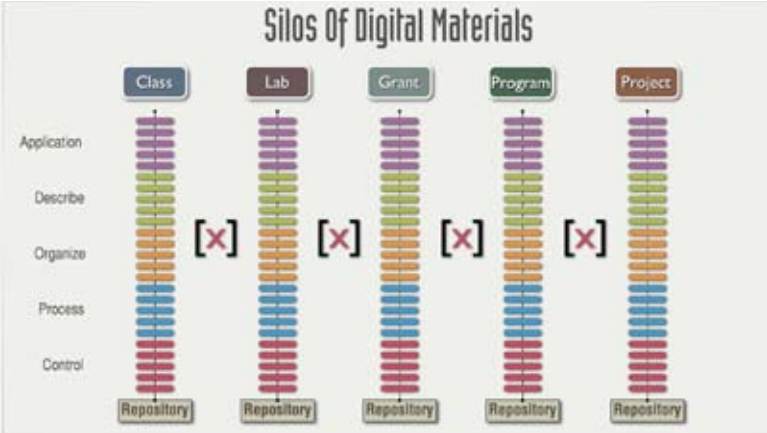


Figure 4: Silos Of Digital Materials

It is not surprising that these conditions have led to digital materials being scattered willy-nilly across the academy. The distributed nature of the institution and specialized nature of the work has naturally spawned a distributed systems development approach resulting in thousands of independent systems. Each system represents an isolated silo of potentially valuable digital materials nearly absent of institutional management, interoperability, or reuse (See Figure 4: Silos Of Digital Materials).

Digital materials used in the daily practice of the academy are at risk!

Ecology of Innovation

The BlueStream infrastructure supports a paradigm shift in which academic teams can build discipline-specific applications atop a sophisticated and robust digital media infrastructure. They do not need to spend time and money building and rebuilding technology stacks to support digital materials. The infrastructure, akin to plumbing for digital media, will handle that (See Figure 5: Digital Media Infrastructure). As with plumbing, it is not necessary to understand the minutiae of the thousands of components that make this happen. After all, who really cares? As long as the media flows when the tap is opened, not a soul.

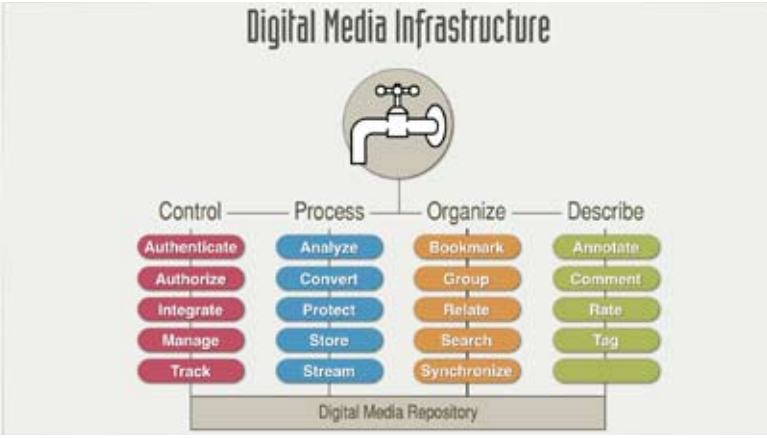


Figure 5: Digital Media Infrastructure

Freed from the burden of building technology from the ground up, freed from materials trapped in silos, freed from the cumbersome characteristics of media files, and armed with the power of new infrastructure, academic teams can turn their attention to shaping experiences that achieve

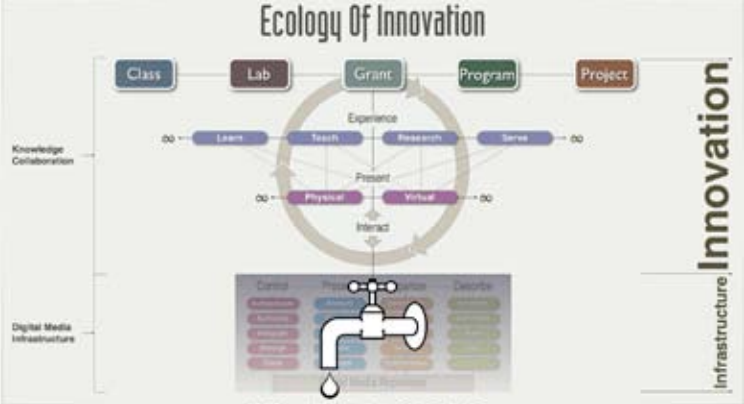


Figure 6: Ecology Of Innovation

their academic goals. In turn, these goals continue to drive the ongoing development of infrastructure. Nardi and O'Day (1999) describe this iterative process as a fundamental component in what they call the Information Ecology. The BlueStream project has embraced this concept and has formalized processes to foster these iterations and in so doing, support ecology of innovation (See Figure 6: Ecology Of Innovation).

Works In Progress

The BlueStream project accepts 25 to 50 applications per year for project space and support. Members of the university community involved in driving or supporting academic outcomes in research, teaching, learning, and service may apply. A portion of the funding line from the Provost's office is set aside to support smaller projects. This streamlines the process of rapidly producing results for known and contained media-intensive activities at the grassroots level. Larger projects are produced in partnership with academic units and are financed through a combination of unit level and BlueStream funds.

In addition to funding, participating units are required to assign academic technology support within the unit to the project. This "BlueStream Affiliate" is a key player in the train-the-trainer model. Affiliates provide a technologically conversant liaison to local culture, a conduit for units to influence the specification of BlueStream, and support for local knowledge exchange that spreads technical and media literacy via a sustainable model.

The following projects provide a glimpse into the type of work BlueStream enables. Take note of the depth and breadth of just these projects and keep in mind that there are currently over 35 active projects like these. In the long run the architecture currently in place can scale to a comprehensive enterprise infrastructure for the entire University of Michigan community.

Projects

Latin Tinge

Latin American Culture – Literature, Science, and the Arts

Professor Jesse Hoffnung-Garskof has always used media in teaching his courses in Latin-American culture, albeit with a considerable amount of fumbling over disks, tapes, and equipment.

He saw the BlueStream digital media infrastructure as an opportunity to do more than improve his delivery of lectures. It was an opportunity to transform the learning experience, to attract a greater number of students to Latin-American studies, and to feed the master's level program in his department.

Figure 7: Latin Tinge Course Website

The new Latin Tinge course has a corpus of over five hundred video and audio artifacts, carefully chosen to support student exploration of culture through sequences of musical forms – rumba, tango, samba, son, mambo, and salsa. The course web site provides a structured, week-by-week, presentation of the materials within cultural contexts presented by the professor. Students exchange their thoughts on required listening through blog postings. Students can navigate freely through the collection to synthesize understanding and find artifacts that support their own viewpoints. Students are required to find interesting and relevant cultural artifacts, add them to the collection, and tag them appropriately. Collectively, they add about 2,000 items per assignment and use them in conjunction in response to writing assignments.

Figure 8: Latin Tinge Student Submissions

High quality lecture materials are downloaded from the repository in advance of the class (no fumbling required). More importantly, much of the listening is done outside of the classroom. In its stead, drum and dance experts are invited in and the whole class learns the steps and beats of Latin American culture in much the same way that the heritage has been passed down from one generation to the next.

Learning objectives are being met and the class is very popular. The learning environment and teaching methods have scaled nicely to support a class size of 150 students. Building upon the BlueStream infrastructure, Professor Hoffnung-Garskof has transformed his undergraduate class into a signature course in Latin Culture that attracts large enrollments, prepares students for critical thinking in advanced study, and serves as a gateway to the graduate program.

Standardized Patient Instruction – Reflective Learning
School of Dentistry

The School of Dentistry has an eight-year record of proven efficacy in improving health care provider communication skills through a Standardized Patient Instructor (SPI) program. SPIs are utilized to simulate patient interactions for students. Typically, students are given an exercise to prepare for the simulation, go through the experience with the SPI, complete a self-assessment, and discuss the assessment with the SPI immediately after the simulation.

A pilot project was established to record video of these exercises and see if the recorded materials could advance the learning experience further. Dozens of exercises were taped. Unfortunately, the usual barriers to using media – recording, storing, securing, processing, and retrieving – thwarted the use of all but a handful of "best-case" examples.

This semester Professor Mark Fitzgerald will takes advantage of the BlueStream infrastructure to support the video component. Students will prepare for their simulation online by watching staged examples, will identify different segments that demonstrate both good and poor practice, and will write justifications for their conclusions. Hour-long simulations for 50 third-year dental students and 20 SPIs will be recorded, automatically uploaded to BlueStream, tagged with metadata, analyzed for voice-to-text indexing, secured with access control, and made available through the class web site. Students will review their own simulations, select clips that demonstrate when they were effective and when less effective, and write explanations of their conclusions. In turn, SPIs provide feedback on these assessments.

Figure 9: SPI Simulations

Figure 10: SPI Online Clip-making

Professor Fitzgerald summarizes the advantages to this approach as follows:

- Improved self-assessment skills of students through review of past performance and planning changes for future performance
- Improved performance skills by facilitating "reflective practice" prior to SPI interaction sessions
- Documented "competency" in various communication skills as a required step toward graduation
- Improved effectiveness of SPI feedback by allowing indexing and annotation of specific examples of effective or ineffective performance by students in simulated and real interactions
- Enhanced student e-portfolios through inclusion of videos demonstrating student personal communication skills and their associated reflections.

BlueStream makes it possible to produce this project of substantial scale and scope with very little lead-time. The only considerations beyond the infrastructure are metadata schemas, workflow, customized interfaces to support the learning method, and training and support for the community. In the end, the course assessment will determine if the learning objectives have been met. In the meantime, BlueStream affords another opportunity to explore compelling and innovative methods.

Grant Opportunities [Collaborative Spaces]
Digital Media Commons – Office of the Provost

GROCS is a program to fund interdisciplinary student research in the use of digital media in collaborative learning. Academic outcomes and collaboration are a significant and integral part of each exploration. Four to five teams are funded per year. Students receive a cash award, equipment, and a flexible learning environment to assist them in meeting their rigorous objectives within a single semester.

One of the most frequently noted benefits of sharing a learning lab is the serendipitous crossing of paths that bring people together who ordinarily would not meet. These connections enhance the collaborative nature of the physical environment and build cross-team communications. Careful observation has revealed that many of these connections are made outside of planned programmatic activities. In fact, it is the evidence of work left behind in the form of artifacts that attract interest and spawn connections. In this environment the artifacts might be just about anything –white boards, screen presentations, models, artworks, photos, costumes, circuit boards, toys, and specialized equipment.

Student research continues all week long although time spent in the lab could be fleeting. Therefore, it is essential that collaboration and discovery fluidly traverse the barriers of the physical learning space and the online learning environment without interruption.

BlueStream has been instrumental in easing the traditional difficulties encountered in such circumstances. Students are able to rapidly drag and drop video, images, audio, and texts into the digital repository. A minimum of metadata is automatically added, access control is automatically applied, and multiple formats are automatically made. Since the working repository is metadata driven, students use search terms to locate their materials. A search for a term, as opposed to a team name, is likely to produce a results list with artifacts from other teams that have been tagged in similar ways. The fuzziness of the search, in some way mimics the serendipity of paths crossing in the physical environment.

Figure 11: GROCS Blog

Figure 12: GROCS Blog

BlueStream also strengthens team collaboration and communication by extending the digital repository into the team and program blogs. The University Library hosts these blogs but does not support the large media files typically used by this community. Teams need only change the access control flag to public view and the media will automatically appear in a media tray on the blog. Media hyperlinks are not used in the blog. Instead, search terms are shown in bold and when executed return the specific file as well as files with similar tags from other groups. In this way, the blog perpetuates the collaborative nature of these investigations through their public-facing communications.

Secondary Master of Arts with Certification (MAC)
School of Education

It is no longer sufficient to prepare students of education to be excellent teachers! Simply put, it isn't possible to train and place enough high-quality teachers to make sufficient improvement. The University of Michigan School of Education addresses this concern by developing students to be skilled, critically reflective, and inquiring educators capable of becoming change agents wherever they are placed.

One proven method for developing all of these skills revolves around the synthesis of understanding through "records of practice." Records of practice include a wide range of materials that are central to classroom teaching. These include traditional records such as attendance, grades, and assignments, and non-traditional documentation such as video of lessons, recordings of student-teacher interviews, photos of board work, bulletin boards, posters, and project work, scans of student homework, tests, written work, teachers' lesson plans, and teachers' notes.

The Secondary MAC program requires all 50 students to carefully collect, share, and study records of practice from observations of a mentor teacher as well as from their own teaching. BlueStream supports the great variety of media types involved, streamlines the collection process, and drives collaborative use of the class-wide collection of records. The digital media collection focuses classroom discussion, supports small group work, and provides evidence in the form of rich media to support arguments made in student writing assignments.

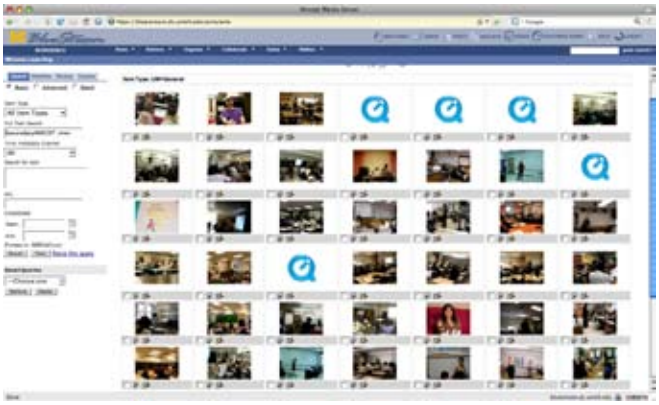


Figure 13: Secondary MAC Collections

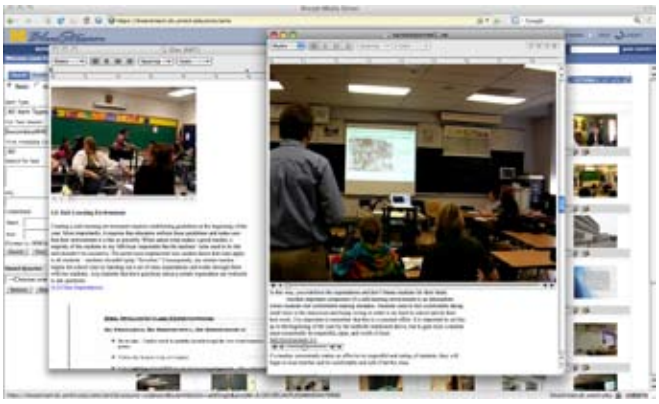


Figure 14: Secondary MAC Multimedia Writing Assignment

Many of the programs in the School of Education are adopting the "Records of Practice" method. The activities are engaging, the time spent on technology is minimal, and the learning outcomes are fantastic. Ordinarily, success of this kind is difficult to scale to ever-growing audiences. In this case, building atop the BlueStream infrastructure, scaling exponentially will not be a problem.

Conclusion

These projects demonstrate that making the digital repository present in both physical and virtual environments opens the door to improved academic discourse and collaboration. Individuals are able to seamlessly move from one social construct to the next, whether in-person, online, or by cell phone, and always have essential materials available.

It is also the case that the repository itself becomes an extensible dataset that can be combined with data from other sources to build more sophisticated collections of information. These "data mash-ups" give knowledge workers the opportunity to synthesize data in new ways and from different perspectives that can lead to greater understanding and new knowledge.

Results from the BlueStream project suggest that enterprise digital media infrastructure provides essential technical scaffolding to media-intensive academic work. It increases productivity of faculty, students, and staff. It improves academic discourse. It advances data collection and synthesis. It secures the community investment in digital materials. Overall, BlueStream provides a tremendous opportunity for innovation in media-intensive academic work in the higher-education information ecology.

Appendix 1: Technical Overview

BlueStream provides the organizational structure and facilities needed to support media intensive work in the higher education institution. An in-depth look into the full suite of technologies would lead to a technical tome. Instead, this section offers a glimpse into key components of the software, hardware, and architecture.

The BlueStream infrastructure is a modular system of components. One of the core architectural strategies is to recognize that each component has a lifecycle. Over time, each will need to be replaced by an alternate solution. This approach increases the complexity of dependencies between systems making it somewhat more difficult to upgrade than single vendor solutions. However, in the long run, the open architecture provides a mechanism for swapping components and integrating new capabilities to maintain "best of breed" quality across the entire system. Modularity across multiple vendors mitigates the risk of volatile purchases and acquisitions in the technical sector that can have a severe negative impact. Since the practice of digital media-intensive work is still in its early stages, it is also important to keep doors open to the potential of emerging technologies and the need to integrate additional components.

BlueStream Features: Highlights

Rapid Acquisition

Media files are large and unruly. One hour of video in standard DV format takes 13 GB of storage. Difficulty in uploading files to an asset management system is a showstopper for most end-users. BlueStream provides streamlined upload (See Figure 15) with drag-and-drop-from-the-desktop ease as well as web upload when that is more convenient. End users need not think about the best place to store the file and all of its derivatives. Based on the user identity, file type, and pre-established policy, all the files and related data are automatically stored in the optimal storage systems within the managed storage environment (See Figure 16).

Figure 15: Streamlined Upload *http://media.nmc.org/2008/proceedings/king/StreamlinedUpload.mov*

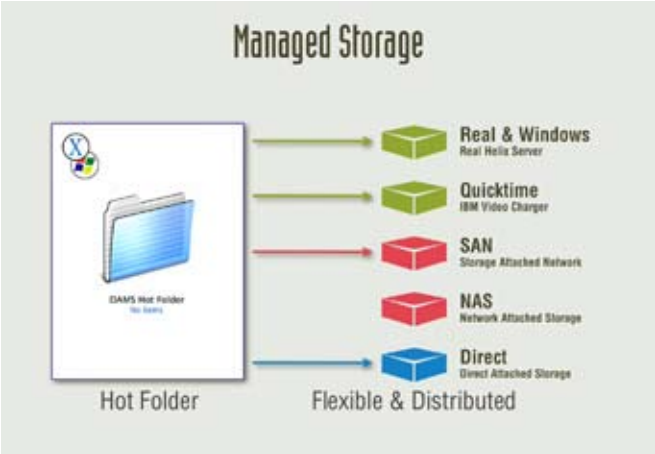


Figure 16: Managed Storage *http://media.nmc.org/2008/proceedings/king/ManagedStorage*

Flexible Metadata

A great deal of the power extracted from a digital repository is derived through metadata. Metadata provides technical, descriptive, and structural information that drives end-user search, retrieval, and use.

BlueStream eliminates early stumbling that can occur over this new concept. Metadata such as EXIF and XMP, encoded within the header of certain file types, is automatically read. Metadata from an external database, a spreadsheet, or an xml file can be automatically matched and associated to assets (See Figure 17). This provides a variety of methods for people and other systems to automate metadata acquisition. When automation is not possible, users can use the web interface to tag metadata.

The Dublin Core metadata schema is provided by default. Dublin Core is sufficient to support a majority of the metadata needs. When Dublin Core is not sufficient, project teams work with a metadata specialist from the University Library to identify standardized metadata schemas used for specific disciplines or when necessary, develop custom schemas (See Figure 18). Standards are adopted whenever possible to ensure that assets stored in BlueStream will "play well" with other systems and easily "migrate forward" to new components within the BlueStream infrastructure.

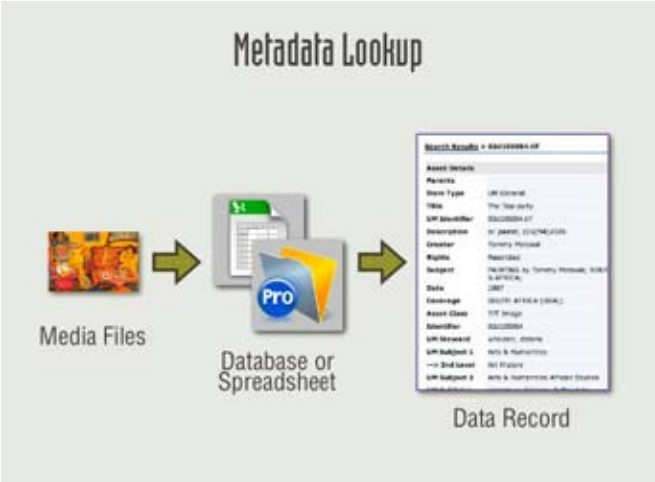


Figure 17: Metadata Lookup *http://media.nmc.org/2008/proceedings/king/MetadataLookup.mov*

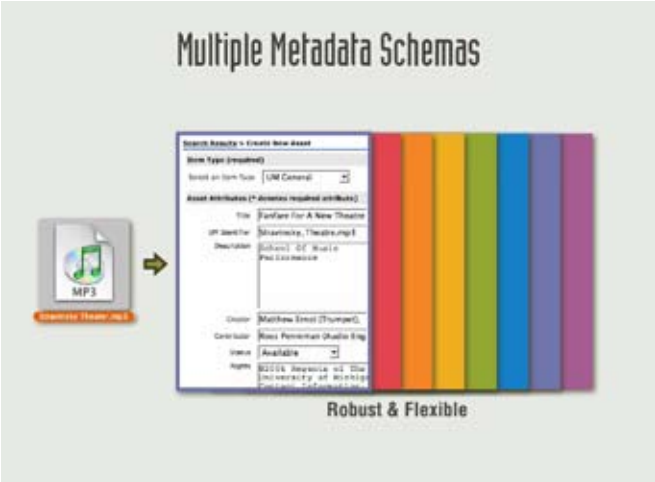


Figure 18: Multiple Metadata Schemas *http://media.nmc.org/2008/proceedings/king/MultipleMetadataSchemas.mov*

Organization & Control

BlueStream search capabilities takes advantage of full text indexing of file-level metadata, time coded metadata, and text-based documents. Users are able to use simple terms and Boolean strings to search across available assets and return query results in order of relevance. Collections allow users to loosely associate related files based on their own organizational constructs. Since collections are essentially a collection of "file pointers," a single asset can be represented in any collection without duplicating the file itself. Highly structured relationships such as the elements of a learning object – metadata, time-coded metadata, structural xml, documents, images, audio, and video – are supported through parent-child associations (See Figure 19).

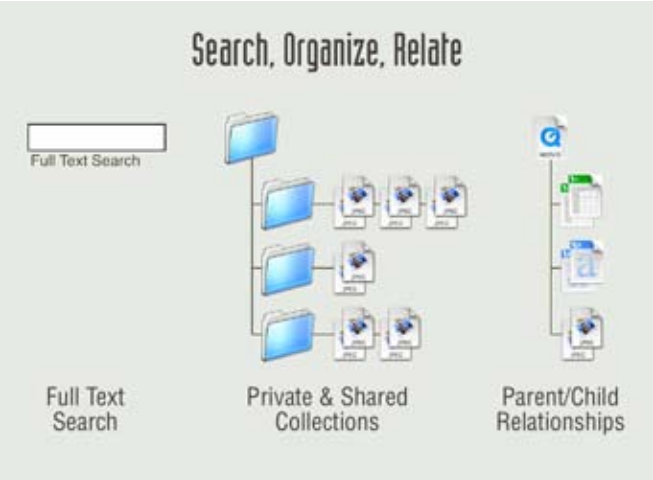


Figure 19: Search, Organize, Relate *http://media.nmc.org/2008/proceedings/king/SearchOrganizeRelate.mov*

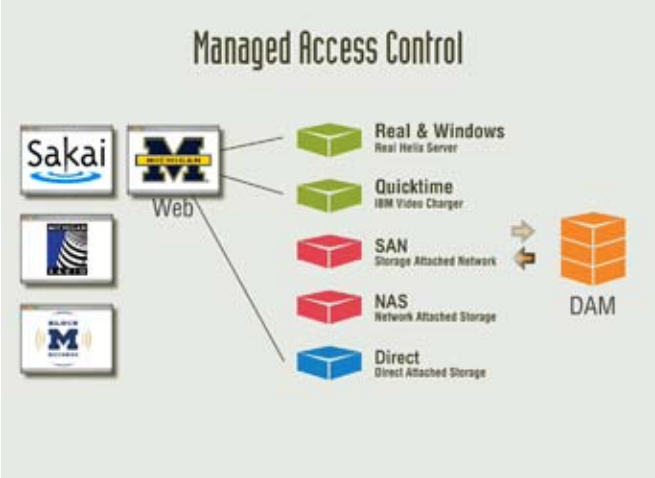


Figure 20: Managed Access Control *http://media.nmc.org/2008/proceedings/king/ManagedAccessControl.mov*

BlueStream secures every part of the asset, metadata, versions, and derivatives, through Access Control Lists. ACLs define who has access to an asset and what privileges the user has in regard to seeing, modifying, and deleting it. Fine-grained access control, set at the asset level, permits sophisticated approaches to supporting collaboration across different publishing and collaborative venues (See Figure 20).

Media Processing

Media processing is flat out too processor intensive and too time consuming for end-users to do. BlueStream takes this heavy lifting off of desktop machines and shifts it to powerful enterprise servers. Automated image conversion (See Figure 21), and video and audio transcoding (See Figure 22), assure that new assets have a baseline set of formats available. Additional formats needed to serve particular audiences can easily be ordered online. BlueStream will do all the work and automatically add the additional formats to the asset once the processing is complete.

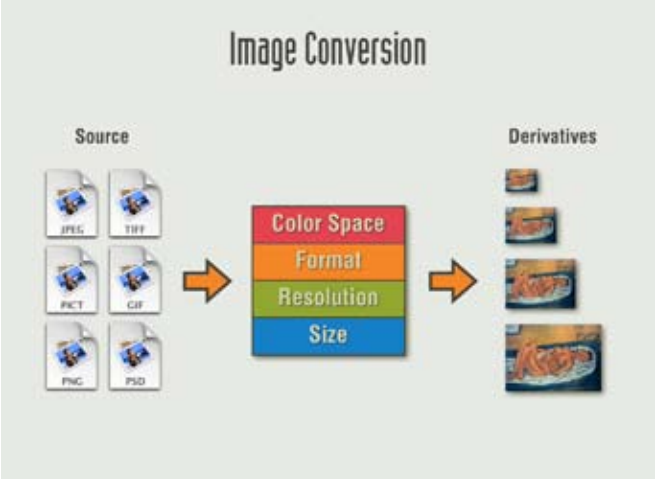


Figure 21: Image Conversion *http://media.nmc.org/2008/proceedings/king/ImageConversion.mov*

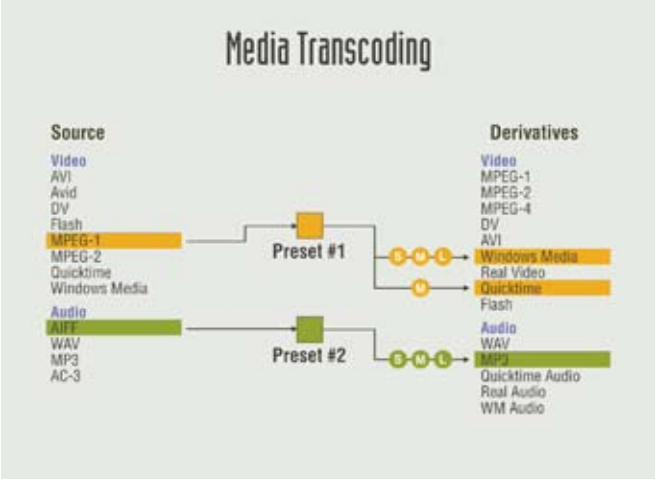


Figure 22: Media Transcoding *http://media.nmc.org/2008/proceedings/king/MediaTranscoding.mov*

Media Analysis

Many people consider metadata tagging to be a dreaded task. This attitude can be catastrophic to a digital repository since metadata is fundamental to the ability to find assets. Media analysis alleviates this dichotomy by using computer analysis to automatically generate metadata that enhances search and find capabilities.

Voice-To-Text analysis (See Figure 23) is particularly good for generating time-coded metadata of the spoken word. Accuracy levels of between 60% and 80% of key words can be achieved from quality recordings of non-accented speakers without background noise. This is not sufficient quality to support transcription. However, time-coded keywords add a valuable resource to the search index, allowing users to search within video and audio content without hand tagging metadata. Once the desired content is found the media will start playing from that exact point.

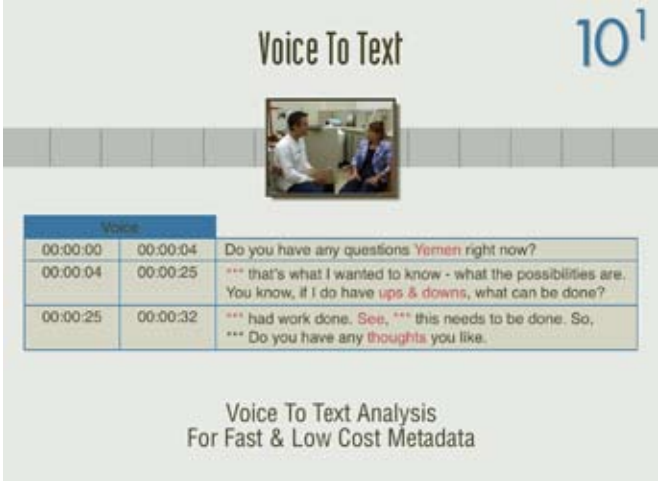


Figure 23: Voice-To-Text Analysis *http://media.nmc.org/2008/proceedings/king/VoiceToText.mov*

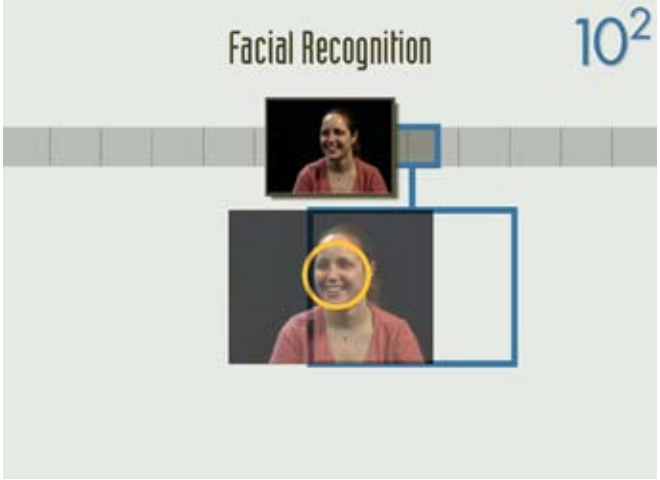


Figure 24: Facial Recognition *http://media.nmc.org/2008/proceedings/king/FacialRecognition.mov*

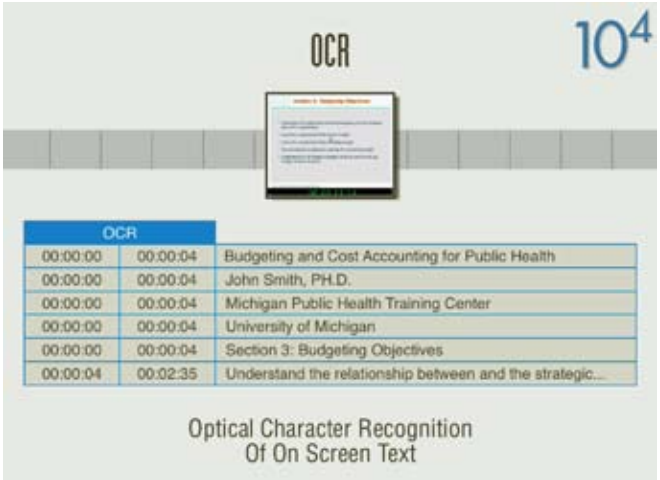


Figure 25: Optical Character Recognition *http://media.nmc.org/2008/proceedings/king/OpticalCharacterRecognition.mov*

Facial recognition (See Figure 24) compares video images to a library of faces. If a match is found, the name of the person is time coded and added to the search index. This is a particularly useful tool for indexing videos of public figures and panels of speakers. End users can easily search through video content to find precisely where a particular speaker appeared. Privacy and surveillance issues mandate that this feature be used with extreme care, in a manner that is transparent to the community, and with the consent of those who appear.

Optical character recognition (See Figure 25) analyzes English letters appearing in video, converts them to text, time codes the text, and adds it to the search engine. This is particularly useful for slide presentations, titles, and subtitles.

Scene change recognition generates a thumbnail of the video whenever the composition of the image changes dramatically (See Figure 26). The thumbnails and time code are saved as another part of the rich data model. They are used to present visual navigation through the content. The end-user can rapidly view the thumbnails, click on the one they are interested in, and play the video starting from exactly that point.

Media analysis is a machine process that has all the expected limitations that machines have in deriving meaning from human action. Nonetheless, the analysis is able to layer multiple channels of data resulting in a very useful ability to search within the content of media files (See Figure 27). This is very effective for lectures and other speaking content. In economic terms, automating metadata tagging, even with its inherent failings, is a huge advantage.

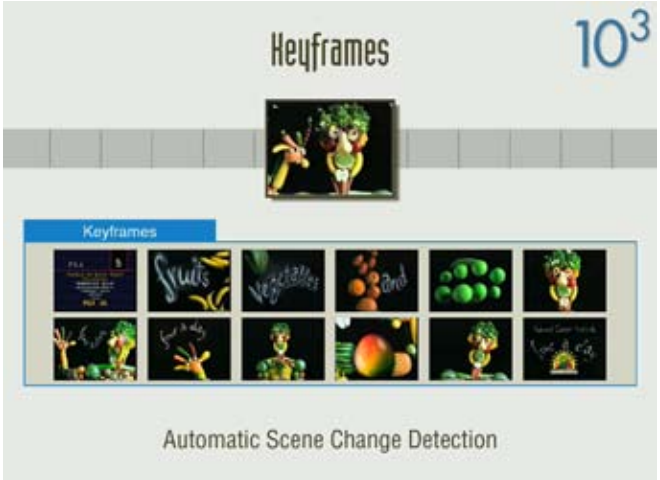


Figure 26: Scene Change Recognition *http://media.nmc.org/2008/proceedings/king/ScreenChangeRecognition.mov*

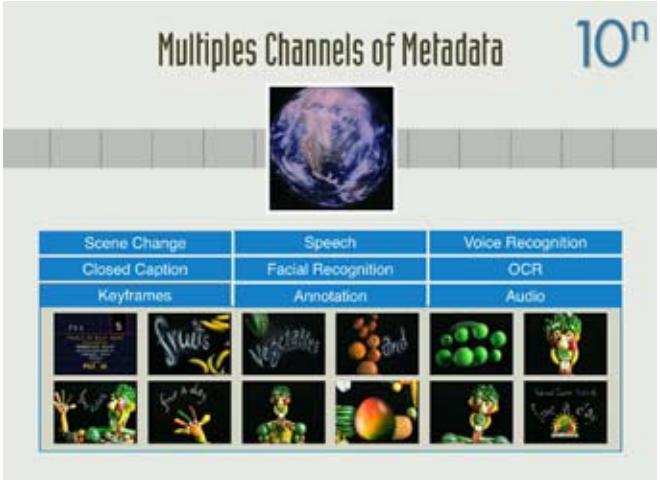


Figure 27: Multiple Channels *http://media.nmc.org/2008/proceedings/king/MultipleChannelsOfMetadata.mov*

Transcripts & Annotation

Automated, time-coded metadata generation is not always sufficient to meet academic requirements. Certain subject matter, outcomes, or activities might require higher standards. This is usually the case with video and audio data used for research. Transcripts, annotation, and event markup must be perfect to ensure that statistical conclusions are accurate and correct. BlueStream supports distributed research teams by easing the barriers to media markup. Required media formats are automatically generated and made available online. Researchers download these files via any Internet connection, use a markup tool to generate time-coded metadata (See Figure 28), and simply drag-and-drop the metadata file back into the system. BlueStream automatically parses the file and synchronizes it to the media (See Figure 29).

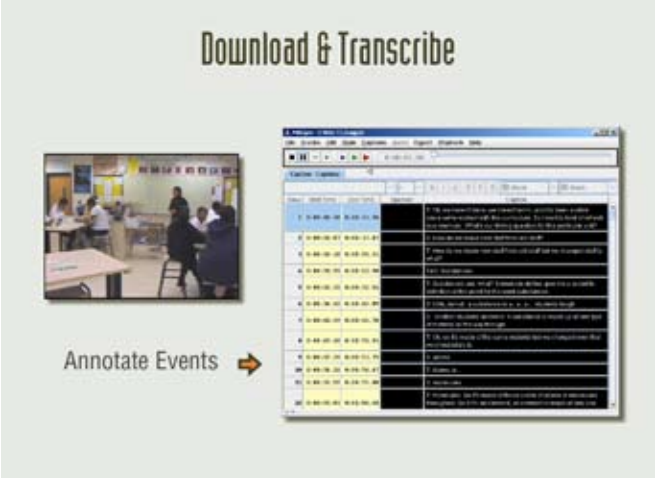


Figure 28: Download & Transcribe *http://media.nmc.org/2008/proceedings/king/DownloadTranscribe.mov*

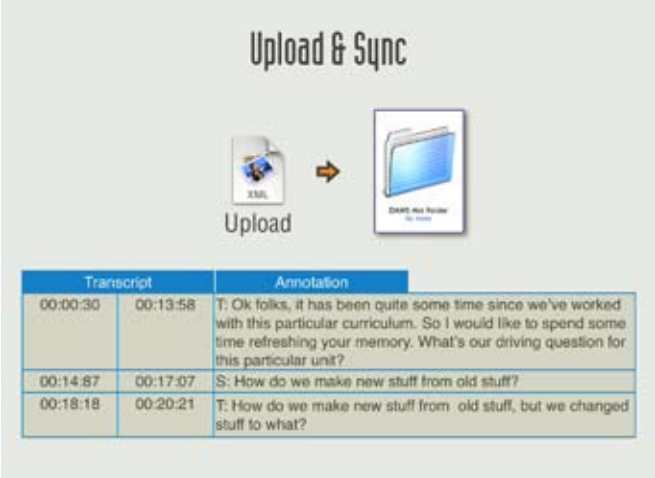


Figure 29: Upload & Sync *http://media.nmc.org/2008/proceedings/king/UploadSynch.mov*

Appendix 2: BlueStream Architecture

In April of 2003, IBM as primary vendor in conjunction with Ancept, Telestream, and Virage, was awarded a contract to partner with the University of Michigan in building a Digital Asset Management Systems (DAMS) Living Lab. The lab was to be a sandbox environment to support media intensive academic work in order to shape a larger solution for enterprise infrastructure for media-intensive work.

By 2006 the environment was sufficiently robust to rename the project for a broader academic use and BlueStream was born. Today, BlueStream supports 25-50 of the most media-intensive projects in the University and interoperates with the other enterprise level academic tools and environments. A brief outline of the technical architecture follows.

Software

1. IBM Middleware
   a. Content Manager Library
   b. WebSphere
   c. DB2 Database
   d. Tivoli Storage Manager
   e. Linux
2. Ancept Media Server
   a. Asset Management End-user Application
   b. Web Services Portal
   c. Media Services Integration
   d. Linux

3. UM Campus Infrastructure
   a. Authentication – Cosign
   b. Streaming Media – Real Networks Helix Server, Darwin Streaming Server
4. Autonomy Virage Video Logger – Media Analysis, Windows Server
5. Handmade Software, Image Alchemy – Image Conversion, Linux
6. Telestream Flip Factory – Media Transcoding, Windows Server
7. Quantum StorNext Advanced Integrity Module – File System

Hardware

1. Chassis – IBM eServer BladeCenter
   a. IBM eServer BladeCenter Chassis
   b. Nortel Networks Layer 2/3 Copper GbE Switch Module for BladeCenter
   c. IBM BladeCenter Optical Pass-thru Module
2. Blades – IBM HS21
   a. HS21, Xeon Quad Core E5430 2.66GHz/1333MHz/12MB L2
   b. Quad-Core Intel Xeon Processor E5430 80w 2.66GHz/1333MHz
   c. 2GB (2x1GB) PC2-5300 CL5 ECC DDR2 Chipkill FBDIMM Memory Kit
   d. QLogic 4Gb Fibre Channel Expansion Card (CFFv) for IBM BladeCenter
   e. IBM 73.4GB 10K SFF SAS HDD
3. Switch, 32 Ports – IBM System Storage San32B-3
4. Storage – IBM System Storage DS4200 Express Model 7V
   a. Expansion Units – IBM DS4200 EXP420
   b. Disks – IBM 750GB DS4200 SATA Enhanced Value Disk Dr

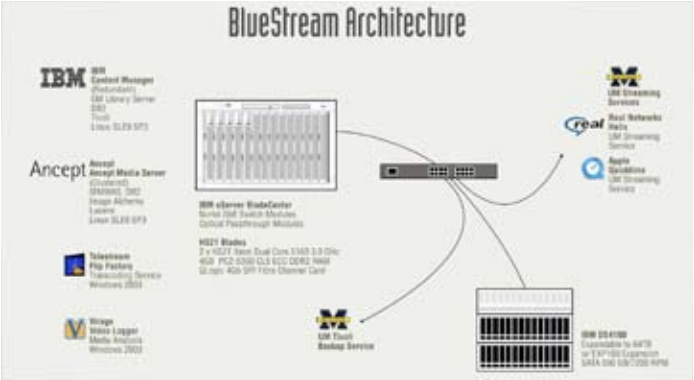


Figure 30: BlueStream Architecture

References

Buchanan, G. R., Blandford, A., Thimbleby, H., & Jones, M. (2004). Supporting information structuring in a digital library. RESEARCH AND ADVANCED TECHNOLOGY FOR DIGITAL LIBRARIES, 3232, 464-475.

Gantz, J. F., Chute, C., Manfrediz, A., Minton, S., Reinsel, D., Schlichting, W., et al. (2008). The Diverse and Exploding Digital Universe. EMC2, from http://www.emc.com/collateral/analyst-reports/diverse-exploding-digital-universe.pdf

Lessig, L. (2008). Keynote: Symposium for Teaching and Learning with Technology. Retrieved 04/15/2008, from http://symposium.tlt.psu.edu/content/lawrence-lessigs-keynote-presentation-version-1

Nardi, B. A., & O'Day, V. (1999). Information Ecologies: Using Technology with Heart: MIT Press.

NISO. (2004). A Framework of Guidance for Building Good Digital Libraries. Retrieved April 25, 2008, from http://www.niso.org/framework/Framework2.html

Suleman, H., Feng, K., Mhlongo, S., & Omar, M. (2005). Flexing digital library systems. DIGITAL LIBRARIES: IMPLEMENTING STRATEGIES AND SHARING EXPERIENCES, PROCEEDINGS, 3815, 33-37.

Weber, L. (2007). Computer Use Expected To Top 2 Billion. Inc.com. Retrieved April 25, 2008, from http://www.inc.com/news/articles/200707/computers.html

About the Author

Louis E. King serves as the Managing Producer of Digital Asset Management Systems in the Digital Media Commons at the University of Michigan. His current project, BlueStream, is developing campus infrastructure to support media-intensive teaching, learning, and research. This work is a continuation of fourteen years of progressive leadership in shaping academic tools and cyber-infrastructure to support emerging practice in the academy. As Director of the Office of Instructional Technology he spearheaded the development of a seminal course management system. This established a foundation for the eventual emergence of Sakai. Louis also served as Manager of New Media Initiatives where he established one of the original thirteen New Media Centers. Prior to joining the University of Michigan Louis spent 12 years in advertising as partner of a boutique creative house where he specialized in business-to-business communications.

Louis can be reached at leking@umich.edu.

Further information on BlueStream is available at http://sitemaker.umich.edu/bluestream

A Call for the Corporeal 'cause Pixels Are Ephemeral and Archeologists Won't Find Them

Jared Bendis | Case Western Reserve University

Much of a student's life today is spent online in a virtual world, blogging, IMing, in Second Life, in Facebook, etc. The *Call for the Corporeal* was designed to bridge the gap between a student's virtual world and real world experiences. The session addressed how to provide guidance and education to demonstrate that technology is not a black hole, that the virtual can become real. Further, the session discussed the value of an individual's online creations in a new and formerly intangible context.

So let us continue the conversation…

When asked to write this essay on my NMC 2008 presentation "A Call for the Corporeal 'cause Pixels Are Ephemeral and Archeologists Won't Find Them," the charge was to relate to the topic of the presentation, provide additional information, include rich media, and be creative in my approach. Addressing this last item first, to be creative in my approach, I decided to simply continue the conversation that was started in Princeton. Of course not everyone reading this was present for that conversation so, by necessity, some of this will re-tread those ideas. There is method to the madness of not presenting the essay in the 'modern' third person. While I hope it comes off as creative, it more importantly frees me from the illusion that this is an objective presentation of researched facts. It is actually a subjective presentation of arguments and opinions (with some facts) designed to elicit both emotional and intellectual responses. And freed from the "taint of neutrality," I hope that it inspires the reader to do something – even if it is as simple as emailing me and telling me that you disagree and think I'm full of crap.

The second slide of the PowerPoint that supported my presentation displayed a large stone circle with the caption "behold the wheel." You see, over the years I've noticed that most presentations given at conferences spotlight new research or a new discovery. However, as my presentation was not one of those, I felt it was important to point out my lack of wheel-like discovery. This is more than a simple notation or observation. Too often I have attended a session at some conference where the presenter, in their enthusiasm, has erroneously misrepresented an experience as an idea. A recent example at an educational conference (not the NMC) involved a presenter talking about the use of blogs in education. I attended the session due to my enthusiasm for blogs in education and compelled (i.e. forced) a friend who knew nothing of the technology to attend with me. However when describing his project, the presenter spoke too definitively; and the line between the technology and his particular use of the technology was blurred. My inexperienced friend thought it was very interesting. Regretfully he also thought that blogging was a brand new idea and that the presenter invented blogs. I, of course, was very disappointed. I saw nothing that I hadn't seen or done before, presented in a way that I felt was misleading. I don't mean to come off as snobbish, as I was actually pleased with the project just not with the presentation. Perhaps it is more accurate to say that when it comes to pedagogy I am a snob. I wanted to know why they were doing what they were doing and I wanted to see the results couched in a context that what they were doing was only "new to them."

This is not just a casual aside, but is in fact the heart of my thesis and the way in which we communicate and disseminate information. I know in my enthusiasm for a topic my tone can come off as evangelical and I often need to remind my students that nothing I am saying is actually gospel. But let me return to the title, "A Call for the Corporeal 'cause Pixels

Are Ephemeral and Archeologists Won't Find Them." When I first showed it to one of my students he looked at me sheepishly and asked "So you want people to print things out more?" And my answer was "Yes, I want you to print things out more." And in a rejection of rich media I prepared a PowerPoint presentation that contained only 4 slides for the entire 75-minute session. The first was the title slide, the second was the aforementioned "behold the wheel" slide, the third was a black screen (which I displayed for the bulk of my presentation), and the fourth featured a simple "Thank You – Any Questions?" So how did I engage my audience for 75 minutes without technology? Well, recently my friend Tony Morris shared with me the following joke: How many performance artists does it take to change a light bulb? The answer: I don't know; I didn't stay. Bad jokes aside, I approach a presentation as if it were performance art. It is something to be experienced that hopefully inspires and stimulates further discussion (with or without me) and, yes, has the danger of losing the audience. This presentation was more performance than most of those I had given before, as this time I used almost no PowerPoint and instead used a large box of props – which we in the educational business call "visual aids." In a previous talk I once referred to myself as the Chicken Little of the NMC, but standing there with my box full of props I felt more like the comedian Carrot-Top. In retrospect I should have recorded it, if only for my own reference. There is no escaping the irony in all this: documenting a presentation, devoid of rich media, designed as a free-flowing dialogue and performance, on the topic of the need to print for a document being disseminated for the most part electronically.

Value

Let me move forward and talk about value. The basic definition of the term is that of importance or the equivalent amount of money that we use to estimate something's worth. I recently came back from Peru. It was a fantastic trip and while my friend Tim went to bring back cultural artifacts for the Art Education program, I was there to bring back pictures. Actually "pictures" is an oversimplification. I was there to have experiences and to encapsulate those experiences using visual expression. On this trip I took more than 2600 pictures over the course of 2 intense weeks (about 2100 with a film camera and 500 with a digital). I know how much money I spent on the film, development, and printing. If I take that amount and divide it by 2600 does that give me the value of each picture? What if I add in the going rate for my time? (And which rate do I use: my day-job salary or my freelance consulting rate?) What if I add in the cost of travel? For some reason when I travel I keep track of every penny I spend, it's a compulsion that makes me feel that I'm not spending too much and that I know where my money is going. I kept these details in this obsessive little journal and I know it drove my friend Tim crazy. On a previous trip to France I calculated every dime I spent on gas and even calculated my mileage. But none of these expenses impact the worth of each image.

Those who attended my original presentation were asked if they wanted to see any of my Peru pictures. Instead of showing some PowerPoint or bringing up Flickr I pulled out a glossy 5x7" photograph of Machu Picchu and handed it to a participant. I then pulled out a fifty copies of the same photograph and passed them out so that each person had his or her own copy. In that moment the medium changed the meaning and increased the value. Instead of a group of people staring at a screen, each person held a photograph in their hands and had their own personal experience. The medium allowed for this intimacy and for both a deeper analysis of the image and a greater connection with it. I saw more than a few smiles when I told the group that the photo was theirs to keep. It's a strange phenomenon that I discovered years ago when I used to hang out in the smoking lounge of the local coffee shop. While I don't smoke, I used to always carry a pack of cigarettes and every so often someone would bum a cigarette from me. Back then a cigarette cost about a ten cents. But the level of gratitude from the recipient was completely disproportional. It is not about the inherent value of the item – a cigarette is after all just a cigarette - it's about the perceived sacrifice and the connection made. It showed I cared. The smiles on those attending the presentation were worth much more than the 39 cents each photo cost. And it runs deeper than that. I asked everyone to turn over the photograph because on the back each photos was signed and numbered. Again a round of smiles from the audience because now the item's perceived value had increased. Many (though not all) now looked at the photo a little differently and some thought twice about carelessly tossing it in their bag others even thought about matting and framing it; the signature now made it art. Why had its value increased? Is it the human touch? The time I took to sign each was minimal. Perhaps it is the implication of sacrifice, that these would be the only 50 copies of that photograph. And in a world of digital duplication scarcity even if artificial (i.e. I am saying there will only be 50) makes me want it more. But how could I make

it worth even more? So I pulled out a negative and a pair of scissors and I cut it up right in front of those attending. One person was so shocked that they put their hand on their chest and gave a little scream. To be fair, I pointed out that while I shoot on film, I scan the negatives so I pulled out a CD and then broke it in half. In that continued spirit of fairness I pointed out that since I printed them at Costco they were still on their servers. Did that make the value go down? This was all just a demonstration, as I don't have the heart to cut up one of my negatives. I have stayed true to my word though and have not printed any more of that image – those 50 photographs remain the only 50.

And even now as I seek to un-tether myself from the burden of worthless possessions I am becoming more and more enthralled by the greater value we place on real items as compared to virtual ones. A friend of mine recently showed me a necklace that her boyfriend acquired for her. He is a ceramicist and she was very proud to tell me that he traded his work for it. It meant more to her than if he had sold one of his vases and then purchased it with the proceeds. In many ways the monetary value of an object is just a compromise – it is what I would pay for it today based on my willingness to buy or my need to sell. And this vase, which we can envision as being inherently priceless until tagged with a price, stayed priceless as it was traded for something that also had not been tagged. With no conversion to currency, both items remain priceless and the artists find themselves dealing with values on a higher plane.

When I return from a photographic expedition I have a large task in front of me because no one, myself included, wants to see all 2600 pictures. The first cut is to simply eliminate the bad ones. This is the easy cut; I figure out which photos I never want to see again. The second cut is a little harder. I have several near identical photos, the same view of the same location but with subtle variations in exposure, focus, and composition. They are all similar and I have to pick out the best. It took me two days to cull the 2600 down to 500, which I then ordered chronologically in two albums. Now the next stage is tricky because it involves feedback from other people. I start to show the albums to people and I look for their reactions and to my own feelings when I am showing them. Within a few days I can cull them down again, removing the photos that don't tell my story and at times finding a better organizational structure (other than simple chronology). Now equipped with a thematically organized album of 260 photos, a mere 10% of the original 2600, I must live with the collection for a while. The last cut is the hardest and can only be done after some time has passed. I have to look at many unique views of the same place and choose which is most representational, to eliminate images that are fundamentally good. Throughout this process it is imperative that I never look back, that I never dip back into the discard pile or I might be lost in a sea of imagery and fall into madness. That isn't to say I throw the pictures in the garbage. A friend suggested that I could make some money selling my unused photos as stock photography. But what would that do to the value of my good pictures? I won't give others the opportunity to compromise my vision simply for a price. So it's quality or nothing. The one thread that is constant in this process is that the photos are prints, they are real, and none of this is done electronically, virtually, or from a distance. I won't let the medium distort the message.

Medium vs. Message

One of the most common things I hear from people when they look at my photos is "Wow, its like a postcard!" Now I understand what they mean when they say that. Generally it's the idea that the picture is prototypical – that if they only had one picture of the subject, this would be the one that they would want. There is another side however. Could I not also interpret it as "Y'know, I would buy that picture for 50 cents, write something meaningless on the back, and then send it to someone else."? Do I really want my pictures to be a vehicle for "Having a great time, wish you were here!"? Similarly the medium of online photo sites such as Flickr does indeed change the message. This is not to say that there are not some fabulous photos and some wonderful photographers on these sites. But in many ways it's the difference between TV and the movies. When I am at home flipping channels in full control of the TV, I perceive it as free even though academically I know I pay a satellite bill and must sit through commercials and product placements. However, when I sit in the darkened movie theater having just paid for my ticket and trapped by the unidirectional prison of time, the movie (no matter how bad) gets my full attention. It goes deeper still. Why does a 2-hour crime movie get more reverence and respect (and budget) then a 2-part episode of Law and Order? The method is the same but the distribution medium is different. And with that difference comes a change in message (and value). How would this essay be different if it were posted on a blog instead of being part of the published proceedings? It is the same essay. If you are reading this electronically (which I hope you are not) then the experience might even be identical. Is it the endorsement or vetting by the NMC that makes the published version have more value? Does the medium help to

establish the meaning? Does the idea that these proceedings somewhere exist in print somehow increase the value of the electronic version? I think it does and I think this is a point that is often overlooked and too easily dismissed.

I am a big proponent of reading books electronically – note I did not say of e-books. Many years ago I owned a "Rocket E-book" (and I'm sure its still somewhere in my closet) and even though it was big and clunky and somewhat limited I found my experiences with it to be transformative. First, I like reading in bed so I found the self illuminated page comforting. But I was more amazed at how much easier it was to get 'lost' in the book. When I watch TV or sit in a movie theater I always have the ticking clock to guide me to the conclusion: 30 min, 1 hour, 2 hour etc. Generally this is the convention. With books we mark our place by the weight in our hands – as one side gets heavier and the other gets lighter. But when reading a book electronically sometimes the end can literally sneak up on me – more than once I had to go to a store to verify that the e-book hadn't been erroneously truncated. Other times when I thought I was at the end I found out I has 1/3 more of the story left. It's not a data file; it's a book. But it's only a book because I know that somewhere it's ink on paper, bound, shelved, and catalogued. I always joke that I prefer to read books only by dead authors so I know how many volumes are in the series. And as much as I joke, there is some sincerity to the notion that I like the closure that comes with a published book. The book when it gets published is codified as complete and vetted as publishable, which could also imply its quality or at least its profitability, but is palpable regardless. With art they say that there is never completion only abandonment. But there is a real moment, whose catalyst might only be financial, when the work leaves the studio and in that moment it becomes complete. Items that are disseminated digitally tend not to have such a moment; infinitely editable and ever changing, they lack a state of completion or even of stability on which one can reflect. They don't take a stand. So how can we trust them? The paradox is not unique to electronic media. It is also found in architecture as paradoxically summed up by the 19th century French architect Eugène Viollet-le-Duc who observed that "to restore an edifice is not to maintain it, repair or remake it, it is to re-establish it in a complete state that may never have existed at any given moment in the past." With electronic media we cannot pick one moment in time over another and in the future I fear that when we look back we may be forced into romantic compromises of meaning, if we choose to acknowledge any value in it at all.

I started reading books electronically back in the early days of music "sharing," and the culture of pirated e-books is vastly different than those in music. It is effortless to rip a CD while ripping a book is a labor of love. To spine it, scan it, OCR and correct it is a lot of work. The files are small and the demographic of its users literate. A librarian friend of mine insisted that I go to the bookstore and purchase the books so that the "heirs and assigns" got their money. He also felt that going to a used bookstore to take one off the market equally satisfied this requirement. In doing so, my actions would be "illegal" but not "immoral." Right now, if you look at my bookshelf you will indeed find many books that I have read but that I have never opened. The other day I donned my virtual cutlass and eye patch and headed over to the IRC looking for pirate e-books. Looking isn't a crime so I can freely share this story. And as I perused someone's online library I made two interesting discoveries. The first is that it contained items found in the public domain, in fact, quite a quantity of them. And though this might only be a personal impression, seeing Harry Potter sitting next to Sherlock Holmes somehow ennobled the intent of the pirate distributor. He was there to share information regardless of its "status" in the law. It wasn't a warehouse of illegal goods. It was a warehouse of content – some of which was illegal. Now I don't condone the theft of intellectual property – I really don't. My other observation was that in this library was a section devoted to books on intellectual property. I can almost imagine someone naïvely downloading books from this section and in the middle of reading one realizing the folly of their ways! But let me move this discussion from issues of legality to issues to practicality. In reality there is no such thing as copy protection. If you can see it you can copy it. DRM is an illusion and the more you try to implement it the more contrived it looks. That doesn't mean I post PDF files of assigned articles for my students, I make them purchase a course-pack. And they hate it. They hate it because they don't get why they should pay for what would be so easy for them to copy. And how many of you won't assign course-packs for this very reason? Creating a course-pack is a lesson in value and if done properly the students will come to value it as much as a traditional textbook, possibly more if they actually use it.

And before I completely leave the subject of medium I need to point out that in the physical world there is no such thing as a "digital picture." That is to say, "digital picture" is not a medium; it is at best a method. A painting at an art museum might indicate that the medium is "oil on canvas," not what type of brush they used or the technique by which it was painted (all of which may be on the label just not listed as the medium). On the screen an image might

be digitally displayed but the way it is output (printed) dictates its medium. A digital file taken to a photo lab and chemically printed is as much a chromogenic print as the one created from a negative. Most people are surprised to learn that at most labs the negative is generally scanned first (there is no enlarger) and that all prints are at one point digital with the paper being exposed by red, green, and blue lasers. As a photographer I only have my images printed on Fujicolor Crystal Archive paper, Walmart prints these at 307DPI and Costco at 430DPI. A good old inkjet print might more fancifully be called a giclée print, though some would insist that to use this term the paper and inks must be archival – if anyone actually knew what archival really meant – and they appear to do a decent job at *www.imagekind.com*. All of this is important because the act of printing creates an instance; it's a transcendent moment than fulfills the potential of the digital file.

Real Output

I think everyone who works in the field of new media has been burned by it at some point. It is a medium that is too easily ravaged by time. My old projects don't run anymore. And I'm probably lucky. I know a guy who keeps old computers around so he can run his projects. He has an array of them set up in his basement so he can always look back. I've learned it's bad to look back. The underlying medium of these projects is the technology: the technology that we have outgrown. It isn't like looking at an old textbook and being able to view the knowledge as dated but in context. The technology outweighs the content. As much as we pretend to the contrary, we are building on an unstable foundation. How foolish would I be to think a website I created in 1997 will look good, and just a little dated, in 2008? My 1997 website probably looks about as good and dated as all of the other 1997 websites with little to make it stand out. My message got lost in the medium. Not to say that I haven't updated. I'm constantly carrying my message from medium to medium and the efforts are split between updating the medium and updating the message and it makes me feel like the medium is flawed. Now I am not advocating that we give up new and rich media. I just want a bigger payoff! I want my work to have longer legs, and in keeping my options open it generally means I need to explore other outputs.

I teach a graduate level art education course called Introduction to *Multimedia Technology*. It serves as a foundation to students who are training to be art teachers and who generally have little technology experience (or desire). When we designed the curriculum for the course we wanted to emphasize the relationship between technology and art, to use technology as the conduit but not the medium: technology as the pen but not the paper. While from a technical standpoint their first two projects are Photoshop projects, I prefer that my students instead focus on what they are creating. The first project is *Photoshop Fact and Fantasy*. I take a purposefully bad picture of each of my students. The image is in focus but badly composed and with the wrong white balance. The "fact" part of the assignment has them correct the photo while the "fantasy" has them take the corrected photo and do something fanciful with it. The final results are sent to the local photo lab and printed at 5x7". The assignment acclimates them to the consequences of their actions. With real photos in hand we are able to arrange the "fact" pictures in order from best to worst and conduct a more traditional critique. The second project is a large multicultural collage with very specific parameters. The final work is 12x18" with images from at least 10 sources; no source can be used more than once, no one source can dominate or become the focal point of the collage, and the culture must be one other than the student's own. The end product is the print and that is graded, not the digital file, and it is the print that hangs in the ***Semester in Review*** show next to the drawings, paintings, and traditional photography. Also accompanying the final collage is a statement and a bibliography. The premise is that the project is more than a technical exercise, it's research, and the final synthesized product contributes to a body of knowledge that can be used by subsequent art education students.

In many ways it's this notion of contributing to the larger body of knowledge that leads me away from the current trend in digital storytelling. I know its impolitic to admit this but most of the digital story projects I have seen have been wonderful exercises in technology and therapy but not immediately accessible to a broader audience, they are too personal. Over the summer I worked with student interns from the Cleveland city schools. Each of these high-school students had to research and create a short digital story that interested them and related to Cleveland. They were advised however to leave themselves out of the story and to redirect their internal enthusiasm about how it related to them personally to an external motivation that inspired others to see what they had seen and feel what they had felt. It's an admittedly difficult task but the final videos stood on their own and came off more as fact than as testimonial.

My art education graduate students avoid this issue altogether by creating how-to videos that teach a specific task. Both groups of students, however, create more than just video clips. They author and publish a DVD, a tangible item, a product.

Last spring, for the first time, I had several advanced multimedia students. Their final project was to adapt a multicultural folktale (of their choice) into a photographic comic book using Plasq's ComicLife software and reference materials by Scott McCloud. It's a very complex project that addresses narrative, scripting, storyboarding, photography, project planning, and Photoshop. The final projects, which ranged from 12 to 26 pages, were sent to *lulu.com,* a print-on-demand self-publishing company which produced full color, bound 8.5x11" comic books. It is difficult to describe the reaction from the students when they saw their own creations made real and also from others who look at the work and instantly see the value in it. Perhaps this represents the epistemological crisis in new-media today.

The New Desktop Publishing

When I came back from Cameroon last summer, the professor who took me asked what I planned to do with my photos. I had just starting exploring various print-on-demand companies and decided to self-publish the photo essay, *A Cameroon Experience,* at *blurb.com*. While the companies make it easy by offering templates and wizards, I wanted full control – I didn't want to do what technology had done to me previously and just fill in the blanks. So I learned Adobe InDesign; spending as much time on the layout as I did correcting the images. When I received the first copy of the book in the mail I got a big surprise: closure. It had been a very difficult expedition and holding the book in my hand was a like having a weight lifted from my heart. Funnily enough, nothing is perfect and I later had to go back and fix two small mistakes and re-publish the book.

The success of the book is not really important to me. But it did open my eyes. The next step would be to get an ISBN number and then submit it to the Books in Print index. And that's where immortality is really found, in an index. Haven't you ever noticed that there are more records of the items that existed than the items that still exist. It's the irony of bureaucracy that for some bizarre reason we protect our lists more than our content. And we only inventory "real" things.

Conclusion

If you have made it this far I want to thank you for indulging me in my informality and lack of rich media. But this is just a start. Recently I started adding desktop publishing workshops to our development series and I want to see what others can make when they put their mind to it. And if you are reading this in print don't throw it away when you are done! Take it over to your library and ask them to catalogue it and add it to their collection (if you are reading this electronically, then forward it to a friend). Remember to make it "real" and to continue the conversation…

About the Author

Jared Bendis is an award winning artist, photographer, filmmaker, and teacher from Cleveland, Ohio. Jared is a specialist in photography, virtual reality, and computer graphics and the Creative Director of New Media for Case Western Reserve University's Freedman Center. Jared received his BA from Case Western Reserve University in Psychology with minors in Music and Art Studio. He received his MA in Art Education from the joint program of Case Western Reserve University and The Cleveland Institute of Art. In 2006 he entered the Art History and Museum Studies PhD joint program from Case Western Reserve University and The Cleveland Museum of Art. He also holds an appointment as adjunct instructor in Art History and Art at Case Western Reserve University where he teaches multimedia. On his first trip overseas, in March 2000, Jared visited the Chateau de Pierrefonds and became driven (if not obsessed) with capturing and sharing cultural and architectural experiences. As an artist and teacher, Jared has photographed almost 400 architectural and cultural sites (primarily castles) in 11 countries.

Infrastructures in Virtual Learning

Holly Willis | University of Southern California

While many universities deploying Second Life have constructed learning spaces that replicate their real world campus counterparts, the University of Southern California's Institute for Multimedia Literacy (IML) has worked to imagine an innovative learning environment. This essay describes the IML's design process, the interrogation of the relationship between virtual and physical spaces, creating new forms of spatiality and social interaction within a pedagogical context, and designing learning objects such as an immersive syllabus and spatialized audio texts, with an emphasis on understanding the structuring mechanism of spatial infrastructures.

The Core Questions

In an essay written in 1980 about potential directions in interactive media, video artist Bill Viola famously asked, "Will there be condominiums in data space?"[1]

If you consider the multi-user virtual environment Second Life a "data space," then yes, there are indeed condominiums, and a lot more. As visitors to Second Life know, much of the design in Second Life aims to replicate material world structures, crafting virtual spaces that look and feel like the houses, offices, shops and classrooms we know from the physical world. This replication is designed to hide the code substrate upon which Second Life was built, but also, often inadvertently, to recreate traditional modes of interaction and hierarchies of power.

This presentation emerges from questions raised at the 2007 NMC Summer Conference, specifically in two presentations devoted to Second Life. The first was "ClevelandPlus in Second Life," led by Wendy Shapiro, who gave a terrific overview of the development and design of the ClevelandOne Second Life space, which includes the campus site for Case Western Reserve University, as well as key landmarks that represent the city of Cleveland, including the Rock & Roll Hall of Fame. Shapiro talked about the collaboration her group formed with the city to help fund and develop a site that would attract visitors as well as students to the site. She also talked about how useful it was to have replicas of dorms and portions of the campus for recruitment purposes. I was struck by the desire for replication, and wondered how the spaces might be reimagined through the lens of pedagogy and learning.

The second presentation was given by Larry Johnson and his team from NMC and centered on an array of projects undertaken by the consortium to assist various academic institutions in creating Second Life spaces. Once again, it appeared that all of the sites that had been developed or that were in the design phase tended toward the representational, crafting spaces that resembled real world structures.

Looking broadly at the array of campus sites in Second Life, we could ask why the emphasis on representational spaces has been so pronounced: is it an instance of what Jay David Bolter and Richard Grusin call "remediation," in which familiar habits and forms of representation are repeated in the initial stages of a new media form?[2] Is it a process of domesticating – sometimes literally – a space that otherwise seems incomprehensible? Is it simply the desire for the familiar, and the sense of wonder produced when you see the real replicated in the virtual?

I don't know the answer, but at the conclusion of the NMC presentation, I asked if any of the institutions developing Second Life educational spaces had started with a theory of pedagogy as a foundation from which to develop their ideas about a Second Life space. The answer was "no."

This was very curious, and countered the direction that seemed so evident: as we begin to reckon with the radical changes that affect today's learners, and as all of us face the challenges of rethinking traditional modes of teaching, what can the affordances of a virtual space do to enhance that rethinking? Rather than starting with the goal of replicating our institutions, how might we instead begin with a pedagogical objective, challenge or problem, and answer it with some of the possibilities of Second Life?

When I left the conference, it was with the vow to attempt to begin the development of the Second Life learning/teaching space for the University of Southern California's Institute for Multimedia Literacy (IML) with a pedagogical theory or challenge as a starting point, and to develop a space that would not replicate our institution, but instead try to build from a pedagogical principal first and foremost.

I also wanted to do this as a group of users, not by hiring a professional design team. I wanted to take seriously one of the fundamental aspects of Second Life, namely that, as Cory Ondrezka puts it, "residents become engines of creation themselves, working as the producers of content in the world, designing and reshaping the space around their own ideas and interests."[3]

This presentation is an account of our year of experimentation, in imagining and researching the possibilities, in asking questions, in designing and building a space, and in experimenting with students and faculty in that space. And while I am presenting this work, it is very much the result of deep collaboration with several others, namely Steve Anderson, director of the Interdivisional Media Arts and Practice Ph.D. program in USC's School of Cinematic Arts; and Bjorn Littlefield-Palmer, who taught herself everything needed to design and construct the IML space while generously assisting students, faculty and artists with their individual projects.[4]

Before delving into the specifics of the IML Second Life design process, however, I want to sketch the particular context out of which our project emerges.

IML Background

The IML was founded in 1998 in conversations between Elizabeth Daley, the dean of the School of Cinematic Arts, and filmmaker George Lucas, who was interested in exploring visual literacy, with the idea that literacy as we approached the new millennium would need to account for not just practices of reading and writing, but those associated with the visual. Throughout our 10-year history, we have conducted research on the changing definition of literacy within a networked world, as well as on new ways of learning and emerging forms of scholarly practice and production.

After several years of experiments pairing a broad array of courses in USC's College of Letters, Arts and Sciences and the School of Cinematic Arts with multimedia labs, we developed the Honors in Multimedia Scholarship program four years ago. It is open to students from any school or division on campus, and leads students through a 20-unit curriculum covering histories and theories of scholarly multimedia, and culminates in a thesis project in the student's final year. The Honors Program is somewhat small – we have 130 students in total – and we have the luxury of being able to experiment in how we design and teach our courses. We have experimented with backchannel, for example, encouraging students to use instant messaging as an extension of the conversation taking place in the classroom. We also work with the tools that the students are using, trying to help instill a critical reflexivity that allows them, for example, to create a critical walking tour of Facebook, analyzing the design and ideological implications of the application.

Our second main program is the Multimedia in the Core Program, which unites General Education courses with multimedia labs, inviting students to create media projects rather than primarily writing papers as assignments. There are many challenges with this program, but it is part of a larger mandate at the IML to work aggressively with faculty and graduate students as much as we do with undergraduates. As such, the program has built into it extensive time for collaboration, course redesign and multimedia instruction and experimentation for faculty.

I should also note that unlike many programs dedicated to emerging forms of literacy, we are housed in the School of Cinematic Arts which includes divisions of production, animation, critical studies, screenwriting and interactive media. All of these divisions and the array of issues and skills that they embody, greatly impact not only how we're able to achieve certain kinds of teaching and abilities with our students, but also influences what we teach.

So this is where we started:

- with questions about an alternative space to enhance literacy and scholarly multimedia practices;
- with a program already dedicated to multimedia scholarship, both at the high level afforded by a small Honors program, and broadly, within a General Education curriculum;
- faculty members with broad interests and experience; and
- the desire to push the boundaries of a theory of pedagogy and to do so in concert with the needs and abilities of our programs.

We were also cognizant of several other key issues:

1 Second Life does not exist in a vacuum; whatever happened in our SL space would need to expand on and integrate with other IML practices and research.

2 The SL space is certainly coextensive with high information density learning environments that many students already participate in; again, the concern here was balancing the specificity of the space with its ability to integrate with larger goals.

3 We know that Second Life is only one among many possible multi-user virtual environment (MUVE) platforms. We did not want to ever get into a situation in which we felt that all that we had done was a waste of money and time; hence it was crucial that the project be as much a learning and research project as a production.

4 We know that Second Life is not well-liked by many of our students; while many people – especially those with little or no experience in interactive games – find SL exhilarating, many students complain bitterly about how ugly SL is, how clunky and how unintuitive it is for building. We knew we would need to reckon with this overtly.

Part 2: Concepts and Inspiration

Our next step was the conceptual phase: what are the key ideas that we wanted to start with? What would form our theoretical foundation?

We had two key concepts that we wanted to put into play.

The first is infrastructure. I borrow the term from two essays. The first is by Genevieve Bell and Paul Dourish and is titled "The Infrastructure of Experience and the Experience of Infrastructure: Meaning and Structure in Everyday Encounters with Space," which is dedicated to understanding the ways in which pervasive computing will impact space and the ways in which we use spaces.[5]

The second essay is "From Interaction to Participation: Configuring Space Through Embodied Interaction," by Dourish, as well as his colleagues Eric Kabisch and Amanda Williams; once again, this essay is dedicated to understanding the impact of pervasive computing on everyday interactions.[6]

In "From Interaction to Participation," the authors note that space is never merely a container for our actions, but instead "a setting within which we act."[7] For the authors, the word "infrastructure" captures the back-and-forth movement between what a space affords as a setting, and how a space is produced by the activities that take place there.

They also note that infrastructures describe the ways in which we encounter spaces, not only through physical components such as walls or streets, but through information, the practices of use that make a space have specific meaning for users, and the social interactions that occur at any given moment.

While infrastructures are often considered merely part of the backdrop against which various activities take place, they also structure, whether overtly or indirectly, the cultural practices that take place within any given space.

Infrastructures, Dourish and Bell point out, are also "crystallizations of institutional relations," and they "reflect and embody historical concentrations of power and control."[8]

Dourish and Bell further explain that the organization of infrastructures work to frame how we experience the world. Infrastructures may be invisible, but they become visible when they break down or problems occur.

They conclude their definition by noting, "Infrastructure, then, is analytically useful both because it is embedded into social structures, and because it serves as a structuring mechanism in itself."[9]

The users and developers of Second Life – both those at Linden Lab and the collective users who generate so much of the building in-world – are in the process of crafting infrastructures, and what makes one's experience in Second Life often so interesting are the ways in which we can witness that process occurring, and further, the ways in which the normally invisible infrastructures that condition our physical existence are reflected back as users attempt to replicate them – or increasingly, reinvent them – virtually.

The second term that we came across that was instrumental in framing our investigation derives from the work of Ed Soja, who in turns derives it from the work of Henri Lefebvre: the term is "trialectics." We came across the idea most fruitfully in Kevin Leander's essay "Reading the Spatial Histories of Positioning" in the collection titled *Spatializing Literacy Research and Practice,* edited by Kevin Leander and Margaret Sheehy. Leander describes three kinds of space: perceived, conceived and imagined.[10]

Perceived space is the everyday space we inhabit; it is the everyday routine space that seems entirely transparent.

Conceived space is planned space; it is dominated by ideology.

And imagined space is formed in relation to both of these: while representations of conceived space appear natural, they also often don't align with our own particular experiences; so imagined space is full of contradictions, which always prevents the production of a final, fixed, stable space.

With these two terms, then, we had a foundation for thinking very abstractly about the ways in which space is produced through interactions: how could we take this knowledge and imagine crafting a space that would not only embody or convey this process – as an aspect of contemporary literacy even – and also be attentive to the changing needs of a space as it is lived and produced?

The final component of our introductory research led us not to other Second Life campuses but to the experiments of a number of artists and architects. Indeed, we found that an array of artists and architects are using Second Life to interrogate the relationship between immaterial and material spaces, reckoning with and creating new forms of spatiality and social interaction, and designing ways of comprehending both that contribute to the redefinition of literacy that we are currently witnessing in broad – and urgent – terms. I will quickly point to five examples:

The work of **Brad Kligerman** (known as Kliger Dinkin in Second Life) and his Ars Virtua artist-in-residence project, which deployed the material traces of avatar wanderings in the construction of the gallery space the avatars eventually inhabited, offers an example of work that is attentive to Second Life's specificity.[11]

The Ars Virtua Artist in Residence (AVAIR) project, initiated in 2006, is itself an art project by James Morgan, Amy Wilson and Jay van Buren. Kligerman was Ars Virtua's first resident, and during the first quarter of 2007, he developed a series of tools to experiment with the flows of information in a digital space. The most compelling of these experiments allowed the information gathered through an avatar's presence in Second Life to become manifest in the gallery space. The history of each avatar contributed to the production of the representation of the space of the gallery.

In his proposal documenting how the project would function, Kligerman explains that teleports would send avatars to other Second Life spaces containing "spaces and machines designed to extract in-world data."[12] Once there, avatars would encounter one of three land-types, each of which held different types of data that would be captured by avatars using a Heads-up Display; that data would in turn be sent back to the gallery space, constructing the space of the gallery itself.

The avatar that had gathered information could return to the gallery space to witness the transformation inspired by the journey. "Visitors moving through the gallery space, over, under and within its formal-textural construct, make critical connections between in-world conditions and deep structures of disparate SL environments that are represented," writes Kligerman.[13]

While Kligerman's project was never fully realized, the artist's thinking about the possibilities highlights a critical concept in considering the relationship between virtual and physical spaces, specifically in reckoning with new forms of spatiality and social interaction, and designing ways of comprehending both. Kligerman's project specifically pointed to the potential of making visible the substrate of information gathered within an avatar. Further, the project was designed to reflect the notion that space is produced by its inhabitants, an idea discussed at length by numerous

theorists interested in how the spaces that we inhabit are never just passive arenas within which activities are enacted. Both of these achievements, then – namely, visualizing the substrate of information gathered and foregrounding the fact that space is produced – contribute two key elements to a new facet of contemporary literacy.

There are several other artists and architects who focus on manifesting or making visible infrastructure and the processes of social interaction within information spaces, either by disrupting conventional patterns of interaction that align with the physical world, or by visualizing the flows of information that generally remain invisible.

Jon Brouchoud (known as Keystone Bouchard in Second Life) is also is a virtual architect and founded the experimental architecture space Architecture Islands in Second Life last year.[14] His projects include a gallery of reflexive architecture in Second Life, as well as Studio Wikitecture, which uses Second Life as a space to consider ways to harness the collective intelligence of a group in designing architectural spaces. He has also conducted a series of experiments exploring forms of responsive architecture, which shifts to accommodate the habits and patterns of use in a space.

His notion of "Carvable Architecture," for example, uses wall panels that move backward in response to the approach of avatars; as spaces become well-used, they increase in size; as they are less used, they grow smaller. Similarly, places that are well-worn in terms of the paths walked by avatars indicate that wear, effectively making visible the patterns of use.

Brouchoud also talks about "Architecture On Demand." In the build embodying the idea, he uses a single block that grows or shrinks as an avatar approaches. When this block is placed in close proximity to others, it creates a collection that becomes a field condition. The individual blocks act in unison to create a field effect that gives the impression of a single membrane reacting as a singular surface. The resultant undulating surface is both elegant and visually complex and contains many more architectural applications as wall surface, floor surface, or spatial element.

Brouchaud's experiments suggest ways that we might rethink learning spaces as responsive or reflexive. Rather that creating spaces that allow us to continue lecturing, or holding office hours, or conducting the real-world endeavors in a new environment, we might think about how our educational spaces might track use, or adapt to patterns and behaviors.

Michael Ditullio is an architect based in New Haven, Connecticut, and known as Far Link in Second Life. His work also centers on experimenting with architectural form in Second Life. Indeed, on his Web site, he highlights a series of new terms for this kind of architecture, using the terms "active, reflexive, reactive, responsive, reflective, 4D, flexspace" and so on.[15] He notes that there tend to be key reasons for working in this manner, whether for "collaboration, entertainment, challenging perceptual norms, a focus for socialization, or a tool for simulating and testing real world interactions." He adds that "while these virtual builds contain particular reactive qualities such as response to movement, presence, voice or other behaviors, I feel that they also allow for a more robust form of interaction rarely taken advantage of in SL builds (with certain recent exceptions)." His primary experiment takes form as SONAR, which refers to "Self-Organizing Nebulous Architectural Response," a project that seeks to create "emergent architectural forms" that are based on the interactions avatars have both with scripted objects, the environment and other avatars.

Once again, using Ditullio's experiments, can we imagine teaching and learning spaces that are similarly "self-organizing" in response to the movements of avatars? Can we imagine designing a space that was attentive to the movements and interactions of avatars within a space?

Designed to interrogate the power of architecture in Second Life, **Archidemo** brought together over 50 different participants from various backgrounds to collaborate on experimental architecture.[16] Hidenori Watanave, an associate professor at Tokyo Metropolitan University interested in collaborative work in the realms of Architecture and Environmental design in tele-existence and the metaverse, was one of the organizers of the project, and advocated the notion of "contents-oriented space," by which he means that because elements such as walls and ceilings are no longer the key components in virtual architecture, we need to think instead about issues such as navigation. He also advocates interweaving real space and the spaces of Second Life, so that there is a kind of layering of realities through the mapping of 2-D images and information into a 3-D space.

In particular, one of the experimental projects in the Archidemo space brings together a series of panoramic 2-D still images that collide with each other; as users move through the space, they connect with differing representational modes that suggest a blended space, disrupting the easy binary distinguishing "real" and "virtual."

Archidemo's experiments are uniquely attentive to the intersections of the physical world and an information space that, for our purposes, could be a pedagogical space. Indeed, from a pedagogical perspective, it is worth noting that the space of the physical classroom where most of us teach is already an information-space where students inhabit a mixed reality learning environment of their own via ubiquitous wireless networks, cell phones, SMS, instant messaging, etc. Once fixed boundaries between the learning spaces of the classroom and the world outside are now fluid and permeable and the literacy that students need to traverse these spaces is part of their ability to navigate a much broader media and information ecology that extends far beyond learning institutions into the streets and across informal peer communities, social networks, virtual environments and more.

Yet another interesting set of experiments is being conducted by **Drew Harry** (aka Zetetuc Aubret), a graduate student in MIT's Socialable Media Group who creates responsive meeting spaces that explore new ways of representing information and participation.[17]

In his conference room project, Harry created a means to make the location of one's avatar have meaning. You choose a position within the space depending on how you want to represent your feelings on a particular topic. Other signs are deployed to show certain decisions: when someone agrees to undertake a particular task, for example, a green cone appears above the avatar's head. Similarly, tall cylinders show that people have held the same opinion for a long time. Harry expects to change the design of this feature, since he has found in tests that people deliberately moved their avatars out of the cylinders to avoid feeling trapped.

In short, these experiments all avoid the dutiful replication of the real world, along with its infrastructures and practices of use, opting instead to explore new infrastructures and how they might impact new practices of use. Our goal, then, was to see how these might mobilize new learning practices and foment broader literacies.

Part Three: The Real Meets the Conceptual

With some conceptual ideas in mind, we next looked at what we actually had to work with, but keeping in mind some other considerations:

- a small seed grant from the Provost's office to establish a space
- one full-time person dedicated to learning how to script
- two courses that would use the space specifically
- two Honors Program Thesis students wanting to work in SL
- two faculty members with a project needing a home
- the need to show how the space could, despite its unusual structure, serve as a recruitment or showcase tool

We started by delineating four levels. We decided that projects would incubate below ground, rising upward as they neared completion.

The main level would be the central meeting area; it would be designed by its users. We were intrigued by the Decka-Decks and the Holodeck, existing structures that we thought might jumpstart our process. We bought them, and they've rarely been used.

Indeed, our best projects and learning objects have developed from the inside out as we realized that we had specific needs based on occurrences within the context of teaching. Here are some of the projects we've built:

Panopticon/Immersive Syllabus

We developed an immersive syllabus based on the need to have screening and lecture materials on hand for students who might want to review the material. Using a metaphor from the course itself, namely the Panopticon, we developed a syllabus in which each week is a box; inside the box, students would find the readings, screenings, slide presentation and lecture for any given week. Ideally, these boxes would become mini-archives, in which students would add material to craft a much richer experience for each week. The process would then encourage a process of remix and curation, two endeavors that we find incredibly fruitful with our students.

Tufte Tunnel

We also are developing an object called the Tufte Tunnel, which transforms one of Edward Tufte's key texts into an immersive experience that students move through. The space also allows students to craft their own versions of the text, adding a critical analysis component that can build over time. Eventually, the Tunnel will include links and supplementary videos as well as pop-up notecards. Here, we are experimenting with creating immersive lesson plans around foundational texts.

Another pedagogical project centers on the learning space itself, and how it dictates or structures what is to occur. We've had several incarnations that are specific to the classes for which they were designed.

Building Tutorial for IML 104

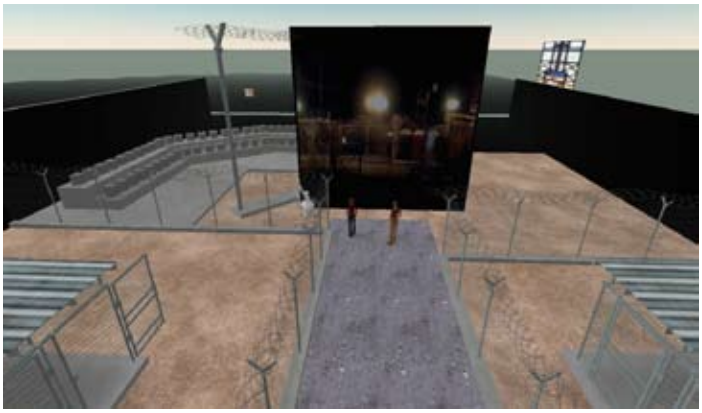
The course titled IML 104: Life in the Network examines the virtual environment as a trope in fiction, philosophy and film, and investigates a series of virtual worlds, from Virtual Lower East Side and Second Life to World of Warcraft and Club Penguin. The goal is to consider a full range of issues, from identity and ethics to cultural norms and institutional regulations. While we held several class discussions in Second Life, using the space as a meeting room, the space was far more useful when it was there for a reason. In one instance, the goal was to use a tutorial and, working together, teach each other how to build a chair. Once the chair was finished, the group had to figure out how to shoot up 100 feet, where we would hold the discussion; this was one of the most successful classes all semester.

IMD: 505

The other class that used the space was the Interactive Media graduate seminar titled 505. The students in the class are a mix of production, critical studies and interactive media students; in other words, they have wildly different skill sets, interests and needs. Often the course is a struggle to manage because of these conflicting needs. However, the Fall 2007 semester saw the development of several productive collaborations, one of them being a project in Second Life that brought together students from each of the three divisions. The assignment was to introduce the readings and lead a discussion with them. However, the assignment had to be completed using some element of social software. The group that chose Second Life as the software ended up creating a game show in Second Life in which contestants see a series of nine videos made by the student group that illustrate key concepts from the reading, and then compete to answer questions about it. The students brought the game up in the lecture room for the course, and the result was an interesting "window" into a second space. The different skills needed in creating a smart project in this case were addressed by the different abilities of this particular group of students, and the project was instructive in that way.

Student Showcase

The space was also home to two Honors Program thesis projects. In one, Rivenscryr, the student, Matt Lee, who is majoring in engineering and theater, created an experiential analysis of Shakespeare's The Tempest, playing on a central trope, namely that interpretation is performance, and performance is interpretation. The project's name combines the word "riven," which means broken and "scryr," which means reading, and he argues that a text without its context is somehow broken. His project tries to invent a context for The Tempest. It takes as its starting point the character of Sycorax, the mother of Caliban; she is dead at the time of the play's beginning, but resonates through the memories of the other characters. Lee argues that Sycorax represents a history of silenced female characters, and his project is in some ways a testament to her role in that he is making a space for what is invisible in the play. For users, the project unfolds as he/she moves through the space, gradually accumulating information and analysis within the space. The project leads users from an upper level and primary sources to a lower – or deeper – level of more extensive critical analysis. The experience of moving through the project the first time is revelatory as one discovers ever more compelling bits of the argument.



Gone Gitmo

Another project is the "Gone Gitmo" project co-created by IML faculty member Peggy Weil and her partner Nonny de la Pena. The project creates an immersive experience of detention, and in September 2007, the space was incorporated into the Seton Hall School of Law event titled "Virtual Guantanamo," a conference in which participants discussed the political and legal questions regarding detention at Guantanamo. The conference proceedings were streamed live into the "Gone Gitmo" Second Life space.

Synchronous Events

Yet another project emerged from the 24/7 DIY Video conference organized by Mimi Ito and sponsored by the IML which extended over several days; we wanted to make the conference proceedings available to those who were not at the event by streaming them live in our space. The IML space has since been home to a few other similar events, again, emerging from our desire to make this information more readily available.

Mobile

In our most recent experiments, we are working with the idea of making Second Life more conducive to mobile media and to the practices we've grown accustomed to with our physical world media devices. Many of us have become quite used to carrying cellphones that play media, or that are equipped with navigational tools, or that allow for the easy sharing of media. Why can't we do that easily in Second Life?

Second Life is predicated on a geographic metaphor, with travel and mobility being key components. However, SL does not easily accommodate mobile "devices" per se. It can be very difficult, based on how spaces are controlled by ownership rights and permissions, to show media beyond one's own SL space. So we've been working on creating a mobile media player that you can carry with you as part of your avatar, as well as a suite of tools – a video projector and slide projector, for example, that allow you to take your media tools with you as you move through Second Life.

We are also working on ways to make showing this material easier, working from commands typed into the chat box, rather than an object that is stored in your inventory.

In short, then, working backwards from what we actually needed, and using the information gleaned in real interactions in our space, we now have a space that includes theses aspects:

- experimental pedagogical space
- presentation space for student and faculty research
- project development and display space
- synchronous event space
- iterative design process

What I can tell you now from our own experience is that the process, while clunky, is productive. It is also very nonlinear!

Conclusion

As we've developed the space through an iterative process, what are some of the new learning practices and broader literacies? For us, Second Life has become a space where we can look back at the infrastructures of learning and ideology in our physical campus. In this way, the space helps disrupt invisible conventions and unsettle unseen infrastructures. Indeed, our experimentation in Second Life has allowed us to focus specifically on the reading of infrastructures. We feel strongly that we need to teach our students how to look at the institutional relationships embedded in infrastructures, but we also should consider reflecting new relationships within the spaces we construct. Second Life in many ways makes apparent or overt many of the things that remain invisible, but this could also be a goal in our building practices, namely to construct disruptive spaces that interrupt habits ported in from real world spaces, or that bring to the fore spatial practices that tend to remain hidden.

Further, taking advantage of Second Life as a space that might be responsive, how can we build spaces that can be shaped by their users? We continue to ask this question, and hope to move toward more innovative, reflexive builds soon.

One of our final realizations is an awareness of the necessity to understand infrastructures in the manner suggested by Dourish and Bell, namely with the notion that they are always relational. Just as a relational database allows users to discern unforeseen relations among sets of data, so too does relational literacy help users discern the invisible or unacknowledged linkages and connections among data streams around us at any given moment.

Notes

1 Bill Viola, "Will There Be Condominiums in Data Space?" in Multimedia: From Wagner to Virtual Reality (NY: W.W. Norton & Company, 2001).

2 Jay David Bolter and Richard Grusin, Remediation: Understanding New Media (Cambridge, MA: The MIT Press, 2000).

3 Cory Ondrejka, "Education Unleashed: Participatory Culture, Education and Innovation in Second Life," in The Ecology of Games: Connecting Youth, Games and Learning, Katie Salen, ed. (Cambridge, MA: MIT Press, 2008).

4 The IML's Second Life space was funded through a Provost's Seed Grant for Teaching With Technology; the initial proposal was titled "Distance Learning in Virtual Environments."

5 Paul Dourish and Genevieve Bell, "The Infrastructure of Experience and the Experience of Infrastructure: Meaning and Structure in Everyday Encounters With Space," Environment and Planning B: Planning and Design 34(3), 2007, 414 – 430.

6 Amanda Williams, Eric Kabisch and Paul Dourish, "From Interaction to Participation: Configuring Space Through Embodied Interaction," Proceedings of the Ubicomp 2005, LNCS 3660; retrieved August 1, 2007, from http://www.ics.uci.edu/~jpd/publications/2005/WilliamsKabischDourish-InteractionParticipation-Ubicomp2005.pdf

7 Williams, Kabisch and Dourish, 1.

8 Bell and Dourish, 416.

9 Bell and Dourish, 418.

10 Spatializing Literacy Research and Practice, edited by Kevin Leander and Margaret Sheehy (Berlin: Peter Lang Publishing, 2004).

11 Kligerman's work is showcased on hist Web site: http://metaverseterritories.com

12 All quotations come from Kligerman's Web site describing the project during his residency: http://transition.turbulence.org/AVAIR

13 Artist Annabeth Robinson (known as AngryBeth Shortbread in Second Life) has recently focused on the role of the avatar in influencing surrounding space as well, by reading the key or unique ID number associated with each avatar. She is currently working on musical instruments that incorporate avatar information in the creation of chords that when combined make music.

14 See Bouchard's site for further information. http://clearnightsky.com/

15 Virtual Interactive Architectures: http://interactivearchitectures.blogspot.com/

16 See the Archidemo blog for further information. http://archidemo.blogspot.com

17 See documentation of Harry's work on his MIT Web site: http://web.media.mit.edu/~dharry/

About the Author

Holly Willis is a Research Assistant Professor in the School of Cinematic Arts at the University of Southern California, as well as Director of Academic Programs at the Institute for Multimedia Literacy, where she teaches, organizes workshops and oversees academic programs designed to introduce new media literacy skills across USC's campus and curriculum. Willis' current research centers on the intersection of media art, graphic design and rhetoric, and the ways ideas and formal strategies from each might inform contemporary scholarly practices. She oversees the IML's research in the pedagogical uses of multiuser virtual environments and promotes the use of numerous online tools for writing and research. Willis is also the editor of The New Ecology of Things, a collection of essays on the potential of pervasive computing, and she is the author of New Digital Cinema: Reinventing the Moving Image, which chronicles the advent of digital filmmaking tools and their impact on contemporary media practices. Ms. Willis has written extensively on experimental media practices and emerging pedagogical models for a variety of publications.

Learning 2.0: Who's in Control Now?

Wendy Shapiro and Lev Gonick | Case Western Reserve University

The internet has the potential to be the single most important and profound enabler of global culture and education. By understanding the behavior of the Net Generation and using Web 2.0 technologies, powerful new designs for education and Learning 2.0 can be developed. There is an opportunity for education to become more innovative, interactive, and engaging, building on the freedom and flexibility of contemporary information technologies. New possibilities for learning – increased collaboration, visualizing and understanding large quantities of data, creatively expressing meaning through storytelling, discovering meaning through mashups, constructing ideas in a social web, and blurring the boundaries between the virtual and the real – are unfolding as Web 2.0 technologies make a more relevant learning experience possible for students and place at their disposal the power to connect their academic experiences to the participatory culture that surrounds them.

Introduction

Forty years ago we were awe inspired when the very first pictures of planet earth were sent back to NASA giving us a view of the whole earth from the view of the stars/heavens looking down on us.

Four decades later we view the earth like this … a global image of internet connectivity.

In the less than twenty years since its birth, more than one billion people around the globe are using the Internet on standard computers. Another two billion users have mobile Internet browsing and message services on their cell phones, including more than five hundred million in China alone. The internet has the potential to be the single most important and profound enabler of global culture and education.

Who are we educating?

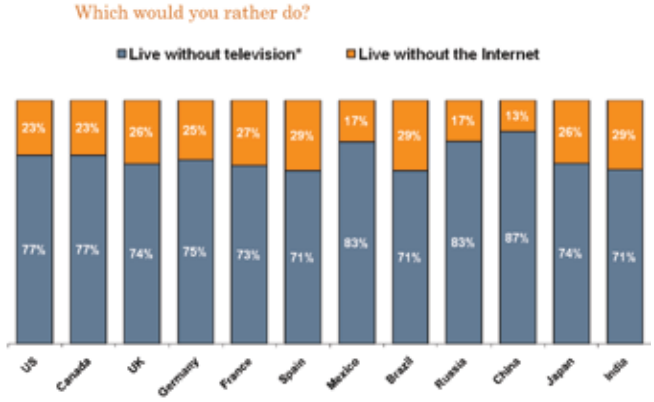
Data gathered by Annenberg's Center for the Digital Future, a global study published by New Paradigm, and Anthony Williams, co-author of *Wikinomics,* help to define the characteristics of the NetGen student. A sketch of the Net Generation begins to emerge as we note that Net Generation students:

- will never read a newspaper but are attracted to some magazines.
- will never own a land-line phone (and maybe not a watch).
- will not watch television on someone else's schedule much longer.
- trust unknown peers more than experts.
- are, for the first time (2005), willing to pay for digital content. Never before.
- have little interest in the source of information and prefer most information aggregated.
- place the community at the center of Internet experience.
- think themselves uninterested in advertising and unaffected by brand (but they are wrong).
- expect that everything will move to mobile.
- are less interested in television than any generation before.
- want to move content freely from platform to platform with no restrictions.

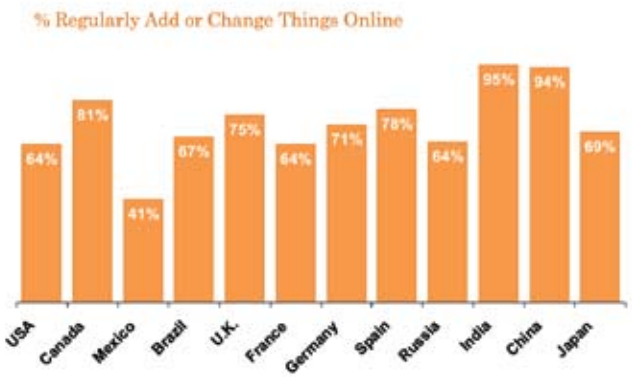
- want to be heard (user-generated content).
- use instant messaging, and think e-mail is for their parents.

– *2007 Digital Future Report* from the USC Annenberg School's Center for the Digital Future

The N-Gen Wants the Internet



*Significantly higher than for Xers/Boomers



Source: 2007 New Paradigm Global Study

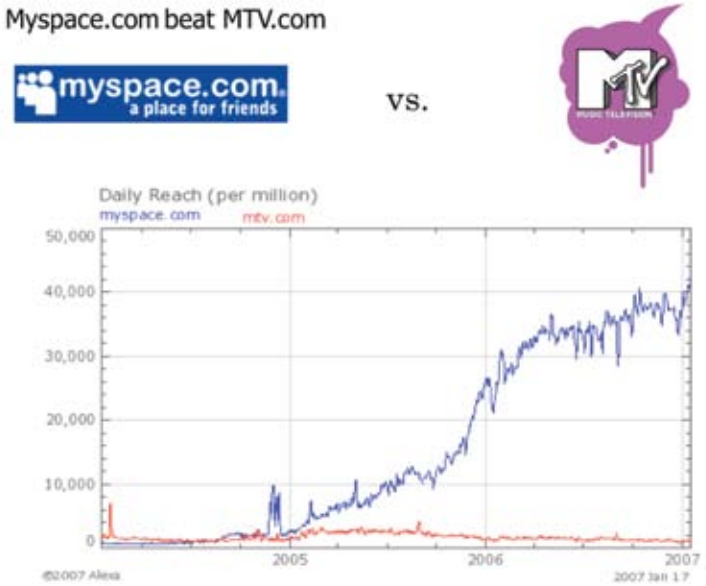
Different trends are emerging in this era of computing and communications. The web has evolved from a medium for publishing information to a medium for building massive online communities around all conceivable spheres of interest. The web has become the infrastructure for business collaboration and increasing collaboration technologies are driving significant changes in other institutions like government and education.

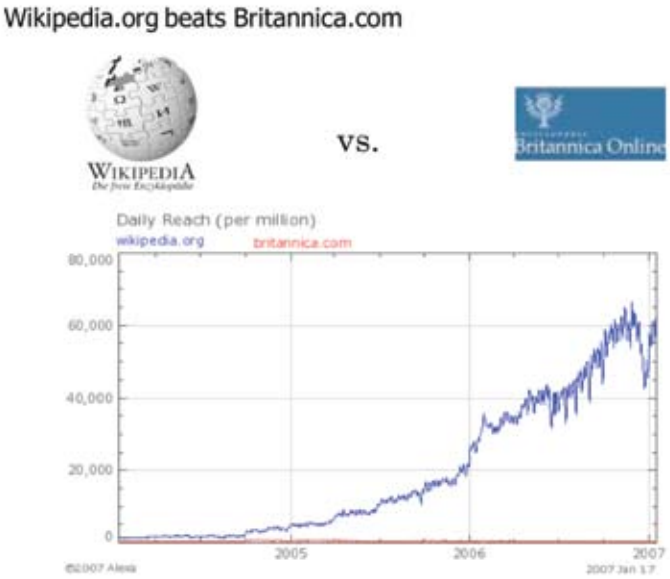
The blogosphere is a good example. It has never been as easy as it is today for ordinary individuals to express themselves and share their thoughts with the world. In June 2005, there were ten million people blogging. We thought that number was pretty astounding. Today over seventy million people are giving a running commentary on everything from technology to celebrity gossip, and 120,000 new blogs are created every day! Much of that growth is in China.

MTV once ruled in the broadcast age, but not anymore. It is not too difficult to predict the future of music. How long will it be before the reach of MySpace exceeds the reach of MTV's broadcast channels?

The Power of Collaborative Communities

Anthony Williams, *Wikinomics and the Future of Education*





In parallel with other trends, Wikipedia has been rising to prominence. This is a free repository of human knowledge that anybody can edit. Today Wikipedia has 1.8 million English language articles, 75,000 contributors, and 1 million editors who make tens of thousands of updates every day. Wikipedia is now the ninth largest site on the Web and is nearly 10-15 times larger than the *Encyclopaedia Britannica* – its closest rival.

Back to Learning 2.0 and Who's in Control Now

Using Web 2.0 technologies and understanding the nature of behavior of NetGeners enables powerful designs for education and Learning 2.0.

Welcome to Learning 2.0 - Movie
http://www.youtube.com/watch?v=2r4_bnCdWnM

The freedom and flexibility of contemporary information technologies has opened dialogs and afforded education the opportunity to become more innovative, interactive and engaging. Today we live in a world enabled by technology that allows us to freely contribute and distribute our thoughts, ideas, skills, projects and products. There is a transparency to learning where both the process and contributors are visible. Students are becoming involved with authentic data sets, solving messy, complex, real-life problems, and discovering ways to see their data that wasn't possible in the past. The social dynamic of learning 2.0 is creating a shift from "access to information" to "access to people."

We are beginning to see instructional strategies used in creative ways that engage students in their own learning; strategies such as situated and immersive learning, problem-based learning, virtual simulation, and community-based learning add new levels of meaning and relevancy to learning. Along with authentic learning, we're seeing more authentic assessment. Students are able to evaluate their own progress, have freedom to make mistakes, and can adjust their course.

Web 1.0 vs. Web 2.0 - Movie
http://www.youtube.com/watch?v=lNZ933g-hm0

In 1987, Chickering and Gamson published an article entitled *Seven Principles of Good Practice in Undergraduate Education*. In this article, important education strategies were outlined which set the stage for a new paradigm of participatory learning. The seven principles included the need for more faculty-student contact, the need to engage students in active learning, the understanding that students can learn from each other, the realization that time spent on task is critical, the idea that feedback needs to be prompt and immediate, the need to set educational expectations to a high standard, and the importance for students and teachers to respect the diverse talents and ways of learning.

Chickering and Gamson have laid an important foundation upon which we continue to grow. Now, more than 20 years after the publication of their article, we find ourselves in a world where innovation, social networking, and change are an everyday occurrence – and we are all contributors. There is a greater blending of technology and learning. A freedom and flexibility has been opened through Web 2.0 technologies. New levels and layers of dialog are possible. Educators are becoming more innovative, interactive and inclusive.

Contemporary Thoughts on Learning *Selected from Chickering and Gamson*

Faculty Student Contact

Student Peer Learning

Prompt Response

Active Learning

Time on Task

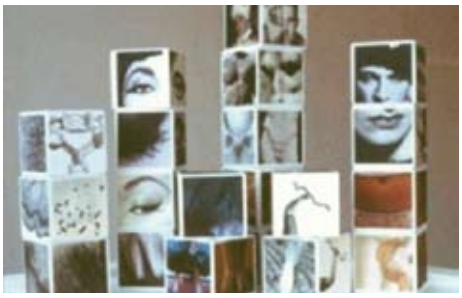
Communicating High Expectations

In the era of Learning 2.0 there is a promise of new possibilities in learning; increased collaboration, visualizing and understanding large quantities of data, creatively expressing meaning through storytelling, discovering meaning through mashups, constructing ideas in a social web, and blurring the boundaries between the virtual and the real.

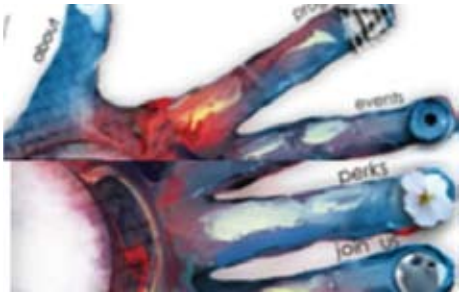
New Possibilities for Learning

Creative Expression

Blending Virtual with Real

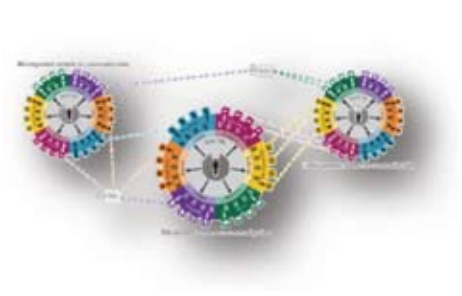


Collaborative Learning
Collaborative Workspaces



Mashups & Metaphors

Visualization & Interpretation



Social Construction of Ideas

Learning 2.0 is enabled with Web 2.0 technologies. Examples of each of the New Possibilities for Learning are outlined below.

Creative Expression

Passing knowledge from one generation to the next is a fundamental purpose for formalizing education. Unfortunately there are many instances in which education becomes more stifling than illuminating. It has been shown that greater depths of understanding and ownership are achieved when students are given freedom to construct meaning from information and ideas. The process takes on increased relevancy as students collaborate and work with peers and experts locally and globally.

An example of this type of learning experience is digital storytelling. Storytelling is a powerful tool to communicate and share experiences, explore meaning, and help students connect to one another. Storytelling bridges age, race, gender, and culture. It creates ways to share experiences and express individual voices. The tools for crafting stories include written text, narration, and multimedia presentation. In each of these venues students explore ways in which sights, sounds, and language can be used to create meaning. In a course conducted at Case Western Reserve University students learned to tell their own story, created collaborative stories, and learned to listen.

The basic element of the digital storytelling class included:

- Writing a personal and meaningful narrative
- Transforming and recording an audio narrative of the story
- Gathering and editing multimedia elements of the story
- Imagining, creating and producing a digital story using Adobe Premiere

The culminating event of the course required students, in avatar form, to present their virtual stories to an invited audience in Second Life on the ClevelandPlus Island. A short video was created of the students in Second Life presenting their stories.

Digital Storytelling in Second Life – Movie
http://www.youtube.com/watch?v=U1hlS3kNrmI

Blending Virtual with Real

Virtual worlds like Second Life provide educators a dynamic landscape for innovative learning; opportunities for exploration, experimentation, research, teaching and creative expression. At Case this is happening at both the undergraduate and graduate levels. In the realm of medical and health education, professional schools are looking at ways virtual realities can support education. There is an keen interest in ways virtual worlds can support, extend and/or replace the use of "standardized patients." Standardized patients are actors who have been trained to accurately portray the role of a patient with a specific medical condition.

These actors simulate the doctor-patient experience, allowing medical students to practice and test their skills. Medical and dental education programs are exploring ways in which virtual worlds can support the experience. Studies have begun to test the viability of using virtual reality as an environment to reproduce or simulate the standardized patient experience. In the virtual setting of Second Life experts take the role of patients while students communicate and interact as "doctor" avatars. All interactions have been or will be recorded using machinima and with cameras focused on the real students. In addition, motivation and perception research instruments have been or will be administered. The findings thus far indicate that there is no significant difference in learning when comparing the real standardized patient experience with the virtual encounter.

Blending the virtual and the real – Movie
http://www.youtube.com/watch?v=R3WLJq5BucM

An article from *Case Daily* outlines the study being conducted at the Case Western Reserve University Dental School:

> The research project focuses on developing scenarios that aid and test students in taking patient histories, providing oral health education like tobacco cessation counseling for smokers, explaining procedures, talking about healthcare options and obtaining informed consent, and working through situations that present ethical dilemmas. These are among the competencies outlined by the American Dental Education Association. *http://blog.case.edu/case-news/2008/07/28/virtualdentistry*

Collaborative Learning - Collaborative Workspaces

Collaboration is central to Learning 2.0. In collaborative spaces students feel that they need, depend on and value each other for success while directly engaging communicate with each other. Collaborative tools remove some of the temporal and time constraints of traditional learning.

Web 2.0 technologies support collaborative environments where students are able to develop communication skills and teamwork strategies. Successful collaboration develops important interpersonal skills such as the ability to see multiple points of view, the ability to collaborate without sacrificing personal meaning and the ability to put consensus and team efforts above individual preferences. In these spaces educators have the opportunity to put increasing control into the hands and minds of students. Students can become designers of their "worlds."

Collaborative web 2.0 technologies can be divided into four categories:

1 Social collaboration – including wikis, blogs, instant messaging and virtual worlds
2 Social networking – including online communities and social network analysis
3 Social publishing – including content sharing (video/audio) and social tagging
4 Real time collaboration – including Adobe Connect and WebEx conferencing

Mashups & Metaphors

Mashup, a Web 2.0 term, carries several descriptions ranging from a new type of web content to Wikipedia's definition "a digital media file containing any or all of text, graphics, audio, video, and animation, which recombines and modifies existing digital works to create a derivative work." To understand the power and potential it is possible to compare a mashup to a metaphor.

There is an interesting parallel between metaphors and mashups. Metaphors such as "the world is a stage" or "you are my sunshine" compare seemingly unrelated subjects thus providing a powerful image to support an idea. Metaphors nurture creativity because they are not accurate. They are open to different interpretations and amplifications. Thought is required to create and understand a metaphor thus bringing new levels of insight.

Like metaphors, mashups bring together information/data from unrelated sources into a single integrated tool. Again, like a metaphor, mashups are a creative way to create new levels of thought and insight allowing for innovative explorations and experimentation. A common example of a mashup is Google maps and Flickr, which produce a personal pictorial travel guide glued to the earth. Just like creating metaphors, creating a useful and meaningful mashup requires thought, consideration and reflection.

Visualization & Interpretation

As a society we have produced more information in the past 25 years than in the previous 2500 years combined. Information overload is a common occurrence in the digital age. In a world of sensory immersion we need to learn to interpret, discriminate, and see patterns in the data and data in the patterns. It is important for students to explore large, authentic data sets through a visual lens. Multiple Web 2.0 tools make possible sophisticated graphing & visual representation of digital information. Authentic and dense information sets are freely available. Students can ask probing questions of census data, geographic data, or climate data as well as their own personal data. For students the process takes a new of form of experiential learning representing elements of research, investigation, reflection and communication.

As Nina Simon states on the *Museums 2.0* blog, "The result [of visual analysis of data] is deeply intoxicating, rich with content, and the meaning seems to emerge artistically from the data itself….Data visualization helps us be intelligent interpreters on our own, instead of asking someone else to design an interpreted experience for us." *http://museumtwo.blogspot.com/2008/02/data-visualization-honest-powerful.html*

Social Construction of Ideas

A question can be asked, "Where do ideas come from?" or perhaps, "Where do solutions come from?" Answers can be found in the wisdom of crowds. Web 2.0 is providing a platform for an evolving method of collaboratively organizing vast amounts of information through crowd sourcing - in other words, mass collaboration. Education can learn from businesses such as Dell and Starbucks to turn particularly challenging questions back to the consumers – in our case, back to the students – for answers.

Dell, Inc., for example, created an interactive web community open to the public for the purpose of expressing needs and desires related to Dell computing. In Dell's words, the purpose of the site is to build "an online community that brings all of us closer to the creative side of technology by allowing you to share ideas and collaborate with one another" (see http://www.dellideastorm.com/). Starbucks is doing the same by reaching out to its customers asking them to share their ideas, revolutionary or simple, just join in and Share, Vote, Discuss, and See (see http://mystarbucks.wordpress.com).

Conclusion

Students, formally known as the class, have taken control of their learning. Web 2.0 makes possible a more relevant learning experience for students to connect their academic experiences to the participatory culture that surrounds them. Social networking technologies are becoming the bridge between formal and informal educational worlds. In the Learning 2.0 era, the portfolio of active learning scenarios and opportunities is nearly boundless.

Where are learning and education headed? Consider the future; consider developing educational environments that promote learning and innovation skills to include creativity, critical thinking, communication and collaboration. Allow for flexibility, innovation, self-direction, social and cross-cultural skills and responsibility. If we are looking to develop leadership, then let the students lead.

References

Annenberg's Center for the Digital Future. (2007). "2007 Digital Future Report." Report. USC Annenberg School, Center for the Digital Future. http://www.digitalcenter.org/pages/current_report.asp?intGlobalId=19

Chickering, Arthur and Zelda Gamson. (1987). "Seven Principles of Good Practice in Undergraduate Education." AAHE Bulletin: 39, 3-7.

Williams, Anthony. (November, 2007). "2007 New Paradigm Global Study." Presentation.

http://www.itcork.ie/contentfiles/eventresources/AWilliams.pdf

Tapscott, Don, and Anthony Williams. (2006). *Wikinomics.* New York: Penguin Group.

About the Authors

Wendy Shapiro serves as Senior Academic Technology Officer at Case Western Reserve University, providing strategic leadership and direction for campus academic technology applications and initiatives. In this position Dr. Shapiro provides leadership in developing, implementing, and sustaining an assessment program designed to support decision-making, curriculum development and innovation, and teaching effectiveness related to the use of technology in advancing the academic and research mission of the University. In addition, Dr. Shapiro serves as Director of Instructional Technology and Academic Computing and is responsible for the design, implementation and evaluation of innovative and emerging technologies to support academic needs 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 design and technology. Dr. Shapiro is a published author, and has made numerous presentations in the area of academic technology and related topics throughout the United States.

Lev Gonick has been teaching, working, and living on the Net since 1987. He 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. He was the Chair of the 2008 New Media Consortium's Horizon Project providing an annual environmental scan of new technologies and their potential impact on the academy. 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. This included the much referenced launch of Cleveland+ in SecondLife. 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 currently serves on numerous community Boards including the Museum of Contemporary Art, Cleveland, the Bellefaire JCB for Children, and Lawrence School for Dyslexic and other differently-abled learners.

Why Walk When You Can Fly?

Reflections from an Advanced Second Life® Preconference session

Christopher Holden and Beth Sachtjen | NMC Virtual Worlds

This session was planned to give those who have mastered the basics of Second Life (SL) some of the tools and perspective required to move on to the next level of content creation. What makes SL unique is the fact that these tools are easily accessible to people outside the field of computer graphics and programming, allowing other professionals such as educators to use them and develop new and specialized uses for the platform.

Content creation in SL covers a wide range of disciplines, including animation, clothing design, film making, scripting (simple programming) and more, though the most successful projects and ideas often combine some or all of them to create a complete, immersive and interactive experience for the end user.

At the 2008 NMC Summer Conference, this session covered techniques for "building" in Second Life as an almost entirely in-world process. While we did discuss the use of third party software outside of SL, such as Poser for the creation of custom avatar animations, and Photoshop for the creation of custom textures and clothing, we chose to focus our scope to creating content entirely within Second Life. In an effort to further hone our focus, we also provided textures for participants to use in the class projects. These served as examples of Second Life's treatment of textures and images, without complicating the process by including instructions on the various paint or image editing packages our participants might choose to use beyond the session.

Anyway... what is "advanced" SL building? Actually it's ALL "simple"!

Compared with other 3D modeling software and indeed virtual reality development platforms, creating in SL is very simple. The difficulty often comes not in learning all of its features, but figuring out how to create sophisticated, professional results with such a limited toolset. In the first section, we took a look again at the basic toolset participants might have learned as newbies (newcomers to Second Life), but with an eye to its accurate and efficient use as the first and most important step to getting more professional results from their hard work in SL.

We pointed out that the first mistake often made by newbies, having learned how to rez (create) a prim (basic building block) and start building, is to over-do things; such as using huge textures (anything over 512 by 512 pixels), applied to hundreds of misaligned prims, built without any planning or sense of what it should look like. Because of this common mistake, we stressed the importance of planning what you intend to build by design or sketch before you even set prim to ground, so to speak.

We defined the most crucial starting point in planning as observation. For instance, if one is replicating a real world object, such as a house or building, it is critical that one observes its fundamental characteristics – as an architect, Christopher is particularly aware of how simple things like the proportions of a window's height and width can make the difference between something that looks convincing and something that looks like an infant's first attempt to draw a house! These kinds of observations are always taught to artists practicing the more traditional forms of representation, but creating content in SL is not so far removed. However advanced or realistic the technology becomes, we are often simply creating representations of the real in our virtual world and the artistic interpretation we apply to them might be as valid as that of an impressionistic painting.

Re-evaluating the "simple" tools

Defining *camera, wand, grid, basic textures,* and more

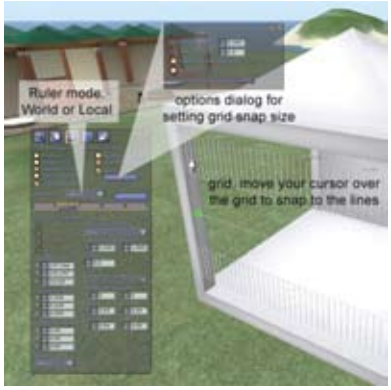
By first pointing out a few of Second Life's tools for interacting within the virtual world, we were able to more quickly allow participants to "break free" from the confines of their avatars and to see Second Life as a program in which object editing occurs on top of the instantly discernable social atmosphere. Below are some of the key terms and functions we helped participants to discover.

Camera. Leaving your avatar in one place and using the camera to move around your build turns "building" into "modeling." Participants were able to recognize how this makes editing easier, as it gave them an overview and access to every face, corner and aspect of their surroundings with ease. Even working on a whole sim, the scale becomes manageable. Participants who had modeled in other programs were more able to relate to building in Second Life with a model-centric view rather than the avatar-centric view that SL typically presents to the beginner.

ALT-ZOOM. Hold the ALT key down and use the mouse to left-click on a subject of interest. Keep the ALT key and mouse button down and move the mouse, side to side and back and forth. By encouraging participants to practice clicking from object to object, or from one side of an object to another, we were able to show them how to navigate an entire sim in this manner of walking with the camera while their avatars remained in one place.

Level Of Detail (LOD). Smaller or more distant prims will be culled (not displayed) by the SL client depending on your draw distance (set in preferences).

CTRL-ALT-D. This key combination enables the Advanced menu. From here, select "disable camera constraints" to roam further. Other useful options we outlined here included the Sun Override: **World > Sim Sun Override.** This stops the sun from setting so you don't have to build in the dark!



The Grid or Ruler mode. This is used to *snap* the prim to known numbers when moving or stretching. Moving the cursor out and over the grid lines while dragging or stretching a prim snaps that prim to the "grid."

- The World grid is relative to the sim for position and uses real world units: meters. Use the "Options" button for the world grid to change the size of the grid snap in meters.
- The Local grid is relative to the selected prim, both for units and direction. Units for the local grid are multiples of the prim's own dimensions.

SHIFT-dragging. Holding the shift key down while you drag a selected prim or object will duplicate it. Try SHIFT-dragging a single prim cube, but use the grid when you do. Try it with both the world grid first and then the local grid. Participants found that they could create perfectly aligned or spaced prims in this manner. You should be familiar with the numbers in the edit box for resizing and positioning prims, as they are unavoidable and quick for many things, but using these techniques you can often build without them entirely and still end up with perfectly aligned builds.

The Wand. This tool is used for rezzing prims. The wand also has another mode not widely known but does give it its "magic." Check "Copy Selection" and "Center Selection." The wand will now duplicate the selected prim or group, perfectly aligned with the face of whatever prim or group you click the wand against. If you're using this function a lot, also check "Keep tool selected." Note the behavior with respect to the root prim of the object being duplicated as it can be unpredictable.

Simple Textures: Builder's Texture, Wood, and Concrete

Simple Textures. These are general purpose square textures (see samples: "Builder's Texture," "Wood," "Stone," "Concrete," "Shadow," and "Invisible"). All are small, 128- or 256-pixel square textures. Simple Textures are typically darkened at the edges to exaggerate the form and lines of the prim and are used to represent most of the basic materials. They are intended to be used with a repeat of just one (not tiled).

We explained to participants that you can do an entire build with textures like these. They are simple to create in Photoshop, using tools like noise, blur, and difference clouds. Builder's Textures were used in place of the default plywood to define edges and clarify the build initially. We also talked about two other types of simple textures: Invisible and Shadow textures. Invisible textures, which are completely transparent, are used because it is impossible to set 100% transparency with the edit menu. Shadow textures, on the other hand, are placed under objects to add depth and realism, replicating a shadow at a set time of day.

Proportional Textures. These are, once again, used at a repeat of one, but created specifically for and of the same proportions as a specific prim, before resizing and uploading. (See "Post" example, pictured.) This technique of creating correctly proportioned textures will be used again later.

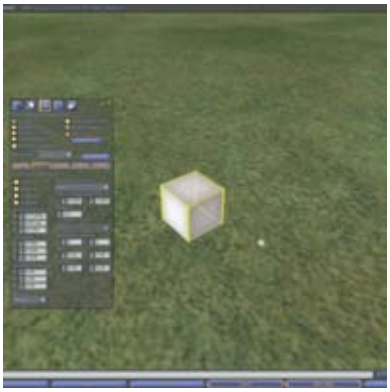
The Do's and Don'ts of Texturing

- **Don't** expect photo-realistic textures to equal photo-realistic results.
- **Don't** tile small samples of a material such as brickwork over prims.
- **Don't** use textures larger than 512.
- **Don't** use several textures with alpha (transparency) in close proximity to each other.
- **Do** use binary multiples for texture sizes, typically 64, 128, 256, 512.
- **Do** use small, simple textures with a repeat of one where you can.

Post Texture

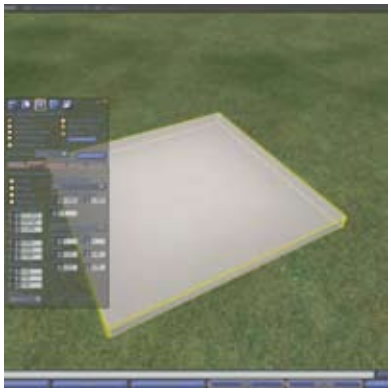
Building Task

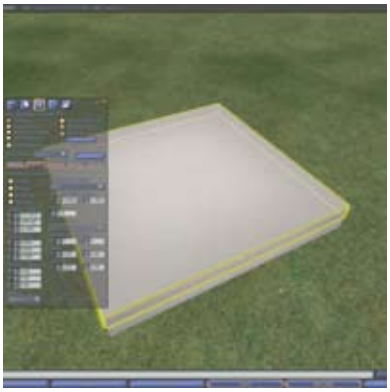
A low prim building module using all the above techniques was used to demonstrate a sophisticated result using simple tools. We asked participants to follow along with these instructions, creating their own structures and asking questions when appropriate.



❮ Rez a single prim cube & texture it with the "Builder's Texture."

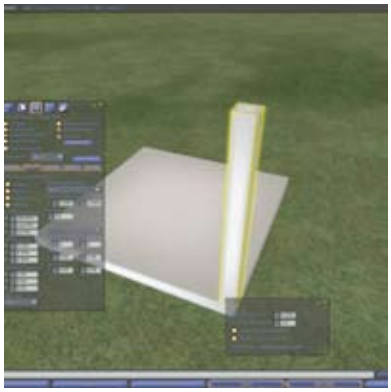
❯ Re-size it using the numbers in the edit box to 8m x 8m x 0.5m

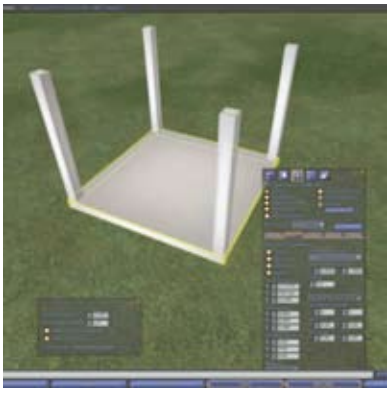




❮ Making sure the prim is still selected, click the magic wand tool on the palette, check Copy Selection and use the magic wand to click on the top face of your first prim.

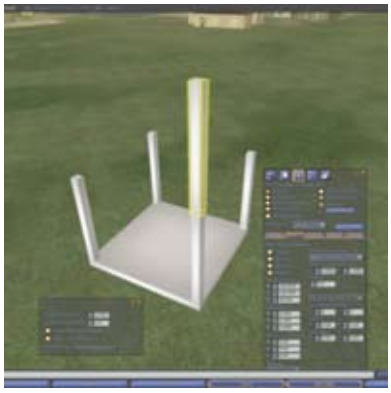
❯ Select the newly rezzed prim which should be a copy of your first and make sure the Ruler Mode is set to World. Set the grid Options to 0.5m and stretch the prim into one corner until it is a post, 0.5m x 0.5m on the sides and 6m tall.

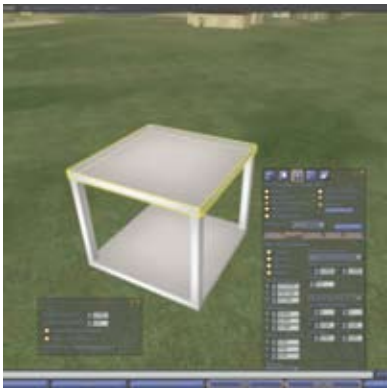




❮ Either repeat this process until you have 4 posts, one in each corner; or set the Ruler Mode to Local and shift-drag your post into the remaining three corners of your base.

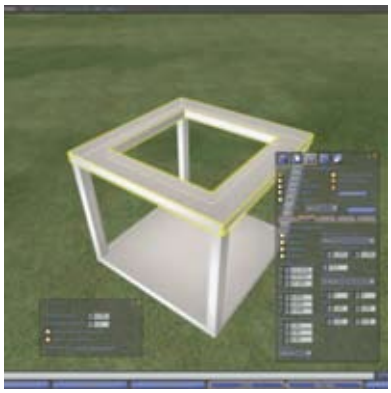
❯ Select just one of the posts, and using the magic wand and copy selection technique, duplicate it on top of itself.

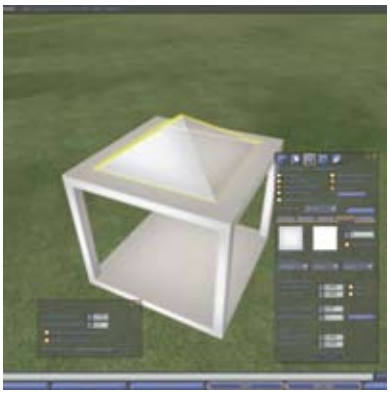




❮ Using the World grid, stretch the newly rezzed post into a roof that exactly fits the columns, 8m x 8m x 0.5m high.

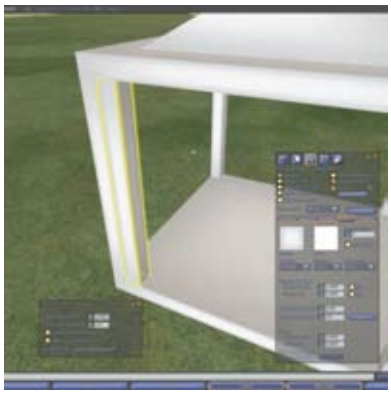
❯ Set the Hollow of your roof to 70 to create an opening for the skylight.

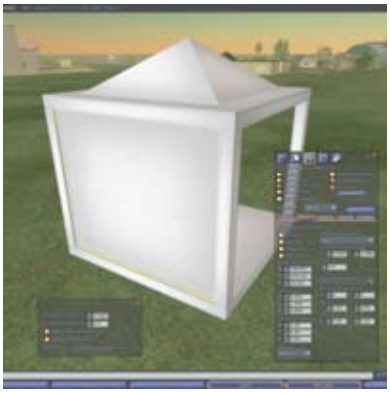




❮ Use the magic wand again to duplicate the roof on top of itself. Resize it using the numbers this time to 6m x 6m, then set the taper to X=1 and Y=1. Stretch it upwards using the world grid so it becomes a 2m tall pyramid.

❯ The last step is to create a single wall between 2 posts. To do this, select a post and use the magic wand to duplicate it next to itself.





❮ Stretch the new post using the grid so it exactly meets the opposite post. Make it a bit thinner than the posts by editing the numbers in the edit box: change 0.5m to 0.3m.

❮ You're done building! Using the textures given to you, texture it as follows:

- Apply the "post" texture to each of the posts.
- Apply the "concrete" texture to the whole base, then texture its upper face with the "wood floor."
- Apply the "interior wall" texture to the inner face of the wall.
- Apply the "exterior wall" texture to the outer face of the wall.
- Apply the "asphalt" texture to the top face of the roof.
- Apply the "wood" texture to the edges of the roof. Set the transparency of the rooflight to 50% and adjust its color to a blue/green.

Linking: Lastly you will link the prims used to create the building module. In edit mode start by selecting any prim but the base; we will select this one last of all. Holding the SHIFT key down, click on the other prims of your building. You will see that this adds them, or by clicking again, removes them, from your selection set. Select them all, finishing with the base prim, and then use the **Tools menu > link** to group them together.

Your building is now a single object that can be taken in to your inventory, rezzed, moved and duplicated.

The "Edit linked parts" checkbox is used for unlinking or editing single prims in a link set. Check "Edit linked parts" in your edit dialog box and try stretching your wall into a half-wall. Unlink a single post by using "Edit linked parts," and use it create a second wall at 90 degrees to the first in your building module using the techniques above. Don't forget to relink the post and your new wall to the module when you're done.

In Review

In general, the participants were able to pack up their finished or nearly finished structures at this point. We covered a lot of techniques with this project and were pleased to see that many of the participants who came in to the session claiming to not know how to build were not only able to complete the instructed building project, but more importantly also had a demonstrable knowledge of the same tools that professional builders use in Second Life everyday. Armed with a new understanding of Second Life's editing functions, participants will be able to go forth and apply their own style of design and personal observation to future projects that they might take on.

This demonstrative approach to learning about the Edit menu provided session attendees with a way of learning by doing that is compatible with the explorative nature of the virtual world experience.

Passing the Torch

To round out our session we briefly covered many other Second Life options that pertain to building and developing either directly or indirectly. Over the past two years of the NMC Virtual Worlds project, we've learned quite a bit about how land settings can impact your ability to share or transfer what you have done to another person or group. Many of our participants were faculty members who would potentially do the same, so we felt it important to cover a few important issues. Similarly, there are quite a few content-related issues that come up for nearly every land owner or builder at some point, and we wanted to pass on our experience.

Land-related Techniques

Many of our participants already owned or rented land, and most planned on doing so at some point, so we found it appropriate to also cover some very basic land management techniques as they pertain to building and development.

Participants were shown how they could access land options from two places:

- **The About Land dialog:** click the land name in the menu bar at the top of the screen, or right click the ground and select "About Land."
- **The Region/Estate menu:** under the World menu at the top of the screen.

We also discussed the two types of ownership on private islands:

- **The Estate Owner** essentially bought the island, pays the island fees to Linden labs and has absolute control of it.
- **The Secondary Land Owner** (our term), buys land set for sale by right clicking the ground and selecting "buy/sell." This may also be a group rather than an individual, set by "deeding" the land to group in the "About Land" dialog.

Understanding how land ownership works in Second Life is important to a builder because the settings of the parcel of land they use can affect the types of content that can be developed, interacted with, and transferred. At this point, we also addressed some common questions that impact the relationship between building and land ownership.

- **Private vs. Mainland:** In regards to private islands, land may be sold to give another person or group permissions to use and change the land for their own use, such as enabling them to set the parcel media stream, set auto return, allow building etc. The Estate owner still retains absolute control and the responsibility of paying Linden Lab. However, on the Mainland the buyer is responsible for paying tier to Linden Labs. You can consider that Linden Lab is effectively the Estate owner in this case.

- **Prim allowances:** Prim allowances are per plot and are cumulative for plots of the SAME owner in the SAME sim, so in a heavily built-up campus sim for example, be very careful about parceling off a small plot and selling it to another person. If there are too many prims on that plot they will be auto returned without warning!

Media

Adding media, sound, movies, and web content is done by putting references in the Media tab of the "About Land" dialog. Islands may be subdivided or "parceled" to allow different media streams in different locations.

To play movies, use either a Freeview or other media screen; or simply make a unique texture to place on a single-prim screen by going into the "About Land" dialog, Media tab, "Replace texture." This also applies to web content.

Terrain

You must either own the land, be in the group the land is deeded to, or the Edit Terrain checkbox must be ticked in the Options tab of the "About Land" dialog in order to edit any terrain in Second Life. Landscaping can be done in many different ways, but there are three different scales on which the terraforming takes place.

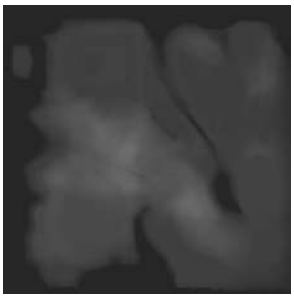
- Small scale: select the tool and size, edit the terrain by hand;
- Medium scale: select land and tool, use the "Apply" button;
- Sim scale: use RAW terrain files.

RAW File Editing

At the time of this writing, only the Estate Owner is able to download or edit a RAW file, but using this process is a powerful way to customize a sim's landscape on an overall scale. To edit a region's RAW file you will need to first locate the functions in the Region/Estate menu, under the Terrain tab.

When editing a terrain file, we suggest the following steps:

- Download the existing terrain as a backup and example.
- Open & save in Photoshop with the following options: 256x256, 13 channels, 8 bit Interleaved.
- A terrain file is basically just a grayscale image ranging from black to white in 256 increments representing height from low to high. This can be made any way you like, but to save it as a RAW file this image must be pasted into the RED channel of a 13-channel Photoshop file and saved in the above format. The BLUE channel gives sea level height; the green channel is a height multiplier. The easiest thing is to use the file you downloaded as a starting point.



Island terrain image, illustrated in grayscale

To generate terrain besides painting by hand, you might try software such as Terragen, a general purpose terrain generator for the PC (see http://www.planetside.co.uk/terragen/), or Backhoe, specifically created for Second Life and available on the Macintosh platform (see http://www.notabene-sl.com/Backhoe/).

Beyond Shape

While terrain and RAW file editing are two of the more common terraform-related questions, we also went on to illustrate some important points on landscaping and creating climate in Second Life. For example, landscaping may be essentially trees, plant, and water, but don't forget "furniture" such as benches, street lights, bollards and paving all help to create atmosphere and realism.

As far as trees and plants themselves go, we urged participants not to overlook the Linden-created plants in their libraries. These are detailed, take only a single prim each, and many of them move with the wind. Used with discrimination these are a great way to populate an outside space using low prim overhead while keeping to the general SL aesthetic.

At the same time, there are many 3rd party plants to buy in SL, but bear in mind, most use alpha (transparency) and if badly done exhibit fringing around the edges, commonly referred to in SL as a "halo." Additionally, alpha ordering will always be an issue with overlapping plants and over-use can also produce garish results & clashing colour palettes.

Introduction to Other "Advanced" Techniques and Terms

While we did cover several topics that were new to participants throughout the session, we wanted to briefly define some new approaches to content creation and related terms in order to plant the seeds of further learning outside of our session. Below is a list of some of the terms we touched on and their definitions:

Advanced texturing, such as mapping using scaling and offsets over multiple prims. More complex objects such as building facades with doors and windows require multiple prims and clearly the simple textures used above won't work. You could use a small sample of material such as brickwork and tile it over all the prims, but as already suggested this leads to poor results, repetition becomes apparent and realistic shading is impossible, so we use a different combination of techniques derived from those of the simple textures.

Scale. The texture scale for each prim equals the prim dimension divided by overall dimension in each direction. (Texture scale = prim dimension / overall dimension)

Offset. The offset for each prim equals the scale divided by two, plus or minus 0.5 for the edge prims (left and right). For subsequent prims, add or subtract the texture scales of adjacent prims between it and the edge, from the above value. (Edge prim offset = (scale / 2) + or – 0.5)

Scripting. In short, Linden Scripting Language (LSL) is an event-driven, state-based programming language.

Sculpties. Sculpties are a special prim type, requiring a third party modeling tool outside of SL to create the shape. This saves the shape data in a bitmap image file which you upload into SL and drop into the square on the object tab of the edit dialog.

Building Tools. These are tools developed to make building easier. We all need a little help sometimes and SL'ers have developed tools using LSL to make some tasks easier. You can buy or get these for free or even script some yourself; every aspect of a prim is scriptable. Examples include Shapemakers, Rez Foo, Rez Faux, Builder Buddy, etc.

Lighting. Lighting requires careful use. The SL client only renders the nearest 6 lights, so over-use results in strange on/off effects. Light knows no boundaries, passes through walls, and can cause light pollution for your neighbors if not carefully planned.

The Session in Review

While "Advanced" Second Life could be defined in many different ways, we found the session we provided to be at an appropriate level for participants who had been in Second Life for 6+ months. By gearing the session towards this specific audience, we were able to maintain an ambitious curriculum and still leave room for the many questions that participants had encountered during their time as residents. Many of the enrichment activities we had initially planned needed to be cut in order to allow for the highly specific questions that residents at this level have, which are often more oriented to Second Life's permission system, land management issues, and the technical aspect of the user interface than they are specific to content creation.

Glossary (of terms not defined elsewhere)

Avatar, Av, Avie (noun): The virtual character that symbolizes your presence in Second Life.

Build (verb): The act of creating objects in world. Build can also be a noun, usually referring to a sim designed as a unit or a series of structures designed together.

Inventory (noun): The window that contains all of the items that currently belong to you.

Newbie (noun): A person that is new to Second Life.

Permissions, Perms (noun): Every object created in Second Life can also have permissions set on it by the creator. A creator can choose to sell/give an item at "full perms" meaning that it is copyable, modifiable, and transferable, or can choose not to allow certain permissions on the object.

Prim, Primitive (noun): A prim is a primitive shape that is the basic building block of Second Life. Prims are used alone or in conjunction with one another to represent the furniture, buildings, and nearly everything else found in Second Life.

Resident (noun): A person that has A Second Life avatar.

Rez (verb): To make an object appear in world by creating it through the build tools, pulling it from your inventory into the world, or by way of a scripted object.

Sim, Simulator (noun): A Second Life location in its entirety. Each sim has a unique name and "sim borders" regardless of whether it is separate or surrounded by other sims.

SLer or SL'er (noun): A **S**econd **Li**f**er**.

Texture (noun): A texture is an image that can be applied to any prim or object in Second Life to further the illusion of the object being a real object. Textures can also be worn on the avatar in the form of skins, clothing, etc. Texturing refers to the process of applying textures to an object, creating the textures outside of Second Life, or the visual result of textures on an object.

About the Authors

Christopher Holden graduated in Architecture and worked in practice for over ten years while maintaining an interest in computer modelling, programming and multimedia. Second Life finally provided the opportunity to apply all these disciplines together and after three years juggling work in both the real and virtual worlds, Christopher crossed over entirely to a full time position with the New Media Consortium. When he is not developing buildings, environments and learning tools for the NMC, Christopher also runs a successful Second Life business and undertakes private commissions for celebrity avatars including Bill Keller, Mick Jagger, and Desmond Tutu, to name but a few.

Beth Sachtjen has been a developer in Second Life for the past three years, working with a variety of clients ranging from educational institutions to corporations and government organizations. Before her move to virtual development, Beth worked in corporate training and client services as well as web support. Beth has been a pioneer in using Second Life as a medium for expressive art and continually displays sculptures in numerous virtual galleries and mixed reality exhibitions. As a geek trapped in an artist's brain, she came to NMC with a sincere passion for exploring virtual worlds as a form of communicating with imagination.

About NMC Virtual Worlds

The mission of NMC Virtual Worlds is to help learning-focused organizations explore the potential of virtual spaces in a manner that builds on community knowledge, is cost-effective, and ensures high quality. NMC Virtual Worlds provides a palette of premium custom services for education and training, and conducts an ongoing series of events, conferences, and programs. A suite of pro bono services and fellowships are a central aspect of the organization, and reflect our deep commitment to learning and access.

Fair Use Ain't What You Think It Is: Copyright and Fair Use in the Digital Classroom

Mark J. Davis, Esq. B.A., J.D. | Tulane University, Loyola University New Orleans

Every faculty member, administrator, and librarian has concerns over what is or is not acceptable under copyright, yet there are no clear answers for educators to these questions:

- Is the use of copyrighted material in an educational environment automatically "fair use"?
- Are there any educational situations that are not "fair use"?
- How much copyrighted material may I use in class?
- Can I always rely on the TEACH Act as a safe harbor?
- Does "fair use" apply to the webcast or podcast of my lecture?

How many times have we all seen this before the show starts?

Back To Basics

To discuss copyright, infringement, and Fair Use, we must return to a basic premise: Western civilization is built upon the free transmission of ideas.

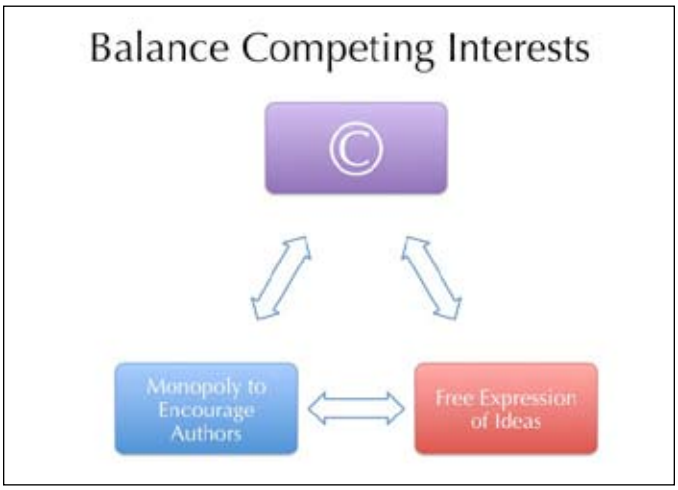
Seneca said it over 2,000 years ago: optimus information es vulgaris substantia (the best ideas are common property). If the best ideas are common property, why do we have FBI copyright infringement notices or even copyright?

There has to be an individual incentive for an author to create something that we value as common to all. Modern copyright's economic rationale encourages creativity of authors by granting them exclusive monopolies in the right to copy and sell their works.

The balancing of these two competing interests: economic monopoly for the author versus the free transmission of ideas lies at the heart of all copyright issues.

The US Constitution Article 1, Section 8 explicitly establishes the basis for both copyright and patent protection of intellectual property:

Congress shall have the power… To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.



Monopoly versus free expression

Six exclusive rights

What is Copyright?

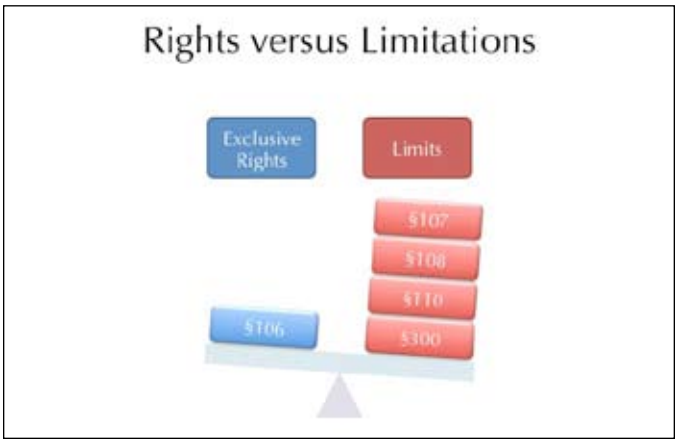
American copyright law (Title 17 US Code §106) grants six exclusive rights to an author or owner of a copyright.

The first and most basic right under copyright is the right to make a copy, the exclusive right to reproduce the work. This right goes hand-in-hand with the third, which grants the author/owner the exclusive right to distribute and sell those copies.

The second exclusive right allows the owner to recast the original work into another form; that is, to adapt the original into other uses. Novels are the basis for movies and television shows. Reprints of original paintings appear on posters and postcards. Music publishers place compositions in movies or change song lyrics for advertisements.

Only the copyright owner holds the rights to publically perform and/or display a work. These rights are like twins. Music, drama, and dance are *performed;* paintings, sculptures, and visual arts are *displayed*. In both cases, the author has exclusive control over the performances and/or displays.

§106 (6) is applicable only to the digital transmission of sound recordings via satellite radio, cable TV, and the Internet.



Balance between rights and limitations

A Balancing Act

Just as Section 106 grants exclusive rights to copyright owners, the law also places limitations on those rights. Copyright law is a balancing act between exclusive monopolies favoring the author and limitations on those monopolies in order to promote the free exchange of information. For educators, the four most important are:

- §107 Fair Use
- §108 Reproduction by Libraries and Archives
- §110 The TEACH Act
- §300 Public Domain

§300 Public Domain

Rights of libraries and archives are complex, and beyond the scope of this paper. However, the concept of Public Domain applies across the board when discussing copyright. In short, copyrights do not last forever.

For works created on or after 1/1/1978, copyright protection lasts the life of the author plus 70 years. In cases where the author has been employed to create the material known as a work-for-hire, copyright lasts either: from the date of publication plus 95 years – OR - the date of creation plus 120 years, whichever is shorter.

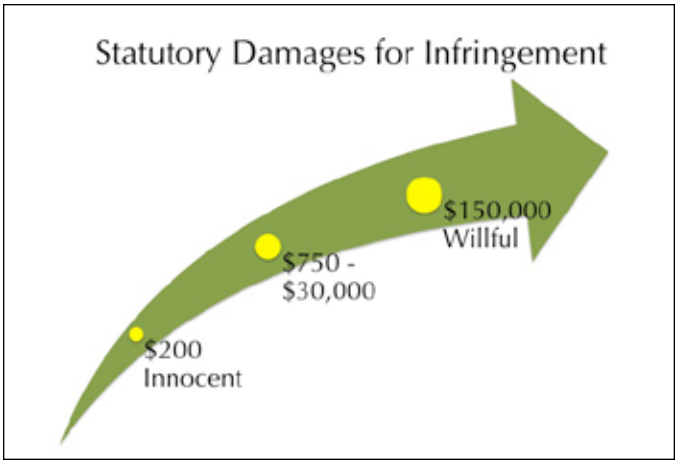
Works created on or after 1978 will not enter the public domain before 2049.

When a copyrighted work enters the public domain, there are no §106 rights, the work no longer belongs to anyone, and it is available to the public at large to use and/or change in any way they wish. There is no need for the user to obtain permission or pay a fee to alter or exploit a public domain work.

Works can fall into the public domain several ways:

- Copyright has expired
- Author has abandoned his copyright (computer freeware)
- Publication in the US before 1923
- Publication in the US before March 1, 1989 without copyright notice
- Publication in the US before 1964 without copyright renewal

Determination of whether or not a work is in the public domain is tricky and best left to copyright attorneys.



The $150,000 hammer

Infringement: The Big Hammer

Title 17 US Code §501 et seq. outlines the penalties for copyright infringement. Anyone who violates the §106 exclusive rights of a copyright owner is an infringer.

If the author or owner properly registered his claim to ownership in the Copyright Office before the infringement (or within three months of publication), he has a choice of asking for either repayment of the actual damages suffered by the infringement or statutory damages.

Statutory money damages payable by infringers range from $750 to $30,000 per infringement. If an infringer proves that was not aware, or had no reason to believe that his acts constituted an infringement of copyright, the court might reduce damages payable to $200. Although employees and agents of non-profit educational institutions can rely on a Fair Use defense in order to claim innocent infringement, and thus the lower damages, I must caution that truly innocent infringers are rare.

Willful infringement carries with it possibility of statutory damages rising to $150,000 per infringing act.

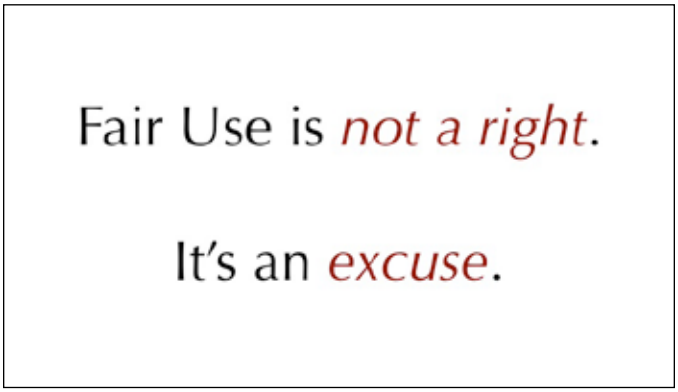
Fair Use Ain't What You Think It Is

A major misconception is that Fair Use of copyrighted works is a right under the Copyright Law. It is not. ***Fair Use is not a right – it is an excuse.***

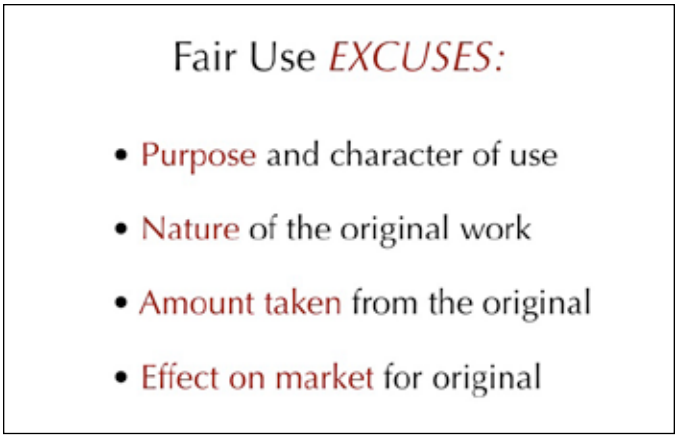
Fair Use is a defense used in court **once you have been sued for copyright infringement.** It is not an affirmative right, but an explanation for your actions, that hopefully will sway the judge and jury that you are not liable for infringement.

Title 17 US Code §107 lists four factors for analysis of Fair Use.

> " . . . the fair use of a copyrighted work, . . . for purposes such as criticism, comment, news reporting, teaching, scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include –
>
> (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
>
> (2) the nature of the copyrighted work;
>
> (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
>
> (4) the effect of the use upon the potential market for or value of the copyrighted work



Tell it to the judge



Four excuses

The Four Fair Use Factors

The easiest way to analyze a possible Fair Use scenario is to break down the four components and list the pros and cons. No single factor is more important than the others are. Courts look to all the elements before deciding that an unauthorized use comes under the protection of §107.

Keep in mind that these factors are practical questions asked on a case-by-case basis. No broad generalizations can be made from a particular circumstance. The four factors also present real life situations that illustrate the functional application of copyright's balance between monopoly for the author and the importance of the free flow of information.

Purpose and Character of Use

Courts first look to the original work's use by the defendant. How do you characterize the accused infringer's use? What purpose does it serve? Is it truly for education, or entertainment? Who is profiting from the work?

Favoring Fair Use	Opposing Fair Use
Teaching	Commercial activity
Research/Scholarship	Entertainment
Non-profit institution	For-profit corporation
Criticism/Comment/News	Verbatim replay only
Original transformed to new use	Reiteration of original
Access restricted to students	Wide audience
Parody of the original	Broad parody beyond original

Nature of the Original Work

Since facts themselves are not copyrightable, anyone can publish their report of a historical event. A fair use claim based upon the use of private correspondence or unpublished fictional works is much harder to substantiate.

Favoring Fair Use	Opposing Fair Use
Published	Unpublished
Non-fiction/factual	Fiction

Amount Taken

Courts also examine the amount taken from the original. **There is no magic formula for determining what constitutes a "significant" amount taken from an original work.** Taking a few paragraphs from a 500-page book is much easier to defend than taking five words from a haiku, however five notes from a song may be its distinctive hook.

Favoring Fair Use	Opposing Fair Use
Small amount used	Substantial portion taken
Non-essential parts used	Unique elements taken

Effect on Market for Original Work

This factor examines the economic considerations involved in the Fair Use defense. Is the accused infringer just claiming Fair Use so that he does not have to purchase a copy of the original work? Is the defendant's work a substitute for the original? Does it devalue the original or make it so common as to be worthless in the market?

Favoring Fair Use	Opposing Fair Use
No lost sales	Substitute for purchase
No effect on value of original	Destroys value of original
Limited copies made	Multiple copies made
One time use	Unlimited potential re-use

§110 The TEACH Act of 2002

Ambiguities in the meaning of §107's fair use factors lead Congress to amend the copyright law. The TEACH Act (The Technology, Education, and Copyright Harmonization Act of 2002, 17 US Code §110) was passed in order to clearly define Fair Use in the educational context.

As we analyze the law, keep in mind that these limitations on an author's exclusive rights only apply if the source material was a lawfully made copy, and not the result of circumvention of a digital rights management system.

Live Instruction

Classical pedagogy has not changed from the time of Socrates. A wiser, older teacher imparts knowledge to youths in a face-to-face setting, assigns coursework, and questions students on the topic.

17 US Code §110 Limitations on exclusive rights:

- Exemption of certain performances and displays
- Notwithstanding the provisions of section 106, the following are not infringements of copyright:
  (1) performance or display of a work by instructors or pupils in the course of face-to-face teaching activities of a nonprofit educational institution, in a classroom or similar place devoted to instruction, unless, in the case of a motion picture or other audiovisual work, the performance, or the display of individual images, is given by means of a copy that was not lawfully made under this title, and that the person responsible for the performance knew or had reason to believe was not lawfully made;

In this setting, educational use of copyrighted material is considered fair use **only if all of the following criteria are met:**

- Performance or display of work
- Non-profit educational institution
- By instructor or pupils
- Face-to-face teaching
- In a classroom setting

Performance or display of work

Teachers may perform and display audiovisual works in the classroom. They may screen their legally purchased copy of a DVD for the class, play a song from a CD, recite a poem, and tack a poster to the wall. However, **it is not Fair Use to make and distribute copies of the work.**

Non-profit educational institution

This criterion specifically excludes for-profit educational institutions such as technical and vocational schools, continuing education seminars, tutors, dance classes, exercise studios, GED/SAT/ACT review courses, etc.

Regional or national accrediting agencies for post-secondary education recognized by the Council on Higher Education Accreditation or the U.S. Department of Education determine whether the non-profit is an *"educational institution."* For elementary or secondary education, the school must be accredited by applicable state certification and licensing authorities.

Thus for-profit companies and un-accredited non-profits are excluded from the protection of the TEACH Act.

By instructor or pupils

Teachers and students are free to perform for each other in class, but this permission does not extend to third parties.

Face-to-face teaching

The instructor and pupils must be in the same room. Another section of the law addresses broadcasting or posting lectures to the Internet.

Classroom setting

All displays and performances must take place on campus, or lecture halls where regular classes are held.

School policies

The educational institution has a positive obligation to create and disseminate a campus wide policy on copyright. It must also provide informational materials to faculty, students, and relevant staff members that accurately describe and promote compliance with copyright law.

Copyright notice

The school and instructor must also provide notice to students that materials used in connection with the course may be subject to copyright protection. The display of the © symbol alone is insufficient.

The TEACH Act in the Digital Classroom

Copyright issues are at the forefront of education, especially since online learning is becoming a key component of the educational experience. The legal requirements for online classes and video are complex and not equivalent to what is permitted in a face-to-face classroom setting. As such, something as simple as posting videos of classes online could lead to an infringement lawsuit.

Traditional notions of Fair Use in copyright do not apply in the digital classroom. Under the latest amendments to the law, teachers, librarians, and administrators must follow strict guidelines when using copyrighted material in their classrooms. These mandates are even harsher for online and distance learning. Libraries and archives have their own set of obligations governing copying, preservation, circulation, and reserves.

If teachers do not follow these dictates, what would be a Fair Use of copyrighted work in a face-to-face classroom setting automatically becomes infringement in a digital learning environment.

17 US Code §110 Limitations on exclusive rights:

- Exemption of certain performances and displays
- Notwithstanding the provisions of section 106, the following are not infringements of copyright …
  - (2) except with respect to a work produced or marketed primarily for performance or display as part of mediated instructional activities transmitted via digital networks, or a performance or display that is given by means of a copy or phonorecord that is not lawfully made and acquired under this title, and the transmitting government body or accredited nonprofit educational institution knew or had reason to believe was not lawfully made and acquired, the performance of a nondramatic literary or musical work or reasonable and limited portions of any other work, or display of a work in an amount comparable to that which is typically displayed in the course of a live classroom session, by or in the course of a transmission, if —
  - (2) (A) the performance or display is made by, at the direction of, or under the actual supervision of an instructor as an integral part of a class session offered as a regular part of the systematic mediated instructional activities of a governmental body or an accredited nonprofit educational institution;
  - (2) (B) the performance or display is directly related and of material assistance to the teaching content of the transmission;
  - (2) (C) the transmission is made solely for, and, to the extent technologically feasible, the reception of such transmission is limited to —
    - (i) students officially enrolled in the course for which the transmission is made; or
    - (ii) officers or employees of governmental bodies as a part of their official duties or employment; and
  - (2) (D) the transmitting body or institution —
    - (i) institutes policies regarding copyright, provides informational materials to faculty, students, and relevant staff members that accurately describe, and promote compliance with, the laws of the United States relating to copyright, and provides notice to students that materials used in connection with the course may be subject to copyright protection; and
    - (ii) in the case of digital transmissions —
      - (I) applies technological measures that reasonably prevent —
        - (aa) retention of the work in accessible form by recipients of the transmission from the transmitting body or institution for longer than the class session; and

(bb) unauthorized further dissemination of the work in accessible form by such recipients to others; and

(II) does not engage in conduct that could reasonably be expected to interfere with technological measures used by copyright owners to prevent such retention or unauthorized further dissemination.

Digital Transmission

Although the TEACH Act clarifies what is permissible in the live classroom, its focus is on the Fair Use implications of digital transmission of educational materials. Digital transmission includes but is not limited to anything that is distributed through digital networks such as uploads to the Internet, television broadcasts, radio broadcasts, distance learning programs, podcasts, webcasts, and videocasts.

As a guideline, anything that is permissible in a face-to-face classroom setting is permissible via digital transmission **if and only if all of the following criteria are met:**

Textbooks excluded

The Act does not permit digital transmission of works produced as part of mediated instructional activities like textbooks and instructional videos. This prohibition also applies to any texts, handbooks, or other media typically purchased or acquired by students. Publishers must issue licenses to schools and teachers who wish to post these materials on the Internet.

Lawfully made copy

The use of an illegal copy invalidates any Fair Use claim. The copy or phonorecord used may not circumvent digital rights management measures. The TEACH Act permits ephemeral copies as long as the works are inaccessible to non-students, and only for as short a time as possible.

Accredited non-profit educational institution

The definition of *"accredited non-profit educational institutions"* and the requirements for elementary, secondary, and post-secondary institutions were discussed previously.

Supervised by an instructor

The individual teacher must be the one who supervises the digital performance. This requirement implies a personal relationship between the instructor and the pupils, and mirrors traditional pedagogy.

Mediated instructional activities

The class must be part of the school's regular curriculum. In order to claim the protection of the TEACH Act, the use of the material must be a regular part of a course of instruction.

Integral part of a class session

Is the digital transmission of the performance or display of copyrighted material an essential part of the lesson plan? The answers may be different for art, history, and mathematics classes.

Performance directly related to the subject

The digital transmission of copyrighted materials cannot be capricious and still be considered Fair Use. What is it that the instructor is trying to teach? Does the digital transmission of this copyrighted work aid the teacher in conveying the lesson?

Equivalent to the amount used in a live class session

Most class sessions last no more than 90 minutes. The TEACH Act does not permit an instructor to podcast an entire Wagner opera to his class when a ten minute excerpt is sufficient.

Access limited to enrolled students

For the protection Section 110 provides to teachers, digital transmissions must be limited to enrolled students. As such, posting videos to public sites like YouTube, and iTunesU violates this rule. As a practical matter, it is advisable to deny students access to the course website at the end of the semester.

Prevent retention & dissemination

The law imposes an additional burden on instructors. They must apply technological measures that prevent retention of the works and unauthorized further dissemination to others. The best method to achieve this goal changes with the advance of technology.

Conclusion

We live in a media-rich society. Education also needs to be rich in media. Teachers must communicate with students in the same media students learn to use to communicate with the world. Internet-based methods of research and pedagogy provide great benefits and even larger perils to today's educators. Unless educators create every bit of media used both in their classrooms and online, they are venturing into an intellectual property minefield.

There are no simple answers to copyright questions. It is the obligation of every user of copyrighted material to determine if their actions are Fair Use under Section 107. I hope that this presentation sets an intellectual framework that will guide and help teachers understand copyright problems they encounter on a daily basis.

Remember, when faced with a Fair Use copyright conundrum:

Well, maybe a little.

References

United States Constitution Article 1, Section 8

Copyright Law of the United States Title 17 US Code

§106 Exclusive rights in copyrighted works

§107 Limitations on exclusive rights: Fair use

§108 Limitations on exclusive rights: Reproduction by Libraries and Archives

§110 Limitations on exclusive rights: Exemption of certain performances and displays (Technology, Education, and Copyright Harmonization Act of 2002)

§300 et seq. Duration of Copyright

§501 Infringement of Copyright

§504 Remedies for infringement: Damages and profits

About the Author

Mark J. Davis, Esq., an Instructor of Music Business at Loyola University New Orleans is an attorney with over 30 years' experience in music and entertainment law. Fully 100% of his practice focuses on copyright and contract issues as they apply to musical artists, songwriters, record labels, advertising agencies, and licensors of musical works. In addition to music publishing administration, catalogue sales, and other transactional matters, Davis has represented songwriters, publishers, labels and artists in copyright infringement suits in Federal courts in Louisiana, Texas, and Mississippi. He is a recognized expert in copyright having served as an Arbitrator for the US Copyright Office. Recent publications include *The Teacher's Guide to Copyright,* and *The Complete Copyright Kit for Composers and Musicians.* He is a co-founder of BuzzGig.com, a website specializing in copyright issues for educators. Feel free to contact him at mjd@buzzgig.com.

The New Media Consortium
6101 West Courtyard Drive
Building One, Suite 100
Austin, TX 78730
512.445.4200
512.445.4205 fax
www.nmc.org

ISBN 978-0-9765087-2-4