Innovations in Teaching with Technology

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A report on innovative projects within the Faculty Innovation in Teaching program, CIT's academic technology pilots, and related activities.

Cornell University

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1) Introduction

About Innovations in Teaching with Technology

Innovation can take different forms. Innovations may emerge from using familiar technologies in innovative ways or from the development of new technologies. Cornell Information Technologies explores innovations in teaching with technology through ad hoc projects, the Faculty Innovation in Teaching program and campus wide pilot projects. This report reflects a central perspective, while acknowledging that there are innovation activities going on across campus as well.

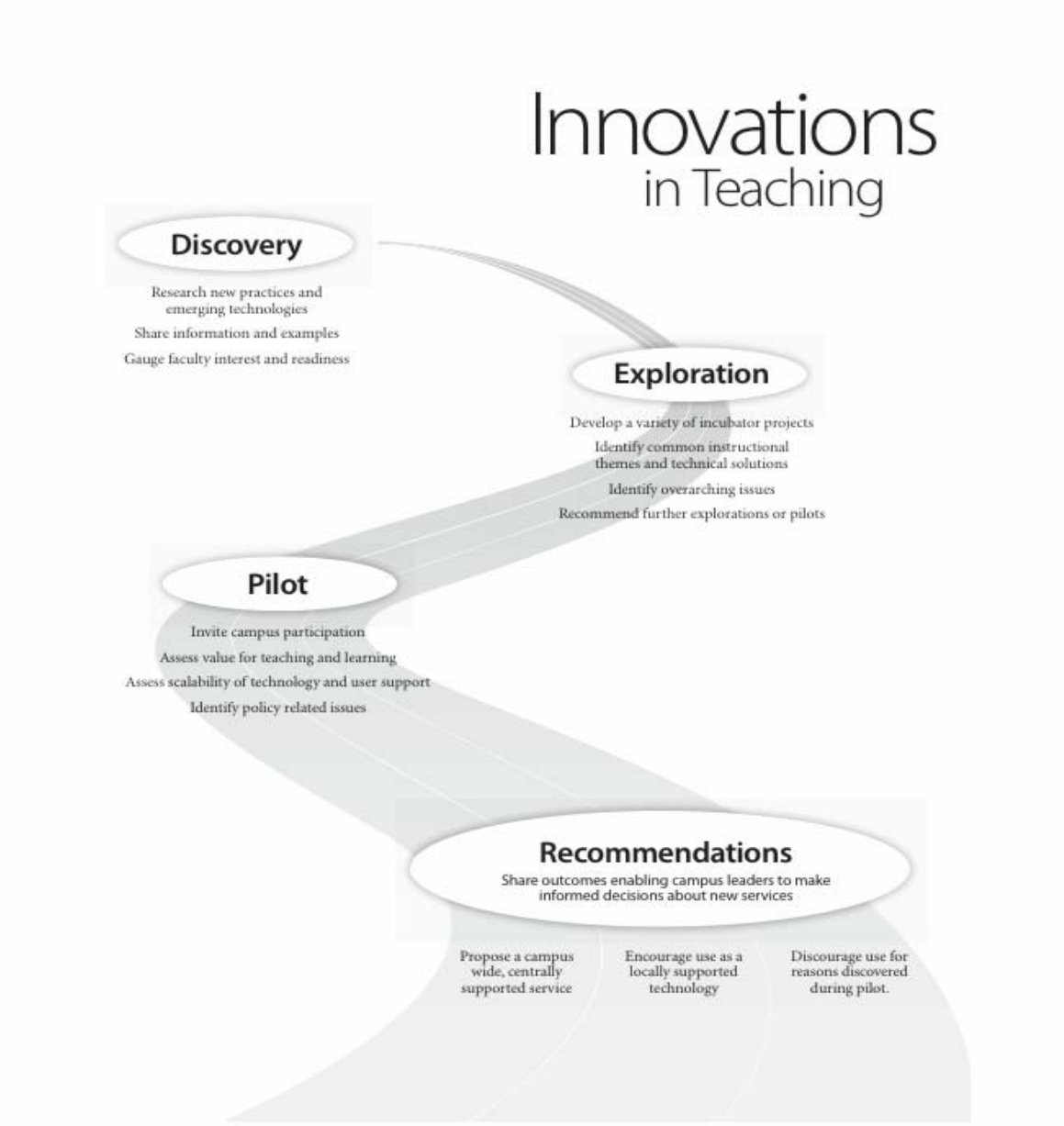
Projects derive from ideas proposed by individual faculty, awards made by each college and school through the Faculty Innovation in Teaching program (funded by the Offices of the President and the Provost), and research into national trends and emerging technologies. In all cases, project development begins with a focus on teaching – identifying the instructional goals and challenges and then choosing supporting technologies that are likely to add value to the learning experience. The projects highlighted in this report include those that were completed between Fall 2006 and Fall 2007 as well as those that are currently "in progress."

Common Themes and Instructional Challenges

Innovative ideas have been developed to support many different courses, but when faculty describe the instructional goals and challenges that motivated them – common themes emerge. These instructional challenges have inspired faculty innovations that use both new and familiar technologies to play a supporting role in facilitating teaching and learning activities, and in some cases, to enable new kinds of learning experiences that would not, otherwise be possible.

Commons themes addressed in faculty projects include:

- Increasing student engagement (especially in large classes)
- Encouraging critical thinking
- Enabling students to share their analyses and reflections
- Building students' self-expression and dialogue skills
- Supporting collaboration
- Connecting students with experts
- Exposing students to public opinion
- Enabling students to apply concepts and gain "hands on" experience
- Making content relevant and "real"
- Providing individualized support and feedback to learners
- Enabling students and instructors to track individual learning
- Correcting longstanding misconceptions
- Bringing a large and varied quantity of multimedia into classroom presentations
- Creating a content collection (multimedia) that can be searched and expanded



Activities that support innovations in teaching can begin and end at different places along a path. At every phase, efforts are made to share information about innovation activities and to reach beyond the faculty and students who are directly engaged in projects.

2) Strategies and Technologies in 2006-07 Projects

Common Themes

The following categories represent different types of strategies and technologies that faculty have integrated with their courses.

- Web 2.0: Collaboration, Creation and Commentary
- Learners as Multimedia Consumers and Creators
- Making it "real" with Digital Resources and Technology
- Real World Assignments
- Virtual Worlds

Innovation projects often represent "proof of concept" efforts. In some cases, it's possible to develop and implement technologies that meet project requirements and are considered "finished" when the project ends. Other technologies are selected to test concepts within the scope of a project, knowing that if the innovation is valuable and has potential for broad application – the approach will stay the same but specific technologies may change in order to be more scalable or sustainable.

Some innovations provided customized learning experiences and timely feedback that has helped students and faculty to understand the process of learning. These innovations offer confirmation to students and identify obstacles, misconceptions, and gaps in knowledge and skills.

These "incubator" projects occur early in the innovation cycle and inform future directions and development of services. Feedback from students and faculty and other evaluation data point to potentially effective practices and technologies as well as aspects of the innovation that didn't work very well. The development process is informative in that it often brings new challenges and issues to the forefront; overarching issues that span a variety of individual projects.

The projects highlighted in this section have been implemented and are *representative* of a general category of innovation. This report does not intend to be a complete list of innovation projects undertaken by CIT and our partner organizations. (*Section 4 describes innovation projects that are "in progress" including pilot projects*).

Web 2.0: Collaboration, Creation and Commentary

- **Wikis**

  Wiki software allows multiple people to create web pages and edit them on demand, quickly and collaboratively building a website based on shared knowledge and effort. Users don't need to have web markup experience, and need only internet access and a web browser.

The *wiki* technology enables students to participate in collaborative academic projects, contribute to new scholarship, develop critical thinking skills, and to create collaborative communities of practice.

Several projects used *MediaWiki* technology to create a customized wiki to meet specific teaching and learning goals. In one project, the wiki software was customized with a *visualization tool* plugin that enabled the exploration and creation of visual objects in a collaborative environment. These examples of wiki customization and uses in teaching, enabled the Faculty Support Services team to develop specifications for a potential wiki service, and project evaluation data provided recommendations about using a wiki in teaching. The exploration of wiki's in these projects has led to the current academic wiki pilot project.

Another project used an open-source course management system (*Moodle*) to integrate course content and a wiki for student collaboration projects. *Moodle* was selected since it could be used to create a customized learning environment, including a wiki. Since *Moodle* can be installed as an *off the shelf* learning system, its use enabled rapid development of the course's learning environment. Since *Moodle* is also an *open-source* application it provided the ability to customize the programming of the learning environment.

Technologies: Wiki software including *Moodle, Confluence,* and *MediaWiki*

- **Blogs**

  Blogging software makes it easy to create content on a web page. Blog (short for "web log") entries appear chronologically with the most recent entry at the top of the page, and usually allow readers to post comments, which the blog owner can approve, edit, or delete. It is also possible to alert subscribers to new posts via an RSS (Really Simple Syndication) web feed. In contrast to a wiki, an individual or group controls access and creates entries on which readers can comment. Blogs tend to present the voice and viewpoint of the blog owner(s).

Several ad hoc and Faculty Innovation in Teaching program projects used *Wordpress* blog software to create customized blogs. In one project, the blog software was customized with an audio plug-in to enable students to upload audio files for course assignments. An audio recording widget was linked to the blog so that students could record audio files in a consistent size and format. By enabling the blog to collect audio assignments, the project met the challenge of collecting assignments within a usable tool that also allowed for student and instructor comments.

In a communications course, students were assigned to post and comment on each other's group and individual blogs. Over the course of the semester, blogs rose and fell in popularlity measured by the comments they received. Students were highly engaged and found it particularly exciting when their blogs were read and cited by general readers in the "blogosphere." (Students did not use their real names when posting publicly). The

public nature of blogs (just within the class) seemed to encourage more thoughtful reflection, analysis and self-expression.. The exploration of blogs in these projects has led, in part, to the current Blog Service pilot project.

Technologies: Blog software – *Wordpress* and *Moodle*.

- **Web 2.0 Learning Environments**

  Web 2.0 was originally defined around such principals as the "web is the platform," users control their own data and content is developed within an "architecture of participation" that will "harnesses collective intelligence." Another idea was to combine "services" rather than rely on packaged software. This approach to design delivers a learning environment that accommodates found and user-created content, enables students and instructors to contribute; builds a searchable and expandable knowledge base, and presents a variety of multimedia content.

One project facilitated student engagement with multi-media landscapes of other cultures and systematically offered the opportunity to develop critical media and intercultural literacies by integrating innovative tools in language teaching. Learners used a combination of several technologies that included a blog, wiki, dynamic content aggregators, and RSS feeds from news web sites within a collaborative learning environment. Dynamic self-assessment and e-portfolio tools were also integrated to promote student reflections about intercultural engagement and learning. The environment was developed using the *Plone-Zope* open source tools. Cornell's Language Resource Center has used this project as a model for providing an integrated learning environment for other language courses.

Several projects also combined a range of digital and multi-media course content, including digital case studies delivered through a combination of several Web 2.0 technologies and visual media. These projects used a *mashup* of content and technology to engage students in learning and to help them acquire a positive sense of "ownership" for courses by actively contributing to content development.

Technologies: various web based solutions including *Plone-Zope*

- **Virtual Research Environments (VREs)**

  Collaborative research projects often require the use of discipline specific applications for data collection, analysis and presentation as well as technologies that facilitate group work and communication. The most distinguishing characteristic of a VRE is that it offers access to these applications in a single environment.

A VRE for Language Acquisition and Cognitive Science provided an environment to share teaching and research materials for the lab portion of a course, and to ease the difficulty associated with students working with children by using video and online

materials rather than sessions with children. The VRE was designed to encourage student collaboration by enabling students to share data with other students.

The project used a collection of web and database technologies to create the web site and VRE. The database-to-web tool enabled the collection, searching, and reporting of transcribed linguistic data via web pages with the ability for students to upload documents. Recent work on this VRE environment included further development of an online data transcription tool (DTA), the polishing of existing learning modules, and new development of learning modules in a template-based approach.

Technologies: a collection of web and data base technologies.

Learners as consumers and creators of audio/video content

- **Course assignments**

Several projects have assigned students to record audio to strengthen the connection with course content. In one project, students who were studying educational systems recorded interviews and told personal stories which contrasted with their assumptions about the educational experiences of others. In another project, students reinforced their skills in creating oral histories by recording interviews and editing them with web-based guidelines provided by the faculty. In a current 2008 project, students in a landscape architecture course are completing the picture of an environment by recording audio in the field and combining the sounds with images, maps and text to provide another dimension that may be useful in planning and design. Having students record audio to develop language skills is a familiar practice, but how these samples are recorded, reviewed and collected has led to explorations such as a student ePortfolio project which is still "in progress."

There are challenges associated with collecting audio files from students, such as file size and formats. A web-based audio recording widget was identified and made available for students to use so that all of the audio files submitted were in a format the instructor could hear, and the file size was optimal for web uploading. In addition, a forms-based audio repository tool was implemented as a "proof of concept" in a current "in-process" project to allow students to upload audio files for course assignments, and to add to the faculty's collection of audio content. The web form provided a usable interface, as well as a consistent way for students to describe the audio file using standard meta-data.

Technologies: audio and video editing software; custom web applications.

- **Online resources and in-class presentations**

In several FIT projects, the use of audio and video was a key component to meeting instructional challenges. It has been effective in increasing student engagement with content across many disciplines. Existing audio and video resources from the news and entertainment industry, and from industry sources were used to connect students with real

world cases, experts, unfamiliar cultures and locations. Original video was also created and used for both in-class and web delivery to support specific concepts and skill development. Bringing multimedia into the classroom is not a new practice; how these media are accessed and integrated into lectures, class discussions, and outside of class for assignments and review has been the focus of innovation.

A key challenge to using video in the classroom is the ease of use when playing video clips from several DVD's within a single class session. Some faculty integrate the video within a PowerPoint presentation, but this is not always possible. The FIT team worked with faculty on various methods to improve the delivery of video to large classes, though the use of DVD and video book marking tools. These tools allowed videos to be changed rapidly and played instantly. Online video resources used technologies currently supported by CIT's course technologies such as RealMedia and QuickTime streaming video. In addition, video was developed using Flash which enabled the video to be combined with other web resources.

Technologies: audio and video production equipment; video and DVD book marking tools, repositories with different presentations, Flash, and streaming video.

Making it "Real" with Digital Resources and Technology

- **Digital Case Studies**

Case studies illustrate how concepts are applied to make decisions and solve problems in a particular situation. Recent projects have used case studies as a "reality-check," enabling students to contrast theories learned in class with the nuances of applying them to a real world situation. In one law course, case studies used multiple sources of information and media (such as news clips) to create a context in which students could review decisions as well reactions to the decision from key stakeholders. In another law course, case studies enlivened what might have been considered "dry" material with contentious applications of the law in real cases. In both courses, case studies provided students with a realistic view of skills and practices and stimulated discussion about the subtleties and consequences of how the law was applied. Technology enabled faculty to build and present cases by bringing individual resources in multiple formats into one learning environment to which cases could be added over time.

An unexpected project outcome was how deeply the students were engaged in learning and actively contributed to the collaborative development of content, independent of course assignments. *"Courses became richer, more realistic, and more deeply imbued with the challenges of professional practice."*

Technologies: audio and video, web technologies, Flash, 3-D animations-visualizations.

- **Simulations and "Games"**

Simulations enable students to practice decision-making and other skills in an environment that provides dynamic responses. This is especially important when students have limited opportunities for practice in the real world. In one FIT project, the faculty converted a paper-based simulation to a virtual one so that students could practice fluid therapy on a "patient" with particular symptoms in a dynamic situation. Principles of "game" play such as time limits, consequences, rewards and setbacks are incorporated in the design. Students are highly engaged and get a more realistic experience with collecting information, prescribing tests and making treatment decisions. Time pressure and a visible indicator of the dog's health in response to treatment add an emotional dimension which was not possible with the paper based exercise.

Technologies: Stella modeling software, Flash, 3-D animations-visualizations, audio & video.

- **Using Robots to teach computer programming**

A unique innovation was used to address a misconception about introductory computer programming. Faculty have been challenged to overcome many students' high school level experiences with computer science courses that focused on programming tasks and draw them into the discipline at Cornell. In this project, faculty distilled the key concepts needed for problem solving and separated them from the mechanics of computer programming to solve those problems. The end result was that the focus shifted from completion of "boring" programming assignments to solving problems that resulted in programming a robot to perform certain actions. Students engaged in higher level problem solving skills with a minimal amount of actual programming. The assignment was challenging and required group collaboration and application of introductory computer science concepts. But the outcomes were far from conceptual as students demonstrated how they had "taught" their robots to behave. Although the robot assignment is unique to this course, shifting the focus to higher level problem solving and demonstrating how it applies in the real world might increase student engagement in other disciplines.

Technologies: iBot hardware, Java programming.

Real World Assignments

When referencing the "real world" in teaching, students often need access to experts, places and other resources that support course activities and increase engagement with content. Another strategy is to assign students a project with a real world outcome and connect them to practitioners and experts. Knowing that the project will have an impact beyond the confines of the course is a powerful motivator. Again, it is an opportunity to apply concepts and practice skills with meaningful consequences.

One project used *Moodle* in a "proof of concept" mode to provide a wiki in which students collected resources, viewed videos representing different conservation projects, and collaboratively responded to complex research questions posed by actual conservation project team members remotely located around the world. ConservationBridge.org has brought together researchers and students in a way that is serving as a model for creating other bridges.

In another project, students prepared lesson plans and delivered "in-service" lessons to Cooperative Extension staff remotely located across New York State. The instructional goals were two-fold; students gained experience developing lesson plans and using distance learning technologies to deliver them. In addition to distance learning technologies, faculty used *Moodle* to collect lesson plans, organize resource materials and provide context through videos that told the history of the Cooperative Extension mission.

*Technologies***:** *Moodle* software, Adobe connect, Polycom video conferencing units

Virtual Worlds

Virtual worlds are computer-based simulated environments in which people interact with each other using avatars (on screen representations of themselves). Avatars have the ability to move as people do in the real world and to fly or walk underwater which is not possible in the real world. A person can have multiple avatars and therefore multiple identities. Virtual Worlds offer a social environment that may have expectations regarding behavior and even have an economy (e.g. *Second Life's Linden dollars*) that supports a marketplace for objects and services that can be virtual or real. Is it a game? A virtual world is not necessarily a game with rules, although people inhabiting a virtual world may decide to build and play games.

Virtual worlds offer a medium for expression, communication and collaboration that enables users to have a voice-enabled, immersive experience with a 3D interface. Virtual Worlds allow users to customize their environment by building objects and structures, or altering the "landscape" to support different kinds of interaction, activities and events.

Despite the media spotlight on *Second Life*, there are several virtual world applications. Interest in virtual worlds is not new at Cornell where *Active Worlds* has been hosted for several years. *Active Worlds* was used in an outreach program that involved middle school students collaborating to create science projects. Logging conversations and tracking other activity in *Active Worlds* has contributed to understanding the impact on learning. Within the context of the innovation program, faculty used *Active Worlds* as a medium for Cornell students to explore the concepts of 'space' and 'time' in a studio art course. The assignments took advantage of the immersion aspect of Virtual worlds actively engaging visitors in environments that the students had created.

Technologies: Active Worlds software hosted on Cornell server**.**

3) Projects & Explorations In progress (2007- 08)

Explorations: Proof of concept technologies & further exploration

Several technologies that had been identified with potential for broader user at Cornell are being developed and implemented in several 2007-08 Faculty Innovation in Teaching (FIT) projects. Many of the identified technologies were selected since they are at a mature stage of development, and have the potential to be implemented as a service. It is expected that these projects and associated technologies will be reviewed in 2008 to determine if further exploration or a pilot project is warranted.

These technology projects include:

1. The *Computer Science CMS application* that offers large class administration and gradebook tools will be piloted in the spring 2008 semester. The software and database has been migrated to CIT servers and put into a supported production environment. In spring 2008, CIT and Computer Science will determine the feasibility of offering this tool an as a central course technology service.
2. *OSP portfolio application* which is part of the Sakai learning and collaboration environment is being developed for pilot use by International TA courses in the spring 2008 semester. The project is exploring the student portfolio options that would allow students to add audio and video to their portfolio content. The OSP system also has the potential to tie course assignments and instructor feedback to student's portfolio content. Once the initial "*proof of concept*" use of the OSP portfolio tool is completed, the Faculty Support Services team in CIT will determine if the OSP technology could be moved into a pilot project for 2008-09.
3. The general category of *content repositories* (e.g. Digital asset repositories) are being explored in many FIT projects this year. Several projects have identified potential repository approaches for teaching and technologies to explore. There are two options that the projects are developing in the spring 2008 semester: 1.) linking the DSpace repository, supported by CU Library, to a content repository in the *Sakai learning environment* as a way to integrate repository resources into a learning module. 2.) using the *Fedora repository environment* to create a repository where students can contribute to a faculty's collection of course content.
4. Many faculty projects use video that need captions to accompany the video. The Faculty Support Services team has used commercial captioning software in the past, but this software has limitations in working with some video formats, such as Flash. To meet the needs of a current Faculty Innovation in Teaching project, developers have created a *general video captioning tool* that could be broadly used on campus. In spring 2008, the tool will be piloted in several FIT projects.

Pilot projects (2007-2008): Blog and Wiki

Projects conducted by the Faculty Innovation Teaching Program, Faculty Support Services in CIT and by CU Library in the past years have explored the use of Web 20. collaborative technologies, such as blogs and wikis. These early projects were conducted as proof of concept projects to identify the potential uses and benefit of collaborative technologies. As a result, several pilot projects were established to conduct further explorations of these technologies and to determine the feasibility of moving the *ad hoc* projects into a central campus service.

A key challenge of the blog and wiki pilots is how can the collaborative nature of blogs and wiki's be balanced with privacy needs of an academic service? Both pilot projects are developing use guidelines based on the needs of academic users balanced with the available features of the collaborative software.

- **Wiki Pilot Update**

A Wiki Pilot project in CIT began in 2006 by Advanced Technology & Architecture division in CIT, and was joined in 2007 by the Faculty Support Services unit in CIT. The wiki pilot project has determined the feasibility of offering a wiki service to campus for academic, communication and research purposes, and is using the Confluence wiki software. In spring 2007, the wiki pilot added academic users to the initial group of pilot users. To date, there are about 40 academic pilot users and several hundred users for other collaborative purposes. The current use of wiki's for teaching include many different disciplines, such as Information Science, Communications, English, Biology, Urban Planning, Business, Asian Studies, and Statistics. The wiki team in Faculty Support Services, CIT has identified the academic uses for the wiki pilot, and has configured the application and support services to meet these needs. User documentation has been completed, and the wiki application is ready to be moved into a production environment in 2008 as a supported service.

- **Blog Pilot Update**

A joint Blog Service Pilot project between CU Library and CIT began in May 2007, and a team of staff from CU Library and CIT was assembled. The purpose of the pilot is to determine the feasibility of offering a joint blog service to campus for academic, communication and research purposes. Project accomplishments to date include the installation and configuration of the Blog software (Word Press MU), conducting an orientation session for pilot participants in fall 2007, and creating over 150 blogs for pilot users. The technical team has been researching and installing blog add-ons, such as plug-ins and widgets. A list of desired add-ons were compiled by the team based on user requests and CIT & CUL experiences with supporting blogs. Nine CU identify compliant design theme's were created for the pilot, which enables users to select a design for their blog. The pilot team has developed a draft of use guidelines for a blog service that address who can request a blog, privacy, and identity management issues. The pilot team has also completed research about security practices and installation configurations for the potential blog service. In 2008, it is expected that the Blog Pilot team will customize

the blog software to meet CU security and identify features. A final decision about the feasibility of turning the Blog pilot into a supported service will be made in the fall of 2008.

Blog Project Background

In the past few years, CIT and the Library staff have been supporting several ad hoc blog projects. People are already blogging at Cornell and there are many others who are interested but not sure where to start. The Faculty Support Services group in CIT, staff have provided ~ 150 hours of support for blogs in the past year, either through Faculty Innovation in Teaching projects or small faculty projects. Since faculty are requesting blogs, and staff have been supporting this technology, it is time for support for academic blogs to be developed into a more sustainable model.

In the fall of 2006, CU Library sponsored a Blog Software Search committee that surveyed the current use of blogs at Cornell and identified issues for a possible service. Several CIT staff participated in the committee's work. In the committee's report, they recommended that: "The Blog Search Committee strongly recommends exploration of centrally-hosted blogging software with CIT. The library should work in conjunction with CIT to set up a standalone test server running WordPress MU and to identify people to provide technical support (software installation, configuration and support) and user support (training, documentation, and troubleshooting) for existing and new pilot blogs and for testing and implementation of a possible shared service."

Discovery: Second Life

Cornell Information Technologies worked with the New Media Consortium (NMC) to lease an "island" in *Second Life*, the virtual world hosted by Linden Laboratories. Educators and organizations such as the NMC have created a strong presence and teaching community in *Second Life* to support exploration of the instructional value of virtual worlds. *Second Life* offers a visually rich environment with a low threshold for getting started and there is a sizable population "in world" according to Linden Labs statistics, making *Second Life* an interesting environment in which to do social research, on topics such as identity, gender, and trust.

Cornell's *Second Life* activities are in the Discovery phase of the innovation cycle. While a few individual faculty have been active and in some cases teaching in *Second Life*, interest is gaining momentum and ideas that propose innovative teaching are beginning to emerge. Pending faculty interest and support, it is likely that there will be several exploratory projects in *Second Life*.

The common observation is that Second Life is a social environment mostly populated by people over the age of 25 years, not by teenagers and undergraduates. Students often remark that there is "nothing happening" in Second Life. The question is whether students will find the environment and immersion experience engaging when they are "in world" for a focused learning experience.
Technology: *Second Life* software, hosted by Linden Labs.

4) Summary: Impact on Learning and Teaching

Innovation projects are evaluated using a variety of methodologies including student surveys, faculty and student interviews, focus groups, formative evaluation, and classroom observation among others. While detailed evaluation outcomes are available for each completed FIT project, the intent of this report is to highlight innovations and summarize the value for teaching and learning. Below are two points for consideration, based on faculty reflections, that could increase the potential for an innovation project to yield positive results.

A key question to consider in planning an innovation is whether assumptions about students' technical skills and preferences are valid. Student and faculty feedback reflect that students are not as technologically skilled in certain areas as they are expected to be. It is often assumed that students have more technical skills and experience than they actually do. Students may be facile with communications and social networking software, but that does not necessarily indicate competence with other technologies. The implication for innovation in teaching is that time and strategies for orientation and skill development need to be included when introducing technology into a course. This is a question that merits further exploration.

Faculty have found that students are their partners in innovation. When faculty gave students the goals and background of the FIT project they planned to implement in their courses observed higher levels of interest and willingness to try a new approach. Students appreciated knowing the context and that they were actively contributing toward the advancement and improvement of teaching and learning at Cornell.

5) Broad Issues

The faculty projects and pilots described in this report explore a range of instructional strategies and supporting technologies. Development and implementation of these projects has raised several common issues that could have an impact on how innovations could be implemented, and on policy development for future services. These issues may also indicate areas for further technology exploration and development.

Digital Asset Management

As digital content proliferates, it is increasingly difficult for faculty to manage and integrate it into their teaching. Several projects have focused on building collections, presenting multimedia content and providing access outside of class.

There is a need for digital asset management technology that enables storing, searching and presentation of multimedia content. Current solutions have varied in part because of customized requirements for how the content is presented (e.g. associated images, sounds and text or activities) and in some cases the need to integrate tools that

enable interactivity with the content (e.g. faculty annotation, student comments). Ideally, an institutional solution would be flexible enough to accommodate different levels of access and enable content owners to create a variety of templates for presentation. Another challenge is making the repository easy for students to upload their multimedia files. CIT and CUL are making efforts to address this need on an institutional level.

Scholarship

Scholarly content is being created and contained in blogs, wikis and other collaborative environments. This format for capturing scholarship continues to raise issues of intellectual property and ownership, copyright, proper citation, and persistence of the work itself. These are still relatively new challenges and discussion of these topics is ongoing.

Privacy

While students derive great satisfaction and motivation from "public" responses to blog posts, faculty need to be mindful of privacy issues when it comes to exposing students and student dialogue to the public. To date, a workaround that enables students to benefit from "public" dialogue while protecting their privacy is using an identity other than their real names.

Audio and Video

Fair Use often justifies in-class presentation of all kinds of borrowed audio and video works (from the news, popular films, etc.). But what happens when faculty want to provide the video for review outside of class or build an assignment around it? Copyright clearance, digital rights management and technology that enables protection of these files remains a challenge and a major topic of discussion in higher education.

Other challenges include rubrics for assessing multimedia assignments; development of production and post-production skills to ensure reasonable quality; and exploring the idea that it may benefit students to learn how to express themselves with the "language" of audio and video (some of which is captured in basic film theory).

Simulations and "games"

Effective simulations and games can make a profound difference to a curriculum but they are often very expensive, costing faculty in time and funding for development. The challenge here is to take the best principles of game design and identify development tools and environments that will support the development of engaging and recyclable simulations. It seems possible given the successful use of relatively inexpensive software such as *Stella* to design a highly dynamic simulation with an interesting but simple interface.

Virtual Worlds

There is currently a lot of "hype" around virtual worlds and it remains to be seen how scalable and accessible these simulated environments are for teaching and learning. Issues that have surfaced are not all technical. As for the technology, some applications can be hosted locally while others must be hosted by a third party. This may have

implications for privacy and intellectual property. Tools that have been used for 3D modeling are not necessarily interoperable with these virtual environments; building is done with proprietary technology. Some of the virtual worlds software is cross-platform while others are not. And finally, there are reliability and ease of use issues – regular upgrades and the ability to use a mouse or keyboard to control avatar movements entails a learning curve.

It always seems much harder to approach the non-technical issues. With regard to an "open" world such as *Second Life*, "citizens" need to be at least 18 years of age to participate on the "main grid." There is a teen grid that extensively screens adults before granting them permission to sponsor an island there. Some higher education institutions have developed two virtual campuses for recruiting - one for each of the teen and adult grids. While many educational islands are "private," there are concerns that students may be exposed to inappropriate and potentially harmful behavior from residents in other non-academic parts of the virtual world. Defining "inappropriate" and "harmful" has generated a lot of discussion about the boundaries within which educators can "protect" students in cyber space.

6) APPENDIX

National trends

Is innovation at Cornell in alignment with trends and challenges that have been identified nationally?

One point of reference is provided by The New Media Consortium (NMC). Each year the NMC, in collaboration with the Educause Learning Initiative (ELI) "charts the landscape of emerging technologies" for teaching, learning and creative expression and produces the Horizon Report. Upon review, Cornell faculty and students have been engaged with most of the next horizon technologies and trends identified in the 2007 Horizon Report.

- User Created Content
- Social Networking
- Mobile Phones
- Virtual Worlds
- The New Scholarship and Emerging Forms of Publication
- Massively Multiplayer Educational Gaming

For more detailed information, an archive of Horizon Reports for 2004 – 2007 as well as the new 2008 report may be found at http://www.nmc.org/horizon/.