Freshmen Orientation…Online: A Librarian and an Instructional Technologist Collaborate

Jean Bennett
Multimedia Instructional Technologist
Information Technology
610-409-3000 ext 2755
jbennett@ursinus.edu

Diane Skorina
Reference and Instruction Librarian
Myrin Library
610-409-3000 ext 2302
dskorina@ursinus.edu

Ursinus College
601 E. Main Street
Collegeville, PA 19426

Abstract

This paper details the collaboration between a librarian and an instructional technologist at Ursinus College, a small liberal arts institution in Pennsylvania, as they worked together to integrate the library into the College's Course Management System, Blackboard. The focus is on two projects undertaken within Blackboard: adding a library component on the Blackboard homepage, and creating a Library Orientation site within the main First-Year Orientation site. Survey results suggesting ways to improve the site in the future are presented. Elements of the collaboration between the librarian and the IT are described, and advice is offered on how ITs and librarians at any institution can cultivate strong, sustainable working partnerships.

Introduction

"Librarians and technologists are becoming increasingly interdependent, so to achieve their goals they must cooperate," writes Mark Cain in 2003. "Perhaps that collaboration will take the form of a merger into a single organizational division, but it doesn't have to" (Cain 181). At Ursinus College, a small liberal arts college of about 1700 students located 30 miles outside of Philadelphia in Collegeville, PA, the Library and the Information Technology department are administratively separate. However, a librarian and the instructional technologists realized early on how valuable collaboration is and would continue to be to each of their jobs. Through their work on two projects in Blackboard, the College's Course Management System (CMS), and through continued meetings, they have forged a sustainable and beneficial partnership despite the lack of any administrative mandate. This paper will first provide some background on collaborative relationships between librarians and instructional technologists (ITs). Details of the projects to integrate the library into the College's CMS through the use of an i-frame that included a library catalog search box and the development of a First-Year Library Orientation site created exclusively for new students will follow. Finally, real-world advice on collaboration concludes the paper.

Collaboration between ITs and Librarians: A Review of the Literature

The library and technology literature of recent years is full of information about merged IT and library departments and how these integrated departments can function effectively (see Diedriech & Laroche, 2005; Motin & Salela, 2006; and Hardesty, 2000 for examples). But there is less practical information available about how librarians and instructional technologists can forge partnerships and work on projects when there is no administrative mandate at a particular college or university. Nonetheless, many agree with Mark Cain when he encourages librarians to work not just in their traditional roles as liaisons to academic departments, but to forge relationships with other departments as well, especially Information Technology (Cain 180). As Joyce Latham points out in her examination of the roles of librarians and technologists, "technology has…shattered our traditional compartmentalization of tasks" (Latham 393).

Collaboration has become essential to the effective operation of any college or university. An entire conference – LOEX-of-the-West 2002: "Expanded Conversations: Collaboration for Student Learning" – was devoted to the subject of collaboration across all departments. Susan Fliss of Dartmouth College Library writes that "librarians need to collaborate creatively with other partners to better support teaching and learning on campus" (Fliss 378). Who are these "other partners"? Not just faculty members, on whom librarians have traditionally focused, but also staff in academic computing, the writing program, the international office, the academic skills center, and residence life. This sort of collaboration can lead to some innovative and exciting new ways to support teaching and learning. Some recent projects on college campuses illustrate how collaboration between IT and the Library can be particularly productive. Updike & Rosen (2006) write about the collaboration of librarians, faculty members and instructional technologists to create an online digital image database at James Madison University; Duke, Vogel & Wilson (2007) write about a similar collaboration on a project for dataset and statistics management at Illinois Wesleyan University; Motin & Salela (2006) illustrate a way that integrated teams can meet the needs of the campus community better than either the library or information technology departments in isolation. The education literature recognizes how important collaboration is between teachers, librarians and instructional technologists (see, for example, Russell's ERIC digest on librarian-teacher-technologist collaboration).

One of the main reasons that collaboration between instructional technologists and librarians can be so beneficial is because of the possibilities that arise with the increasingly prevalent use of course management software, such as Blackboard and WebCT, on college and university campuses. These systems are not just used in online courses. Since the 1990s, even in schools that rely mainly on traditional face-to-face teaching (as many schools will continue to do well into the future), CMS's are increasingly integrated into courses, in ways that range from serving as a repository for course readings to acting as an essential avenue for academic discourse among class members. Instructional Technologists were hired at many colleges and universities beginning in the mid-1990s in large part to assist faculty members with the task of improving or enhancing their teaching by incorporating online elements into their classes. In 1996, Daniel Surrey, examining posted instructional technologist job ads, noted some of these teaching-centric tasks of the instructional technologists: the role of a consultant who helps "faculty identify and evaluate instructional software" and develop curriculum materials; the role of a "multimedia specialist" who "works with faculty to develop a variety of instructional products" such as "developing instruction to be delivered via the World Wide Web;" and the role of the "trainer" who "is responsible for developing, conducting and evaluating training workshops in areas related to instructional technology."

As of this writing, however, little exists that examines the direct, voluntary collaboration between instructional technologists and librarians and explores projects on which they have worked. Boiselle, Fliss, Mestre & Zinn (2004) provide the most recent and relevant example. Librarians and instructional technologists from Mount Holyoke and the University of Massachusetts Amherst attended a training workshop on how to collaborate. "Librarians, instructional technologists, faculty and students should not plod onwards in isolation" (125), they learned, and they were able forge effective partnerships and work on successful projects together at their respective campuses. The authors concluded that "for instructional technologists and librarians, the former support staff roles are changing into roles based on partnership." Clayton (2006) describes the results of a project involving collaboration between ITs, librarians and faculty: an online tutorial for a teacher education course in Blackboard that received mixed success. Another project that involved IT-librarian collaboration on a less intense level is described by Lenholt, Costello & Stryker (2003). They developed a "unique, yet simple, method for incorporating library instruction handouts into course-specific online classes" by uploading handouts to Blackboard for particular classes in the School of Business Administration. Their collaborative effort involved primarily faculty and librarians, but also required assistance from the university's Center for Information Technology.

Librarians sometimes serve as "instructors" or "TAs" in Blackboard (or other CMS) virtual classrooms to provide resources by adding relevant links to library resources, but this is limited to particular classes and only reaches students enrolled in them. Many librarians have created web-based tutorials (see Dent, for example), but these usually exist outside of the CMS systems where students are required to go for many purposes, and they require significant time and expertise with website design often only available at larger universities. Also, if the tutorials are not required, students do not tend to use them very much. Terry Anderson writes in *Theory and Practice of Online Learning* "the Web supports these more passive forms of student-content interaction, and also provides a host of new opportunities" (Anderson, 43). Working together, Jean and Diane were able to integrate the library more holistically into both Blackboard and the online part of the First-Year Orientation experience.

The Project: Part 1

In this age where information is easy to come by but the process of thorough academic research remains as rigorous and as difficult as ever, the library at Ursinus constantly seeks ways to promote its offerings and services to students. Diane Skorina, Reference & Instruction Librarian, reached out to the instructional technologists when she began work in August of 2005 for two reasons: help in preparing a library survey that would gather feedback on what students needed from the library and what they currently used; and advice on how she might integrate the library into Blackboard more effectively. In particular, she was disturbed by the presence of a large Google search box on the main page of Blackboard while the library was not represented at all. This explicit promotion of Google directly conflicted with information literacy efforts of the librarians and presented the wrong message about where students should start their academic research. In Spring of 2006, both Instructional Technologists left Ursinus and so no real progress was made until the Fall of 2006, when Jean Bennett and Tori Waskiewicz joined the staff of the IT department as Multimedia Instructional Technologists.

The first part of the collaboration involved creating a library presence in Blackboard. With only limited success in working directly with faculty to incorporate library resources into specific classes, Diane was interested in trying a more general approach. First, Diane sought to have the library integrated into Blackboard as a tab across the top page that would always be available to students. This idea was turned down by the IT department as one that would create too much clutter on the Blackboard site. However, Tori presented a compromise offer: an i-frame (an in-line frame that contains another web document) could appear in the main part of the home page, more prominently located than the Google search box. The i-frame would contain links of the librarian's choosing.

The resulting box is shown in Figure 1.

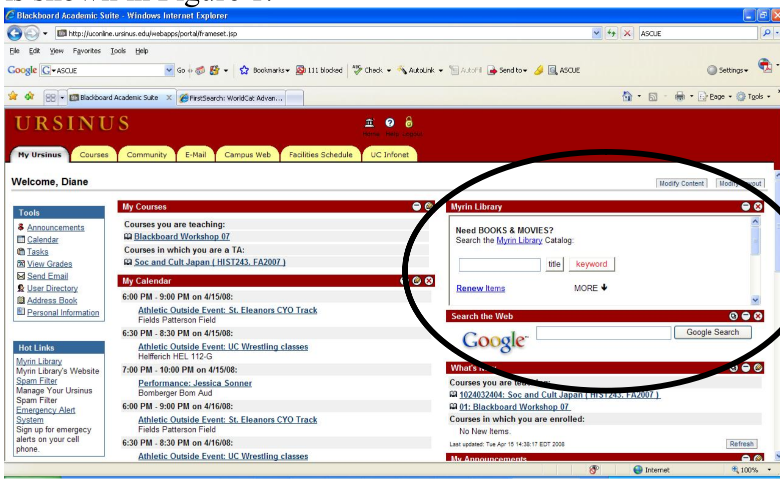

Figure 1: Screenshot of Blackboard Homepage with Myrin Library Section cir-

The first element of the i-frame is a library search box that allows students to query the library catalog directly from Blackboard (a new window opens up with the search results). Scrolling down in the i-frame, students see several things: headings that read "Need Articles" and "Need News," each of which link into appropriate databases; a link to the subject list of databases; and the e-mail address and phone number to call for assistance. Usage statistics have been impossible to track for this particular feature, but the Blackboard site is now more academically appropriate and in-line with the library's information literacy objectives. This was a relatively simple solution to the problem, arrived at by compromise on both sides.

The Project: Part 2

In the course of this project, it became clear that both the librarians and the instructional technologists were tasked with and interested in addressing similar issues. While Tori was on leave in the Spring of 2007, Jean and Diane continued to work together in face-to-face meetings to determine how to dovetail overlapping needs into one project. Jean mentioned that she was interested in addressing plagiarism, something the library has traditionally handled. Diane expressed a desire to reach First-Year Students online, since many of them couldn't, or simply didn't, attend the in-person library orientation in August. (Consistently over many years, no matter what enticements are offered, about 1/3rd of the First Year students show up; attendance is not mandatory because of a desire to accommodate students' sports schedules). At the time, Jean was working on the Blackboard Orientation site that all students are required to use – at their own pace – before they arrive on campus in August. Within this site, they do such tasks as take placement tests and complete surveys that help choose roommates, but they also and learn about other parts of campus life as they get acclimated to the Blackboard system that they will use in the coursework and for administrative purposes during the semester.

Jean and Diane quickly realized how to address both the plagiarism question and the Orientation need: they decided to create a library component of the general First-Year Orientation Blackboard site that would include information on plagiarism. The plan was to make the site simple and straightforward – something that students' could peruse at their own pace (and that would stay available after the summer) – but Jean and Diane also wanted to use the less static features of Blackboard by incorporating tutorials and video links. The site would necessarily duplicate some information from the library website, but would do so in a way specifically designed for First-Years, including the way it addressed plagiarism. Jean and Diane included a plagiarism section on the Library Orientation site with text-based information, but they also added videos that they produced featuring professors and First-Year students talking about plagiarism in an informal but informative way. After all, since in-coming college students today are using blogs, wikis, podcasting, videocasting, social networking and other Web 2.0 technologies as early as elementary school (see, for example, Hargardon 2007), it becomes increasingly important to offer more dynamic ways of presenting material to them at the college level. These videos were created at the end of the Spring semester, edited jointly (Jean taught Diane how to use the software) over the summer, and then housed on a streaming video server and added to the Blackboard site as links. Figure 2 shows the first page of the Library Orientation Site. Information on how to find books, DVDs and journal articles, written at the basic level for First Year students, as well as a Tutorial on using the Web (which they are all used to) vs. using the Library Resources (which are not as ubiquitous) were included here, in addition to more fun aspects of the library, such as social events held and pictures of the building. Figures 2-6 show representative pages.

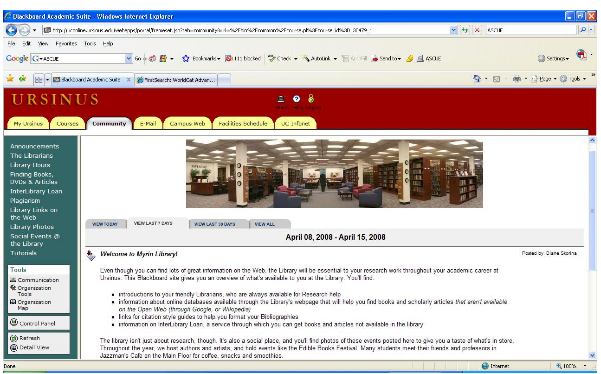

Figure 2: Screenshot of Homepage of First Year Myrin Orientation site

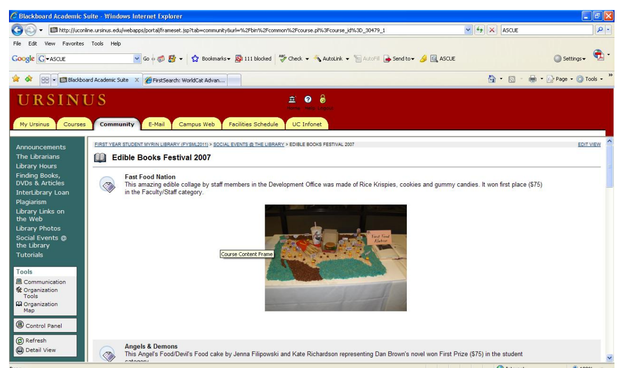

Figure 3: Screenshot of "Social Events" link – Edible Books.

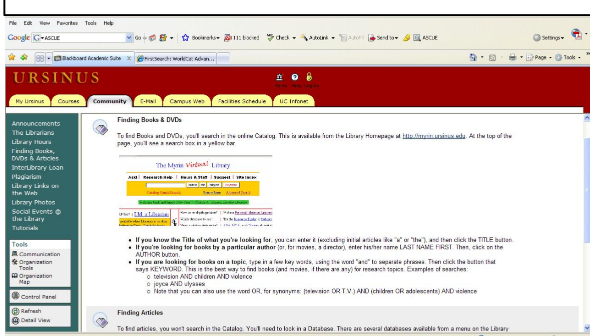

Figure 4: Screenshot of "Finding Books & Articles" link.

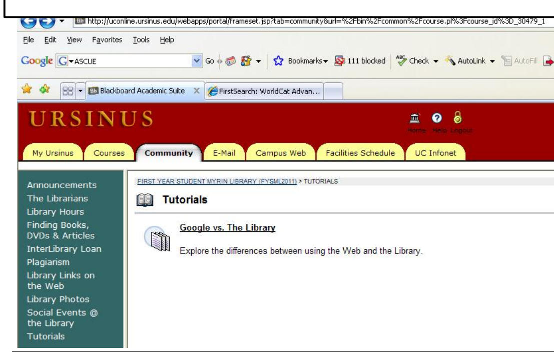

Figure 5: Screenshot of "Tutorials" link.

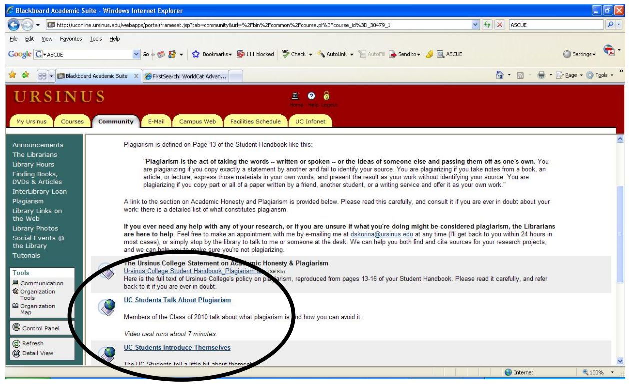

Figure 6. Screenshot of Plagiarism section. Links to videos circled

While it is not currently possible to track how many students visit each part of the library site, its location in the required General Blackboard Orientation site makes it likely that they know it exists. In fact, a survey of First-Year Students conducted in January 2008 revealed that many students *did* visit the Library site.

80 First Year Students responded to a 6 question survey (if they hadn't visited the site, they were only asked two questions), which is about 20% of the class of 2011. Approximately 75% of them visited the Library Orientation site at least 1 time, while a little under 25% did not click on the link. The most common reasons for not looking at it were that they "didn't notice it," indicating a need to highlight it or draw attention to it in some way through color or within the text, or that they "didn't feel they needed it," indicating that perhaps we should require people to at least click on it before their attendance at the General Orientation site is recorded as complete.

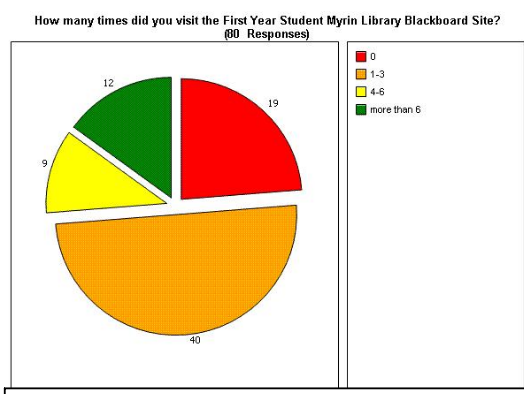

Figure 7. Amount of visits to the Blackboard Library Orientation Site

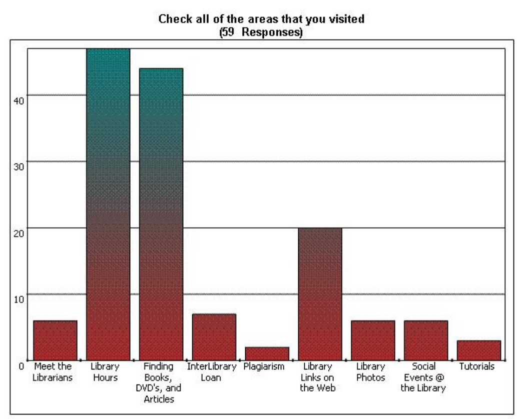

Figure 8. Visits to each section of the site.

The most popular areas of the site were the "Hours" link, the "Finding Books, DVDs and Articles" link, and the "Library Links on the Web" link. Very few students visited the Plagiarism area of the site, indicating a need to draw attention to this section.

Ratings show that people who visited particular sections almost always found the sections useful or very useful.

Please rate the following:

	1 Not Useful	2 Useful	3 Very Useful	N/A Didn't Use
Meet the Librarians	1 (1%)	3 (5%)	5 (8%)	45 (75%)
Library Hours	1 (1%)	9 (15%)	36 (60%)	11 (18%)
Finding Books, DVD's, and Articles	1 (1%)	19 (31%)	24 (40%)	13 (21%)
InterLibrary Loan	0 (0%)	3 (5%)	6 (10%)	45 (75%)
Plagiarism	0 (0%)	4 (6%)	0 (0.00%)	48 (80%)
Library Links on the Web	0 (0%)	11 (18%)	11 (18%)	31 (51%)
Library Photos	0 (0%)	5 (8%)	5 (8%)	43 (71%)
Social Events @ the Library	0 (0%)	5 (8%)	3 (5%)	46 (76%)
Tutorials	0 (0%)	4 (6%)	0 (0%)	49 (81%)

Figure 9. Usefulness of each section of the site to respondents.

Of the 4 students who visited the plagiarism site, only 2 watched the videos and neither of them reported finding them useful. The reasons given were: "My high school had a very strict plagarism [sic] policy and therefore the information that the library presented was not new information;" and "I read the written definition of plagiarism and the college's policy on it on the website." In the future, Jean and Diane plan to revisit these videos to hold focus groups in which students watch them and give us feedback to make them more relevant. Both Jean and Diane see a need to put more emphasis on this section as the videos are informative and, it is hoped, fun. First Year students see rising sophomores and professors they will probably meet in their first-year talking about plagiarism. If more students were aware of the videos and if the videos were improved to be more relevant, Jean and Diane theorize that more could be persuaded to watch them, just as they might watch a YouTube video.

Collaboration

Neither of these projects would have been possible without collaboration between the IT and the librarian, and the new projects that Jean and Diane are working on depend on the partnership's sustainability. The following steps are crucial to a long-term IT-librarian collaboration:

- **Weekly or bi-weekly in-person meetings.** Jean and Diane met often during the creation of the orientation site on an as-needed basis, and wanted to continue to work together when it was done. Currently, they meet every other week to discuss current projects, and new developments in their respective fields. These in-person meetings, even if they are short during busy times, are absolutely crucial to the continued collaborative efforts.

- **Brainstorming.** Some sessions are devoted exclusively to brainstorming and exploring. Jean and Diane are open-minded to each other's ideas. Often during the semester, meetings generate ideas that cannot be explored until the summer.

- **Project planning.** Timelines, deadlines and clear designation of duties are essential. For example, during the filming of the video projects, Jean communicated with the faculty and the students, eliminating any confusion about responsibilities. On the First Year Orientation Site, Diane created it and instituted any changes while Jean served as the reviewer and adviser. Deadlines, too, are crucial to making sure things actually get done, even if they are at times artificial.

- **Work together to address faculty.** Jean and Diane have presented at campus common hours to communicate what each of them does and is capable of doing for the betterment of the student's learning and research processes. This has so far met with mixed success, but librarians and technologists share a lot of common ground: as Cain points out, "these days, librarians and technologists must both contend with rapid change" (180), and we both must help faculty and students contend with and adapt to it as well.

- **Update each other about developments in the IT and library worlds.** This can help foster better understanding of each others' jobs and spur the generation of ideas. Boiselle et. al. (2004) also emphasize the need to teach each other about recent developments.

- **Open mindedness & a willingness to compromise.** As Susan Fliss points out in her 2005 article, "Being creative in a group is difficult to do. Upon hearing a new idea, one's initial impulse is to break it down rather than continue to develop it." Jean and Diane remain open minded and flexible, willing to try new things with new technology with the shared goal of improving the student and faculty experience on campus kept in mind.

- **Attend workshops & conferences together.** Jean and Diane attended a local workshop on using Blackboard, which generated ideas, expanded knowledge and fostered mutual understanding of each other's jobs. Jean was of great assistance to Diane at the workshop in helping her to learn how to use Blackboard, and she herself learned more about the functionalities of the system. Jean will attend library and education conferences in the future, and joint attendance at ASCUE 2008 is looked forward to as a development opportunity.

- **Socialize!** Though it is not always possible, it helps to cultivate a working friendship outside of the "office," so to speak. Going out to lunch and attending events outside of the professional context can build stronger relationships. Boiselle et. al. (2004) point out that "cookie chats" "and the informal relationships they helped build between the two groups were so valuable that they must be continued in order to lay the groundwork for future collaborations" (135).

Conclusion

Librarians and instructional technologists, whether they are part of the same department or not, can – and perhaps must – forge strong partnerships to meet the needs of students and faculty and to help college campuses keep up with ever-changing technology. At Ursinus, over the course of a year, an instructional technologist and a librarian successfully integrated the library into the general campus Blackboard site in two important ways: via an i-frame that included a catalog search box on the front page of the main Blackboard homepage; and in a First-Year Library Orientation site which was part of a required General First-Year Orientation site. This latter project addressed the need to reach students who can't or don't come to in-person library orientation by providing them with general information about the library that they could approach at their own pace before arriving on campus. Jean and Diane were also able to address an important academic problem, plagiarism, both in a traditional, text-based way and in a video production aimed at the younger generation. The IT and the librarian keep up their collaborative partnership by adhering to practices and principles that make collaboration between ITs and librarians at other institutions possible. These include meeting weekly or bi-weekly, planning projects and brainstorming with an open-minded attitude.

In this information age, librarians and instructional technologists can hardly afford not to communicate and collaborate with each other, on projects both simple (adding a i-frame to the general blackboard site) and complex (developing a site for library first-year orientation, and more). Only through collaboration will librarians and instructional technologists be able to effectively serve the needs of the college campus in the 21st century, where face-to-face and online teaching and learning meld seamlessly into one new learning-centered educational framework.

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Providing Usability Testing: Countering Student Assumptions through the "Oh!" Experience

Kerry Henson
University of Central Missouri
Adrian and Margaret Harmon College of Business Administration
Computer Information Systems Department
Warrensburg, Missouri 64093
660.422.2705
henson@ucmo.edu

Introduction

Usability testing is often viewed as requiring expensive resources and beyond the scope of most programming and analysis and design courses. This is not necessarily true. While sophisticated and expensive testing options exist, less costly technology can still provide benefit to students prototyping their program interface designs. Students observing their deign in use may realize they do inject their own biases into their designs, a point they may hear their instructor address, but one they do not embrace before a personal "Oh!" experience.

This paper describes how prototyping is incorporated into a user interface design course. It will promote extending user testing of student-designed interfaces into programming and analysis and design courses as well. A usability lab facility will be described and alternative testing tools will be considered. One should conclude that usability testing by can be beneficial and accessible to students.

Definitions

In "usability testing," the term "usability" often connotes an assessed degree of adequacy attributed to a human-computer interface. While the term "adequacy" can be applied to various perceptions of an interface, usability actually describes not the structure of an interface, but the degree to which an interface supports user interaction, that is, a specific set of users with identified characteristics completing a specific, defined task in an identified setting. As posed in ISO 9241-11 (1998), usability is assessed through effectiveness, whether the interaction accomplishes the defined task, efficiency, whether the supported task requires minimal effort, and satisfaction, the user's view of the task process.

Evaluation is an important component in many defined interaction design processes such as the Star Lifecycle Model (Hartson and Hix 1989) and the Human-Centered Design Lifecycle Model (ISO 13407 1999). Prototyping is incorporated in all these design processes. Such evaluation is especially applicable to interaction design, as compared to systems design, since project scope tends to be relatively small and modifications can be implemented relatively quickly.

Jacobson and others (1992) suggest different modeling tools are appropriate at different points in the software development process as the design moves from conceptual to physical. The same is true of interaction design. In interaction design, story boarding, personas, etc. can be used to represent aspects of the user, task, environment or process at appropriate levels of abstraction.

At physical implementation of a series of interfaces supporting task interaction, observing hands-on user tasks can be used to evaluate and validate design decisions.

A Design Project Involving Evaluation

Several evaluation tools are used in a user interaction design course at the University of Central Missouri. This course strives to move students through a complete design process of an interaction design project of limited scope, emphasizing process and design guidelines. It is a four-phase project with major deliverables due at the end of each phase. Several tools and techniques are used as reflected in Table 1.

Phase	Tools and Techniques Used
Requirements Definition	Interviews, Questionnaires, Observation, User Profiles, Personae, Scenarios, Use Case (graphical and narrative), hierarchical task analysis
Low-Fidelity Prototyping	Story boarding, Task Walk-Through, Questionnaire, Paper-Based Prototyping
High-Fidelity Prototyping	VB.Net or Java, Heuristic Evaluation
Evaluation	Questionnaire (internal and System Usability Scale), usability testing (lab and field testing)

Table 1: The Four Phases of the Student Project

As previously stated, prototyping is an applicable approach in interaction design as project scope is limited. This is especially true for student projects where scope is further limited by academic time constraints. In the four-phase project described here, low-fidelity prototyping, using a paper-based screen representation, and high-fidelity prototyping, using mockups implemented in VB.Net or Java, allow students to receive immediate feedback and do not require that representative users possess technical knowledge. The real advantage is students seeing the results of applied theory that can prompt an enlightening revelation.

The "Oh!" Experience

Although user-centered design is emphasized in the course and students are required to obtain feedback from subjects during low fidelity prototyping, the project time line restricts students' frequent interaction with interface users. Most prototyping cycles consist of just one or two iterations and students conduct the heuristic evaluation upon their own project; thus, design decisions are primarily based upon their interpretation of guidelines discussed in class. Instructor feedback concerning design decisions during the process is purposely limited to ensuring project scope is addressed. Few suggestions are given in applying design principles and guidelines allowing the design process itself to highlight design flaws and weaknesses. This gives students confidence in working through the process and quite often leads to the "Oh!" experience during usability testing.

The "Oh!" experience was initially demonstrated when a design group conducted usability testing for their student enrollment interface. They recruited a fellow information systems student to serve as a subject in testing their mock interface that was designed and developed over several weeks. As students, all designers had negotiated course enrollment procedures so the task was not new and, to them, the design appeared straightforward. Usability testing suggested otherwise as at one point in the assigned task, the subject became confused, unable to continue the task. The design team in the observation room became irritated that a fellow student who had previously enrolled several times and was technology-literate, could not complete the task. Agitated, one member of the development team said he felt like reaching through the observation window and "slapping him upside the head." The need to click on a button was obvious to the design team, but not so to the subject. It was an "Oh!" experience for the design team.

This brought focus to several principles covered in any interaction design or systems analysis and design course: the potential for introducing developer bias into the design and the need for continued user involvement throughout the design and development process. In course projects, students may make many assumptions during systems or interaction design, assumptions they do not see. Observing the shortcomings of their design when implemented is a much richer learning experience than reviewing related theory at a conceptual level.

Options for the "Oh!" Experience

Testing within prototyping is especially applicable to the interaction design course, but instructors of analysis and design as well as programming courses can encourage the "Oh!" experience, also. Interaction design is covered in systems analysis and design model curricula (Gorgone and others 2002) and textbooks (Dennis, Wixom and Tegarden 2005; George and others 2007). While scope of a student project in a single semester course may not extend beyond logical design to development, design activity should incorporate screen design. Students can then test their interface design with paper-based mockups in low-fidelity prototyping. Courses that do extend to physical design and development should require students to assess their interface design with usability testing. Likewise, programming course requirements can be extended to include user testing of screen interfaces. In either case, these additional requirements will place little additional burden on students, they will enjoy seeing their creative work in use and will benefit from employing prototyping. Additionally, they may arrive at an "Oh!" experience.

Supporting Usability Testing

To support students testing their high-fidelity prototype, testing facilities must be provided. The choice of testing in a lab or the field is driven by purpose and resource availability. Field facilities can give students prototyping experience at relatively little expense. A collection of portable equipment set up in a student computer lab can support the testing process. If the actual testing results are to influence the final product, a more formal field test considering the task environment or a controlled test in a lab setting is appropriate, but this will require more sophisticated equipment and, for a lab setting, planned space.

The goal of the testing technology is to capture a subject's use of input and output devices, in conjunction with the subject's verbal and nonverbal cues, while he or she completes specific tasks with the designed interface. For desktop or laptop-based applications, ideally the subject's computer screen, use of keyboard and mouse, facial expressions and verbal statements will be monitored, recorded and stored for later retrieval and review. Obviously, as more testing artifacts are incorporated, the technology configuration becomes more complex, especially since all artifacts must be temporally linked to preserve meaning. Additionally, giving the observer the capability to annotate the recording in real time is an efficient and effective improvement to the process.

In field testing, the observers may or may not be separated from the subject. The facilitator may sit close to the subject, a room partition may divide the two or remote testing over a network may be used, but the test facilitator should always be aware of intrusive technology. While the goal of field testing is to assess within the intended use environment, the testing equipment is not a part of the usual setting and can become an abnormal distraction.

Lab facilities vary in sophistication and cost based upon the number of environmental variables to be controlled. A professional lab will consist of multiple rooms: the experimental room where the subject completes the task, one or more adjoining observation rooms where observers freely discuss the test as it occurs and a reception area to separate the experimental room from busy, noisy hallways. A one-way mirror separates the experimental and observation rooms allowing the test to be viewed in a less intrusive atmosphere.

The experimental room should emulate an actual working environment while eliminating external distractions. A computer, desk and wall hangings give the facility an office feel. Cameras are placed in the experimental room to be minimally intrusive. In some labs, a desk phone provides a direct connection to a mock help desk.

Separating the experimental room from the hall removes the possibility of an individual trying to enter during a testing period. Removing external noise is essential when testing for research-oriented studies so soundproofing measures are taken such as extending walls above the false ceiling to the actual ceiling and insulating walls, ceilings and around doors. Above all, there should be no visual or auditory signals received from the observation area. Subjects should not be influenced by reactions to their work.

Many examples of usability labs are available on the web. Ovo Studios (2008) has several suggestions for the design of a usability lab some of which were implemented in the Usability Laboratory within the Computer Information Systems Department at the University of Central Missouri.

A Usability Lab at the University of Central Missouri

The lab consists of two adjacent rooms with a computer in each. As the subject completes a task at the computer in the experimental room (Fig. 1), the computer screen image as well as images from three cameras providing a facial view, overhead view and rear-side view can be viewed and recorded in the observation room (Fig. 2). The experimental computer screen image can also be stored on the local hard drive.

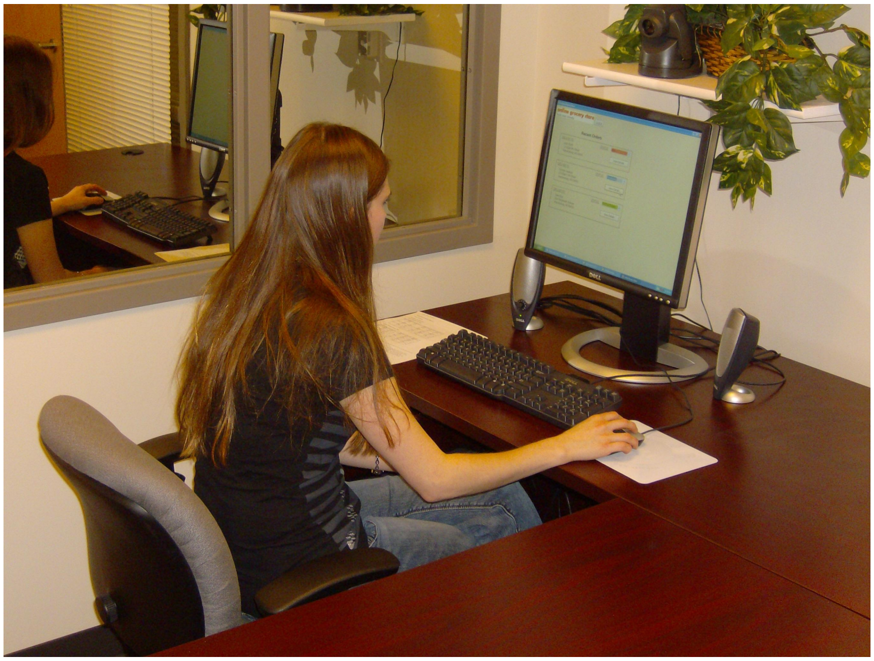

Figure 1: The Experimental Room

Figure 2: The Observation Room

History and Physical Structure

As the University made plans to renovate an existing structure for new classrooms and labs, a request was made for a usability testing facility. While incorporated into the blueprint, space was limited, so an isolated usability suite, as is the case in many commercial settings, was not possible; yet, two adjacent rooms were placed on the top floor near academic classrooms.

The experimental room and the observation room both have doors opening directly to the hall, not an optimal configuration for a controlled environment as hall traffic between class periods can be distracting. A double-pane, one-way mirror and an additional door separate the rooms. Without a separate reception area, the adjoining door was included to avoid having to enter the experimental room from a noisy hallway during a usability session.

In pursuing a controlled environment, measures were taken to reduce noise and light external to the experimental room. While walls of the experimental room do not extend above the false ceiling, substantial ceiling insulation is in place above both rooms, the doors are solid core and commercial-grade weather stripping extending to the carpet is installed on all doors. During testing, those in the darkened observation room can easily speak softly without being seen or heard in the experimental room.

Lab Technology

Because of budget constraints, outfitting the lab with state-of-the-art monitoring equipment was not possible. Cheaper alternatives were sought which would still give students a controlled usability testing experience. A complete list of equipments is reflected in Table 2.

2	X10™ Color Anywhere Cameras
1	X10 Vanguard Professional Camera
2	Desktop computers
1	Video adapter card with TV out (s-video)
1	Kalcom SuperQuad System One SQG4 Quadsplitter
1	TiVo® DVR
1	Video Cassette Recorder
1	13" TV
	Miscellaneous composite, s-video and component wiring
	Miscellaneous s-video to RCA and RCA to BNC connectors

Table 2: UCM Usability Lab Hardware

Cameras were purchased from a well-known video surveillance system company and a used quadsplitter was obtained in-house. Although the screen resolution is not optimal, it is adequate for capturing the subject's activity. A camera with better optics and remote pan/tilt/zoom capabilities captures the facial view. As shown in Fig. 3, these three cameras feed the quad-splitter in the observation room along with a video feed from the video card in the subject's computer. Output from the quad-splitter, as commonly used in commercial surveillance systems, will show any one of the views or will rotate through the four views at timed intervals. It will also simultaneously show all four views and it is this option that is invaluable in usability testing. Quad-splitter output may be captured using a VCR or DVR and saved on tape or DVD. The output is also visually monitored via a TV. Audio from a microphone on the overhead camera is connected to the DVR and is captured as well. The TV monitor reflects an approximate half-second latency from real-time so audio volume is reduced during testing.

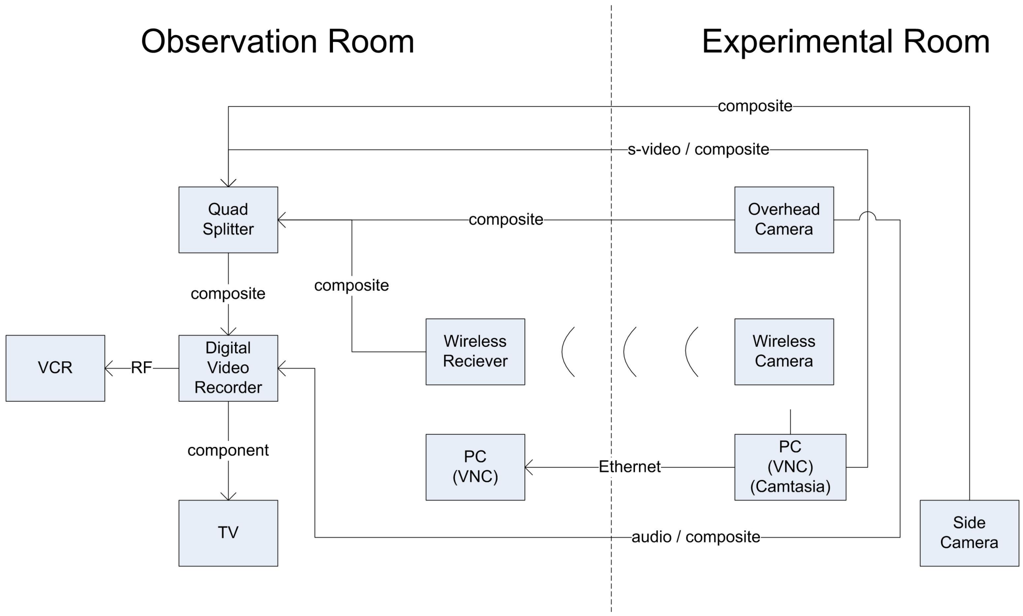

Figure 3: Wiring Schematic of the Usability Lab

The quad-splitter enables the subject's facial expressions and use of keyboard or mouse to be temporally linked to action on the subject's monitor, but presenting all four views on the observation TV reduces the visual detail of individual views. While video from the three cameras is adequate on a smaller-scale, details of the subject's monitor are difficult to perceive due in part to poor scan conversion. For monitoring purposes, a freely available Virtual Network Computing (VNC) server is installed on the subject's computer. A wired Ethernet connection then allows the subject's monitor not only to be observed, but also manipulated from the observation room. For archival purposes, Camtasia Studio® by TechSmith® is installed on the subject's computer so that screen activity is captured to the local hard drive and can later be transferred to CD. If screen activity details cannot be extracted from the quad-splitter video, the Camtasia screen capture is used as reference.

It should be noted that this monitoring configuration is built upon analog devices. Although testing artifacts can be stored on DVD, all video signals are analog. While analog equipment is generally cheaper than digital alternatives, the content in analog form is not easily manipulated in real-time. There is no capability in this system to mark or annotate the visual record; thus, testers must use pen and paper or a separate computer, but these records will not be timed to the artifact.

One option to partially address this shortcoming is to install screen capture software on the observation computer and open a text editor and VNC client during testing. Screen activity containing the relayed subject's screen and observer's notes could then be stored locally and later moved to a DVD. This approach would indirectly link the subject's activity and video with observer notation, requiring observers to review two archival records.

Other Options for Usability Testing Facilities

At most academic institutions, building space and funding are in demand diminishing the opportunity to create a lab facility. Alternative configurations, especially for field testing can be less expensive and are more easy to implement. Although components of linking multiple video records with screen interaction may not be implemented, such configurations have been used in commercial settings and would be effective for student projects.

A simple, yet effective approach has been used at Southwest Airlines (Hurst 2005). The subject uses a second monitor and mouse attached to a laptop computer. A video camera is positioned to capture the subject's face and the screen of the laptop in dual-monitor mode. This creates a single recording of screen activity, facial expressions and audio. Because the monitor and mouse must be in close proximity to the laptop, this configuration is intrusive and there is no facility for marking the artifact, but it is certainly adequate for student projects and non-research, practitioner testing. It requires only a laptop or desktop computer with dual-monitor capability, a second monitor, a mouse and a video camera mounted on a tripod.

Incorporating a second computer and a web camera can address the intrusion concerns of the prior example. The subject's computer with the web camera and a VNC server can be attached to the observation computer via a crossover cable or, for remote testing, over a network. The facial expressions and audio from the web camera along with the subject's screen activity, transmitted to the observation computer, appear onscreen together where both can be videoed or captured to a local hard drive. Camtasia can be used to capture and later manipulate the stored record.

CamStudio™, a freeware alternative to Camtasia, also has substantial recording capabilities including annotation and producing Flash® movies. Its rendering of screen activity can be a bit jerky, but it is adequate for student projects.

Another TechSmith software tool, Morae®, can support all of this functionality with its application suite. Morae is tailored for usability testing and can be used in a lab or the field. The annotation function is much more sophisticated than other tools described above and multiple observers at different locations can view and mark the record. Likewise, the suite of applications built upon Ovo Logger from Ovo Studios allows many testing options capturing up to eight different inputs. These are powerful suites, but expensive.

Conclusion

Research-oriented usability testing requires sophisticated tools and environments to obtain detailed records of task interaction and to precisely dissect the artifacts to obtain valid, reliable results. The interaction between humans and computers is complex. Parsing interaction records requires such tools; however, the goals of usability testing do vary and some practitioners are willing to concede capturing all details in order to efficiently examine use of an interface in an affordable manner.

Students can obtain a similar goal by assessing the adequacy of their interaction design. Whether performed with low-level or high-level prototypes, obtaining hands-on feedback about their designs will help students realize that they do have biases and that continued user involvement throughout the design process is necessary to counter these tendencies. Usability testing can be implemented in inexpensive ways. It is a fun exercise and can lead students to an "Oh!" experience.

Product Information

CamStudio: http://camstudio.org/
Ovo Studios: http://www.ovostudios.com/
TechSmith: http://www.techsmith.com/
X10: http://www.x10.com/

Attributions

CamStudio is a trademark of CamStudio.org.
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RCA is a trademark of Thomson S.A.
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X10 is a trademark of X10 Ltd.

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Lots of Simple, Little Things Interacting in Cooperative, Intelligent Ways: What We Can Learn About Problem-Solving From a Swarm of Ants

Marc Kirschenbaum
Department of Mathematics and Computer Science
John Carroll University
Cleveland, OH
(216) 397-3024
kirsch@jcu.edu

Daniel Palmer
Department of Mathematics and Computer Science
John Carroll University
Cleveland, OH
(216) 397-3024
dpalmer@jcu.edu

Ravi Vaidyanathan
Department of Mechanical Engineering
University of Bristol
Bristol, UK
+44 (0) 117 331 8266
R.Vaidyanathan@bristol.ac.uk

Abstract

We have developed a Flash-based, web-deliverable, teaching tool for understanding Emergent Behavior concepts that also serves as a platform for the discovery learning of problem-solving techniques. In many areas of science, business, and society, we find leaderless processes exhibit not only intelligence, but self-organization. While these processes are flexible, relatively inexpensive, and amazing to watch, they are often counter-intuitive. We built this tool to help people understand the concepts, trade-offs and implementation mechanisms of swarm-centric design principles. This paper presents three challenges, one from each of the scenarios in the Emergent Behavior Simulation Tool (EBST), as contexts for hands-on experimentation to learn and apply problem-solving strategies.

Introduction

One of the difficulties in teaching problem-solving skills is that for many types of problems – certainly familiar ones – students may have pre-conceived ideas for solutions. If those approaches don't work, it can be difficult to start fresh and attack the problem from a new direction. One way to avoid this is to use an unfamiliar problem space. Our swarm simulation system, the Emergent Behavior Simulation Tool (EBST), teaches the fundamentals of emergent systems [3] and swarm programming, and can also serve as an excellent unfamiliar problem space for learning general problem solving skills. Other online swarm visualization systems to consider can be found in [1, 8].

We have created an interactive, Flash-based system that allows users to experience the strange interdependencies of trying to alter the behavior of a crowd by telling individuals how to act. Many instances in life require giving instructions to individuals to bring about specific *individual* behavior – teachers, parents, personal trainers, supervisors, writers of instruction manuals – the list covers most everyone. We also have experience with interacting with groups of people. In most instances we alter the relationships within the group to allow for more organized interaction based on control and predictability. We build hierarchies of command, we define authoritative relationships, and we explicitly state the responsibilities of the individuals within our organizations. Examples here also abound: companies, sports teams, the military, the government, unions, and even multi-generational families. As the head of a household, a manager at the office or the mayor of a city, we individually interact with groups of others. Individuals in the group understand the limited resources of the leader and react accordingly. We expect to schedule meetings in advance when we want to talk with our boss, but adjust our own schedules when the boss summons us. In short, humans have a lot of experience with 1-to-1, 1-to-many, and many-to-1 relationships. We have much less understanding of many-to-many relationships. This is not from a lack of experience but because we lack the perspective to see them in their entirety. We all participate in numerous many-to-many interactions – crowds, the free market economy, traffic, public opinion, fashion trends, public transportation, culture, and colorful neighborhoods. In each of these situations we are all free to act, but our ability to exert influence on the group is significantly smaller than the group's influence exerted on us [5]. A single-person boycott is meaningless, so is individual hoarding, but if either idea takes off, the impact can be significant and wide-ranging. On the other hand, if we are at a peaceful demonstration that turns violent, we can be swept up in the ensuing chaos. Because we are immersed in the larger context and we cannot see the patterns. We simply react to local information and remain unaware of the bigger picture. In short, the purpose of our Emergent Behavior Simulation Tool is to provide the big picture. Users of EBST control the actions of individuals in a crowd, but, unlike real life, the user can "zoom out" and see the subtleties and patterns of dynamic many-to-many relationships.

In this paper our goal is not to provide the reader with a ground up EBST tutorial that will allow a novice to become a user of the system. Rather we hope to give the reader a sense of how the tool works and then show in three concrete examples (ants crossing a gap, hungry ants crossing a gap, and robots clearing a mined beach area) in which the system can be used to teach problem solving. In the next section we provide a high-level overview of the way that the system works, and outline the features that support problem solving. A walkthrough tutorial of the system exists as an online course at the Naval Post-graduate School [9], and the three scenarios can be experienced through the website: http://mathcs.jcu.edu/EBST/index.html.

Problem-Solving, Expression and Experimentation

In general, it has been our experience that students enjoy trial and error debugging and problem solving. Their interest is maintained and often students experiment with "what if" scenarios. With these ideas in mind, we produced EBST to encourage problem solving through discovery learning and trial and error in a fun context so that students would want to use it. The result is a game-like environment in which users can drag and drop commands, select options via radio buttons and check boxes, and run animated simulations that look like a video game and even score points, encouraging friendly competition. Students easily want to spend an hour or more on "playing" with the tool and they even try to improve upon already working solutions. This differs notably from typical classroom behavior, where marriages between theory and hands-on problem solving are often met with a lack of motivation. Even when this succeeds students generally are satisfied with the first working solution and there is little desire to improve upon it. By staying engaged with EBST students have come up with solutions that were not only different but sometimes also better than our own.

Intuitive Programming Approach

To make this tool accessible to a wide audience, we have stepped away from traditional, text-based programming languages and instead have designed a drag-and-drop interface with which users can develop "instructional flow" diagrams also known as finite state automata (FSA)[7]. For every possible state of the system, the programmer defines the outcome of every possible action. The combination provides a complete description of the system's behavior. For simple contexts, these diagrams are intuitive. Consider the controller for the security lights in a parking lot. It has a sensor to tell if it is dark or light out and it can perform two actions: turn the light on or turn it off. The FSA for this scenario is shown in figure 1. Note that the actions are associated with the states (circles) and the environmental status is associated with the directed edges between the states. Think of executing the program as having a marker that moves from state to state based on the environment. When the marker arrives at the circle, the associated action is performed and the marker stays there until it detects another change in the environment.

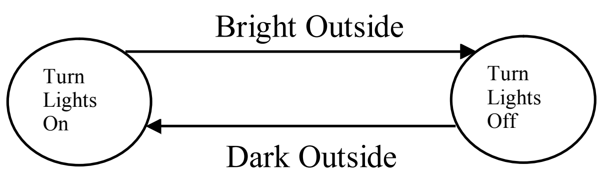

Figure 1 Simple FSA for controlling Security Lights

In figure 2 we introduce two additional FSA features providing greater expressability. The first introduces probabilistic transitions between states. Consider a thunderstorm after dark. When a flash of lightning brightens the sky for a second, the sensor "sees" that it is bright outside and the security lights turn off. Because they require a long refresh period, they do not immediately come back on with the return of darkness. To combat this problem, we introduce a probabilistic edge that we've split into two parts – one that goes back to the Turn-Lights-On state and one that goes to the Turn-Lights-Off state. Each path is labeled with a number, indicating the relative frequency with which the branch is taken. So in this example, for every 100 times the marker goes back to the Turn-Lights-On state, it will go to the Turn-Lights-Off state only once. Therefore, the probability of turning the lights off at any given sensor reading of "bright" is less than 1%. So the lightning problem goes away. Yet, in the morning, when the sun comes up, the sensor will read "bright" continuously and the control will swiftly switch to the Turn-Lights-Off state.

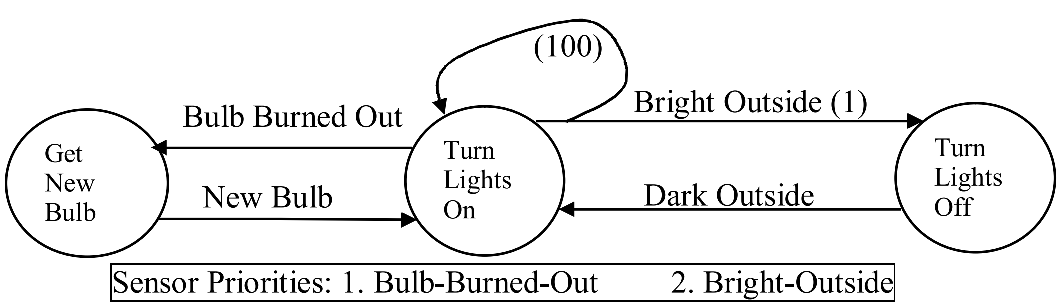

Figure 2 Enhanced Security Lights FSA using sensor priorities and probabilistic state transitions.

The second new feature allows users to set priorities on sensors clearing up any ambiguity if multiple sensors trigger simultaneously. In figure 2, we have also added a third state (Get-New-Bulb) and edges to and from the Turn-Lights-On state. So, at any point when the lights have been turned on, if the bulb is not producing light, the marker will shift to the Get-New-Bulb state in which a maintenance person will fix the problem. When the new bulb is installed, the marker will go back to the Turn-Lights-On state. Although unlikely, it is possible that both the Bright-Outside sensor and the Bulb-Burned-Out sensor could trigger at the same time. Without additional information, either outcome would be valid. However, in one case the broken bulb remains unfixed until night, while in the other case the problem is fixed right away. By assigning a higher priority to the Bulb-Burned-Out sensor over the Bright-Outside sensor, we ensure the second outcome will occur.

Experiment-Feedback-Modify Problem-solving Cycle

When first opening the EBST website, the user can access the model, the set up, and the simulation pages to build a swarm simulation. The user progresses through EBST in this order to address a challenge. Once the problem is well understood, the user designs an FSA using the actions (states) and sensors (edges) on the Model page. The user drags and drops these features onto the programming canvas; then arranges them to express the behavior of an agent (ant or robot). By using radio buttons, check boxes and slider bars on the Set Up page, the user specifies the priorities of the different sensors and defines additional characteristics of the simulation such as the size of the swarm. Finally, with an expectation of the swarm's resulting behavior, the user goes to the Simulation page and watches a real time animation of how the interactions of all agents play out.

One of EBST's strengths is the immediate and dynamic visual feedback. This benefits problem solving in general and facilitates understanding the many-to-many relationships fundamental to swarms. Humans can quickly process large amounts of information visually and can look for causal connections between what they programmed into the agents and the behaviors they see in the simulation. Speculating on the differences between expected and actual behaviors helps the user think about how to improve the program. He or she then flips back to the Model page, changes the FSA and starts another iteration of the development. This swift cycle of expression, feedback and modification encourages students to experiment with many approaches and fosters long term engagement with the system.

Three Problem-Solving Challenges

For the rest of the paper we will present three specific problem-solving challenges from EBST – each from one of the three scenarios [6] – discuss the issues involved, highlight the problem-solving characteristics and then present and discuss a solution.

Challenge #1 Ants Building Bridges

Squatting on a dirt path in the woods, you watch a swarm of ants, completely entranced by their purposeful march. They move swiftly along a rock wall spreading across the stones like a living carpet. As you watch, they approach a flat rock with a two-inch gap to the next rock. You watch as they reach the edge but they are not stymied. The first ants reach out into the gap, antennae in constant motion looking for something to grab onto. Ants immediately behind them do not hesitate and climb onto their brethren to reach out even further. It is as if pseudopods of the living carpet are stretching out to traverse the gap. The swarm's progress has definitely slowed, but once the first ant, grasps the other side, the flood of forward motion resumes in earnest.

The first scenario in EBST and the first challenge of this paper embodied this scene. When we present EBST to students, this first scenario is initially all about learning the system – there are only 4 states and 3 sensors. As students get comfortable, it becomes all about problem solving. The ants in this scenario all start on the right side of the simulation area, with an inch-wide, gap preventing them from getting to the left side. The actions (or states) available to the ants are: "move randomly", "extend into the gap", "climb on top of an ant extending into the gap", and "climb off an ant that you climbed onto". The three sensors answer the questions: "I am at the edge?", "Have I found an ant extending into the gap?", and "Did the timer I set elapse?" Using these actions and these sensors, plus a swarm of ants ranging in size up to 200, we challenged students to write a program (build an FSA) to build a bridge of ants to cross the gap. Figure 5 shows a typical first attempt – ants wander around until they find either the edge or an ant extending. If an ant finds the edge, it extends into the gap and if it finds an ant extending into the gap, it climbs on.

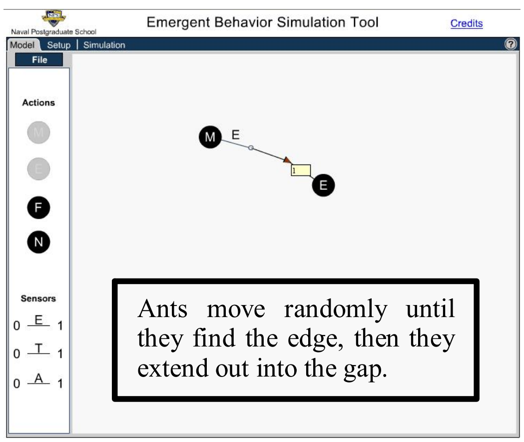

Figure 5 First Attempt at a FSA

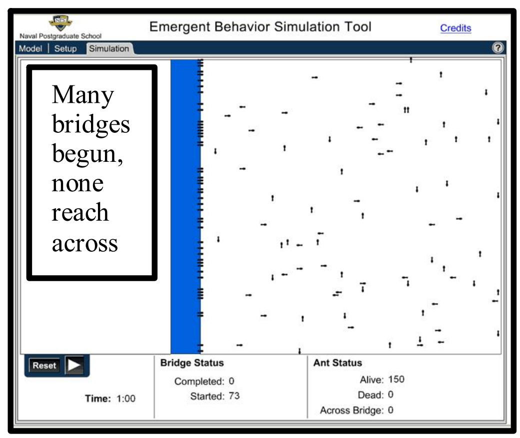

Figure 6 Simulation snapshot for FSA in figure 5

To make this scenario work, the student must prioritize "finding the edge" and "finding an extending ant". In the animated simulation, students will watch their swarms dutifully perform the exact instructions given and even a swarm of size 200 will not have enough members to complete any of the bridges begun. (see figure 6). Now the real fun begins. The students have seen how to make things happen, they have complete control over the individual ants, but to actually solve the problem, they need to be more creative. The simply stated challenge can now be recognized as a resource management problem in which the ants themselves are the resource. There are two approaches to improving better manage the swarm's resources: 1, abandon some bridges that get started, and 2, start fewer bridges.

The presence of the "Climb Off" action and the "Timer" sensor suggest the first approach. The second approach seems attractive, but maybe not as immediately attainable. (This depends on how well the students understood including probabilistic transitions between the states.) In any case, students generally opt for one approach or the other and plug away.

The interaction, immediate feedback, and simplicity of the challenge all combine to keep the students engaged and focused. Those students who chose the first approach, to abandon some bridges, will make some new discoveries as they progress. First, if an ant that is supporting another ant decides to abandon the bridge, the supported ant is out of luck and unceremoniously dropped into the gap. Without a sensor to determine if an ant is supporting another ant, this detrimental behavior cannot be avoided. Additionally, without any way to measure the success of the bridge (ants cannot tell if they are part of a long or a short bridge) the abandonment approaches indiscriminately undermines all bridges. Because there are more ants in a successful bridge, the probability that some ant will decide to abandon it is higher than shorter bridges. The bottom-line is that this approach will not work and must be abandoned itself.

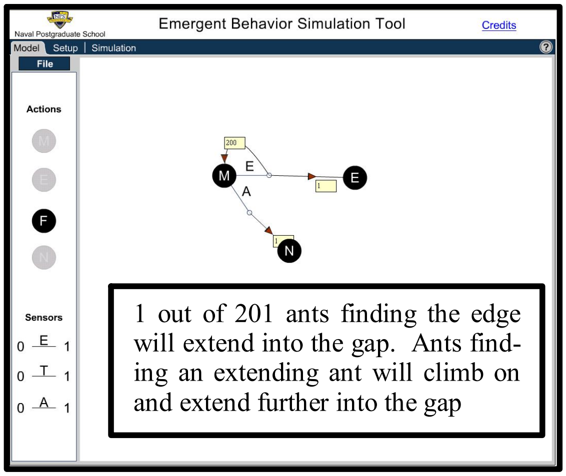

Figure7 This FSA is one possible solution for the ants to successfully cross the gap

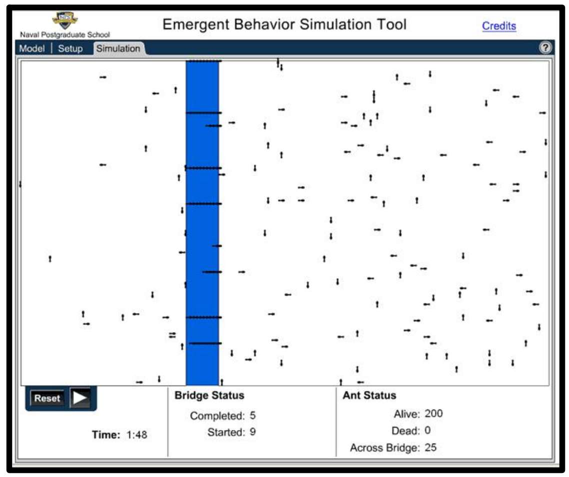

Figure 8 Simulation snapshot for FSA in figure 5

On the other hand, students who took the approach of building fewer bridges will find a steady series of improvements as they further reduce the number of bridges started. By lowering the probability of extending when an ant finds the edge, the number of bridges started decreases. By giving the discovery of an extending ant a higher priority than finding the edge, the ants are "funneled" onto existing bridges rather than starting new ones. Under these circumstances, even swarms with only 50 or so ants can reach the other side. A snapshot of a good solution with its corresponding FSA can be seen in figures 7 and 8. Once the bridge building challenge is met, the students can then work on bringing the largest number of ants across the gap in the shortest amount of time. While this can be rewarding, the basic insight of starting fewer bridges does not change and soon students will be ready for a more complex challenge.

Challenge #2 Building a Food Sensor From Primitives

The next day, an ice cream cone in hand, you go back to the rock wall and as luck would have it, another swarm of ants is approaching the gap. Once again fascinated, you ignore your treat as sweet drops of melted ice cream splatter across the ants' path. This time, as they start to build the bridge, you notice some ants disengaging from the task and consuming your drips. You notice the ants shifting in behavior between bridge building and eating, as if attempting to balance two important goals. They are not spanning the gap as fast as they were yesterday because they don't seem as frantic to reach their destination. Clearly the advantage the food provides is worth slowing down for.

In the second EBST ant scenario - less realistic, but more compelling from a problem solving perspective - the ants still build bridges to get across the gap, but now they must also make sure that they eat to maintain their energy. We exaggerate their energy requirements to bring the two separate goals to the same level of importance, so the ants get hungry faster and can die of starvation on the same time scale as crossing the gap. In addition to the more complex goal, the ants in this scenario have more actions and more sensors to work with. Their new actions include: "move in a straight line", "move towards near-by food", "call out to other ants", and "follow the call of another ant". The ants have all the actions from the previous scenario except "climb off" which proved unnecessary. New sensors answer the questions: "Am I hungry", and "Can I hear another ant calling?". However, they do not have sensors to answer the questions "Am I currently at food?" or "Am I currently near food?". The new action – "move towards near-by food" – can cause them to home in on the food when they are in close proximity, but if there is no food around, that action defaults to random movement. There is no way for the ants to directly tell if they are at or near food. This "missing" sensor forms the basis for the next challenge. Since the range of their ability to home in on food is smaller than the range of their ability to call to other ants, it would be helpful to have ants send a message when they have found a food source to call others to the table, so to speak. It would be easy to provide such a sensor in our Flash implementation, but instead we present a challenge to build one out of the available actions and sensors.

So the next challenge presented to the students is to temporarily ignore the bridge building and write a program to prevent as many ants from dying of starvation as possible. The perfect solution would lose no ants to hunger. A very simply solution is to immediately have all the ants in the scenario simply perform the "go towards near-by food" action and hope for the best. This works fine for scenarios with large amounts of food and smaller swarms. But what about the reverse case – when food is scarce and there are lots of ants in the swarm? If there were a "food sensor" then a good solution would be to have ants that find food call to others, acting as a food beacon. So, one plan of attack is to build such a "food sensor" enabling this approach. Through discovery learning, students will eventually realize that they must detect proximity to food indirectly through examining an ant's own hunger status. If an ant is hungry at time t, and they are no longer hungry at time $t + k$, then they must have encountered food during the interim. By making k as small as possible, the ant's location becomes as close to the actual location of the food as possible. Once this trigger occurs, the ant can call out, bringing other ants (hungry or not) to the food location so that they can eat, or eat as soon as they get hungry. Great plan, but how do you implement it in the finite state automata?

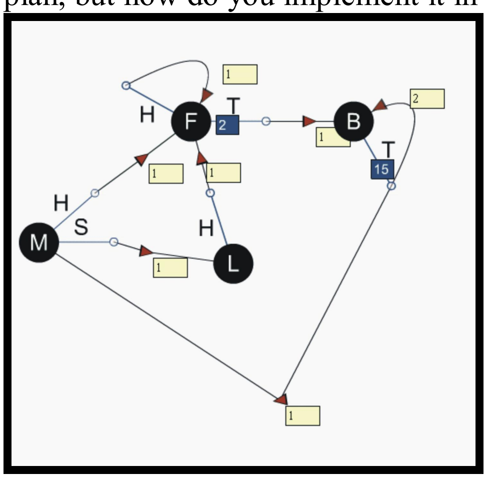

Figure 9 This FSA provides a solution to programming the swarm to reach the nest.

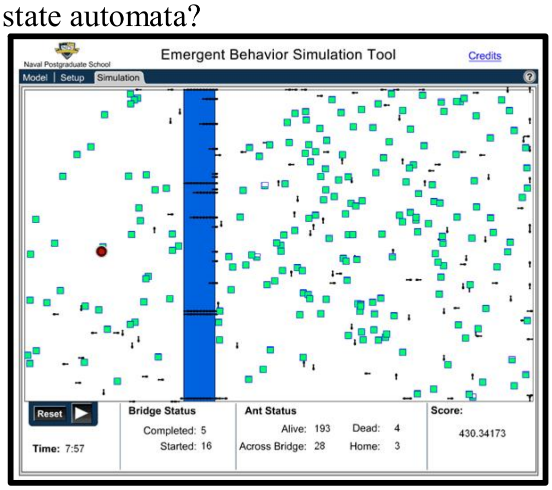

Figure 10 Simulation snapshot for the FSA in figure 9

Students must have two key insights to make this indirect sensor. First, they want only hungry ants looking for food. If an ant that is not hungry looks for food, then it cannot use its own hunger status to determine the food's location. Second, to capture the exact moment when the ant transitions from hungry to no longer hungry, the student must carefully prioritize a timer and the hunger sensor. The realization that a timer is reset upon entry to a state is the last piece of the puzzle to make the indirect food sensor. Figures 9 and 10 show the configuration of instructions to make this work and a snapshot of the simulation. The states in figure 9 are: M – move randomly; B – broadcast a call; F – find food; and L – follow a call. The sensors (transitions) in figure 9 are: H – hunger; S – sound of a call; and T – timer has elapsed.

Challenge #3 Recruiting Other Members of the Swarm

Imagine you are heading a rescue operation to free hostages being held by a terrorist cell. If you can get your people through the mined surf and beach areas the chances of success are determined to be favorable. The good news is you can deploy a swarm of autonomous robots to sweep the area for mines. It may be assumed that there are many more mines than robots and there are time and robot energy constraints for the mission. The main goal is to program the robot swarm to sweep the beach area to create a relatively safe route for the rescue party to get from the sea to where the hostages are located.

Currently work is being done at the Naval Post Graduate School and at Case Western Reserve University to determine appropriate sensors and capabilities for autonomous robots to perform surf zone minesweeping [2]. Our goal for EBST is to use this idea as a contextual background for more complex swarm programming challenges.

This challenge has 17 states and 10 sensors. FSAs created for this scenario reach the point where their ease of use is counterbalanced by their lack of formal structure. But the range of possibilities and the potential for many approaches for solving the same problem offers important insights into swarm programming not reached in the two ant scenarios. Introducing all the minesweeping components and their interactions are beyond the scope of this paper, interested readers should go to the minesweeping scenario website at http://mathcs.jcu.edu/EBST/index.html. The remainder of this paper will focus on a small subset of the capabilities; yet still provide insights into the depth of the scenario's complexity.

Communication is a key concept for understanding and programming swarm behavior. As in the second ant scenario, the robots can broadcast to each other, but they have an additional channel and they can now move towards or away from the sender. As in the ant scenario, the messages do not have any inherent meaning, but take on whatever intent the user specifies. The final challenge described in this paper is to congregate the swarm to the extent possible. The ideal solution is that all the robots in the swarm will situate themselves in a small, contiguous grouping. However, since probabilistic transitions are the only way for robots to differentiate their behavior, it is not possible to guarantee that only a single robot will initiate the gathering. It is unavoidable that a few separate groupings can start.

The range of a simple broadcast is not sufficient to affect the entire swarm, so application of problem-solving cleverness is needed to build a longer range message. One approach to this would be to set up a two-layer broadcast cascade. A probabilistically selected robot will start broadcasting on frequency 1. When other robots receive the message they start broadcasting on frequency 2. If enough robots do this, the radius of the broadcast zone is effectively doubled and the area covered is four times larger. (see figure 11) This still only impacts a portion of the swarm. In order to reach most of the robots, the user must program a careful balancing act in which robots receiving the message on frequency 2 also broadcast on frequency 2 for a short while. The result is a general trend of robots moving towards the original broadcasting robot. Figure 12 shows one FSA for this approach and figure 13 shows the robots, initially dispersed throughout the rightmost region, clumping together as the broadcast propagates.

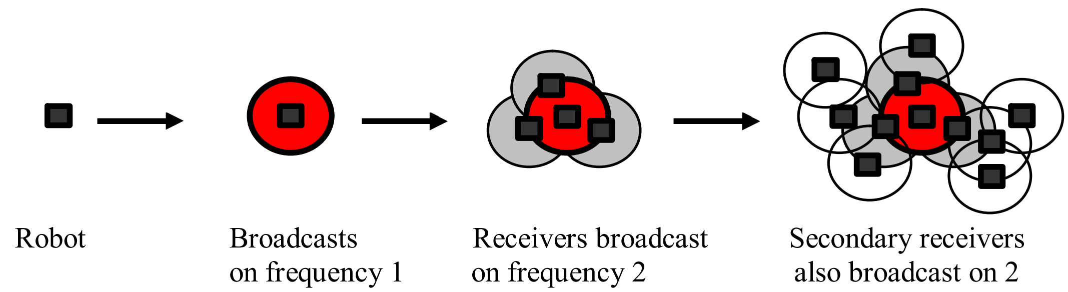

Figure11 Strategy for the cascading broadcast to summon robots from a large area

Other challenges include:

1. Determining the ratio of robots with mine sensors. If all robots have mine sensors then for a fixed budget there will be fewer robots in the swarm. On the other hand, if no robots have mine sensors then there isn't much to be done but run into a mine and blow it up. If there are many more mines than robots the latter approach will not be successful.
2. For robots with mine sensors how often should marked mines be deactivated? There is an energy cost for deactivation so maybe it is better to mark many instead of marking and deactivating a few.
3. Deployment options – Choose which area of the beach to deploy the swarm.
4. How can robots call other robots to a specific location? A robot can broadcast on a particular frequency but it has a limited distance. We would like to have cascading broadcasts to help extend the range of a broadcast.
5. How to handle robots close to energy death?
6. When is trail leaving a good technique? What percentage of robots should have this capability?
7. Investigate the tradeoffs between cost and capabilities of a swarm. Also, what effect do time constraints have on swarm performance?

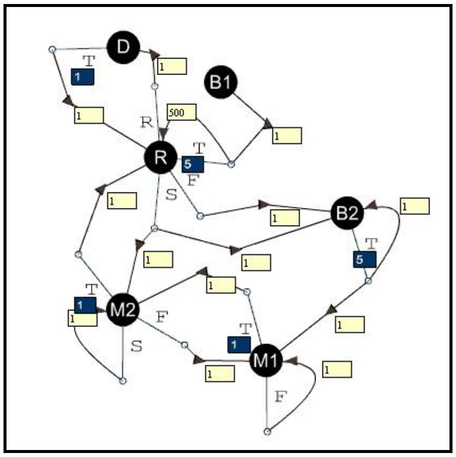

Figure12 FSA for cascading broadcasts

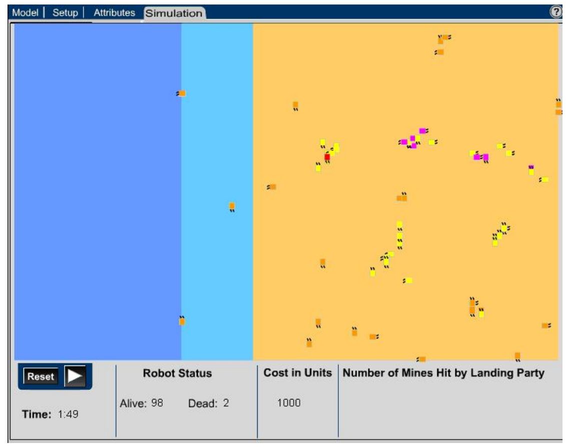

Figure 13 Simulation for FSA in fig. 12

Conclusion

A wide variety of audiences have experienced the Emergent Behavior Simulation Tool. It was originally developed as an online course at the Naval Post-graduate School, both liberal arts and computer science majors at John Carroll University have used it, and it serves as a focal point for a workshop at the Naval War College in Rhode Island. In all venues the system has proven to be very engaging. Students have learned the basics quickly and the nature of the challenges has kept interest levels up while students learn the more advanced features of the system. In several instances, students remained engaged after the classroom experience, and in one case turned their interest into a summer-long research project. Even though the total number response surveys has been small, the feedback from the Naval War College workshop indicates that the interactive features of the system lead to a better understanding of emergent behavior than a traditional lecture presentation of the material. One of our primary goals when developing the system was to make it accessible to non-programmers. Unlike many existing swarm simulation tools, (RePast, Swarm, etc. [4]) EBST does not require even a basic knowledge of computer science or programming to use. This point was highlighted in feedback surveys indicating that respondents "Strongly agreed" with the statement that "EBST is easy to understand, use, and the results were clear." Our next step is to expose younger groups of students to the tool and systematically evaluate its effectiveness as a problem-solving tool.

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Using the Media Computation Approach to Teach a Web-Based Java Programming Course

Robert Logan
Assistant Professor
College of Technology
Kent State University, Salem Campus
2491 State Route 45 South
Salem, Ohio 44460
330-337-4265
rlogan@kent.edu

Abstract

Nationally, student success rates in introductory programming courses have been declining. At Kent State University, introductory programming courses offered in the Associate of Applied Business (AAB) in Computer Technology (CT) program have student success rates ranging from 68.0% to 75.6% which may be contributing to the declining enrollment in programming courses. In an effort to improve student success in introductory programming courses, the *media computation approach* developed at Georgia Tech was introduced for a asynchronous web-based introductory Java programming course.

Introduction

In recent years enrollment in programming courses has been declining partly because of lower retention rates (Guzdial, 2002), and partly due to a perception that the job market is shrinking (Litecky, et. al., 2008). Institutions of higher education have undertaken various projects to improve retention rates, and hopefully also attract some additional students. These programs typically involve ways to increase student engagement. One example of this approach comes from the Ohio University College of Business where the introductory Visual Basic course was changed to focus on ASP.NET web development rather than traditional Windows Forms development (Brown, 2007), a change that resulted in a 135% increase in enrollment for the course. Brown concludes that students have a familiarity with web-based information and applications due to the pervasiveness of the Internet during their formative years, and that this familiarity translates into an increased interest and level of engagement, eventually resulting in the increased enrollment observed.

Increased enrollment is not the only benefit that can be derived from an increase in student engagement. Current learning theory suggests that a high degree of student engagement is required to support the reflective and cognitive processes necessary for deep learning which enables students to reuse knowledge learned in new situations. Therefore, changes in teaching approach that lead to greater student engagement will help facilitate deeper learning and also lead to greater student success rates (grade of C or better), another important factor in student retention.

Another example of an effort aimed at improving retention can be found at Georgia Tech where researchers hypothesized that students from the “MTV generation”, who have grown up in an environment filled with a cacophony of multi-media stimulus, may be interested in creating similar media when learning to program (Guzdial and Soloway, 2002). Guzdial (2003) later developed the "media computation approach" to teaching introductory programming courses using multimedia manipulation as a context for teaching programming principals and language syntax, which proved successful in significantly increasing the student success rate at Georgia Tech. Table 1 below illustrates the improvement achieved at Georgia Tech using the media computation approach (Tew, et. al., 2005). Similar results were later achieved when the media computation approach was implemented at Gainesville College (a two-year institution).

Table 1 Impact of Media Computation Approach on Student Success Rates

	Enrollment	Success Rate
Georgia Tech's CS1		
Average 2000 – 2002	930	71.2%
Media Computation		
Spring 2003	120	90.0%
Fall 2003	303	86.5%
Spring 2004	395	89.9%

Introductory Programming Courses at Kent State University

Three introductory programming courses are taught within the AAB in CT program at Kent State University: Visual Basic, C++, and Java. The Visual Basic course is a required course for all students in the program, while C++ and Java are elective courses typically taken only by students with a concentration in Application Development. As one would expect given this curriculum, there is significantly more data for the Visual Basic course than for the others. Table 2 summarizes the aggregate student success rates for these three courses for the period from spring 2004 through fall 2007.

Table 2 Student Success Rates 2004 - 2007

	Visual Basic	C++	Java
Enrollment	538	118	150
Student Success Rate	75.6%	72.0%	68.0%

Due to declining enrollments in the Application Development concentration within the AAB in CT degree, it has become necessary to offer the Java class via the Web in order to have sufficient enrollment. Web-based instruction, at least in the case of the Java class, results in a lower student success rate than traditional classroom delivery. The student success rates for Java classes with web-based vs. classroom delivery from 2004 through 2007 are shown in Table 3.

Table 3 Web-based vs. Classroom Student Success

	Enrollment	Success Rate
Web-based delivery	55	63.6%
Classroom delivery	95	70.5%

Student Demographics and Attitudes

A survey was conducted during the first two weeks of the semester to obtain information on student demographics, preparedness, and attitudes regarding programming. Selected items from this survey are summarized in Table 4.

Table 4 Summary of Initial Student Survey Responses (N=9)

Survey Item	Answer
Gender	88.9% Male
Major	66.7% Technology
Have you programmed a computer before?	77.8% Yes
Rate your experience with image manipulation tools such as Photoshop.	22.2% None 22.2% Beginner 55.6% Intermediate
Rate your experience with sound manipulation tools such as Sound Forge.	66.7% None 33.3% Beginner
I am confident in my problem solving ability.	22.2% Strongly agree 66.7% Agree 10.1% Neutral
I am looking forward to this class.	44.4% Strongly agree 55.6% Agree

The initial survey data shows a significant majority of respondents have had previous programming experience, and that more than half of respondents rate themselves at the intermediate level of experience with image manipulation. These statistics suggest that students are well prepared to begin their studies of Java using the media computation approach.

Students were administered a second survey at mid-term to gather data on student learning behaviors and attitudes toward the course. With respect to difficulty, Table 5 indicates that student responses were skewed toward the difficult end of the continuum, but with no responses at the extremes. Despite the tendency to view the course as somewhat difficult, the majority of students were neutral with respect to their enjoyment of the class with no students ranking the course at the extremes of the continuum.

Table 5 Course Difficulty vs. Student Enjoyment (N=5)

	Easiest				Hardest
	1	2	3	4	5
How hard is this class turning out to be?	0%	20%	40%	40%	

	Hate It				Love It
	1	2	3	4	5
How much are you enjoying this class?		20%	60%	20%	

All respondents to the mid-term survey indicated that they felt they were learning to program. This is important to note because it represents the students self-perception of their success in the class. The survey responses also indicate that very few students use the programs they create for the course for their own benefit outside the course; nor do many do more than the minimum required work. This is troubling because highly engaged students typically will look for opportunities to apply their new knowledge in new and different situations.

Table 6 Student Behavior and Perception of Learning (N=5)

	Yes	No
Are you learning to program?	100%	0%
Do you ever use the programs from this class or write other programs for your own problems or data?	20%	80%
Do you ever write pieces of code outside of what's required for homework?	40%	60%

Results

At the time of this writing, final grades were not yet available for this initial trial of the media computation approach at Kent State University; however, mid-term grades may provide some indication as to whether student success rates will vary significantly from past measures. At mid-term a total of four students had withdrawn from the class, while another three had earned a grade of F. There were also eight students with A's, none with B's, and two with C's resulting in a success rate of 58.8%. In a class with a starting enrollment of 17, each student represents 5.9% of the class so it is unlikely that the mid-term success rate of 58.8% is statistically different from the 63.6% success rate experienced in previous web-based Java classes.

Summary

While the results obtained from this initial study do not duplicate the significant improvements in student success observed at Georgia Tech and Gainesville College, there are no indications that student success has been impacted negatively. Therefore, it is planned to continue using the media computation approach. A thorough review of the end of term data will be conducted, including the results of student evaluations. Once the end of term review has been completed, the learning modules and assessments used for this class will be reviewed and appropriate changes made to improve the quality of the instruction and assessment of students.

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The Impact of Personal Response Systems on Student Learning in Undergraduate Business Courses

Jennifer Paige Nightingale
Instructor of Information Systems Management
A.J. Palumbo School of Business Administration
John F. Donahue Graduate School of Business
Duquesne University
Pittsburgh, PA 15282
Tel: 412-396-6257
Fax: 412-396-4764
nightingale@duq.edu

Abstract

This study investigated the growing body of research of how a personal response system (PRS) may make a positive impact on student learning outcomes. Results of the study provide insight into participants' use of PRSs within the classroom instruction. Although there are numerous stated benefits for both students and instructors, this study focused on student benefits. Consequently, an experiment was conducted with undergraduate business students using PRSs in varying business courses at Duquesne University. Comparisons were made between traditional and modified stand-up lectures that not only focused on, but also encouraged active student learning via the use of PRS facilitated question and answer feedback methods. The main objective of this study was to determine whether integrating PRSs into traditional lectures enhanced student achievement. Data were evaluated via descriptive and summary analyses. Results of the data analysis revealed that the implementation of a PRS did not result in statistically significant positive difference in student achievement when compared to students receiving the more traditional written and verbal response contingent feedback methods. The conclusions drawn from the results of this study show that PRSs may be a promising, developing technology for improving student achievement. However, continued research regarding the use of PRSs in undergraduate business classes is needed.

There has been some discussion in recent years suggesting that the way in which students learn has changed, and that sitting in a passive mode in large lecture halls is not the expectation (d'Inverno, Davis & White, 2003). Prensky (2001) explains that because of technology, today's students are different than those who the educational system was initially designed for because students "think and process information fundamentally differently from their predecessors" having grown up around computers, video games, and the Internet. Referred to as Net Generation (Net Geners) and Millennials, they represent the first generations to be completely surrounded by technology where email, instant messaging, and cell phones are integral parts of their lives.

The Net Geners and Millennials, who are now entering colleges and universities, have learning expectations, styles, and needs different from past students (Murphy & Smark, 2006; Skiba & Barton, 2006). Tapscott (1998) describes the Net Geners as assertive, self-reliant, and curious, who are entangled in an interactive culture that centers around ten central themes. These themes are indicative of how Net Geners have the ability to flourish in an environment filled with technology and experiential activities, which include fierce independence, emotional and intellectual openness, inclusion, free expression and strong views, innovation, preoccupation with maturity, investigations, immediacy, sensitivity to corporate interest, and authentication and trust. Given these characteristics, it is apparent that the Net Geners and Millennials demand "a new learning paradigm" (Skiba & Barton, 2006).

There is a great deal of research into how students learn at the postsecondary level and it is apparent that technology has altered the undergraduate learning environment. Information technology (IT) can allow teaching and learning to be transformed, even when students do not interact with each other face-to-face. Some students who are silent and passive in face-to-face settings "find their voice" and become active participants in technology-mediated communication. Prior to integrating technology into the classroom, a key question in evaluating the impact of IT in education must be asked if technology-intensive approaches provide any advantage in student learning when compared with more traditional approaches (Hilton, 2002).

With all of the technical resources available today, instructors are able to do things that are not possible in a traditional classroom setting. "At the same time, technology does not replace the need for instructors, nor does it necessarily reduce interaction and communication with and between students" (Bates & Poole, 2003). Because there are infinite improvements in instructional technology, the process of engaging students in interactive feedback can be improved and personal response system (PRS) technology can enhance this technique. A PRS is an emerging technology, which allows students to take an active role in the learning process, making them more accountable for learning outcomes (Stein, Challman & Brueckner, 2006), and enhances the traditional lecture-based learning environment. PRS technology has been used with positive results in primary, secondary, post-secondary, and post-graduate institutions (Beatty, 2004; Beekes, 2006; Brewer, 2004; Conoley, 2005; d'Inverno et al., 2003; Paschal, 2002; Presby & Zakheim, 2006; Stein et al., 2006; Trapskin, Smith, Armitstead & Davis, 2005) by gauging classroom comprehension, assisting in recording attendance, and awarding classroom participation scores so professors can encourage students to participate in discussions.

College students need to be actively involved in their own learning (Angelo & Cross, 1993). Students, who are more engaged, will learn more, enjoy more, and possibly earn higher grades because they have a better understanding of the subject (Howorth, 2001) and an engaged student is more likely to be intrinsically motivated and feel like they are a part of the learning process (Bates & Poole, 2003). Newmann (1992) defines engagement as a student's "psychological investment" in learning. Ultimately, "engagement with material increases the chances that a student's learning of that material will continue after the course is technically over" (Bates & Poole, 2003).

A vast amount of perceived benefits are associated with the integration of PRSs in the classroom. It is commendable if an instructor, whose role is to help students learn, can motivate and engage students. Unfortunately, this may not be a simple task as the majority of college faculty still teach their classes in a traditional lecture mode. An alternative and/or supplement to the traditional lecture is to incorporate a formative assessment tool, such as PRSs, to create an environment that encourages active learning (Presby & Zakheim, 2006).

The following research question formed the basis of this study: Do students who receive feedback through a personal response system have statistically significant higher scores on final exams than those who receive feedback through non-technology based methods? This was conducted by evaluating cumulative final exam scores within each participating course. Students' scores were collected from faculty teaching in the courses: Information Systems Management, Introduction to Marketing, and Quantitative Science.

This study presupposed that participating students will be amenable to using an innovative classroom technology. Without the subjects' cooperation, the experimental data could not be collected. Furthermore, the study also assumed successful technical functionality of the radio frequency (RF) receiver, ResponseCard® keypads, and software. If the technology did not function properly or failed completely, reliable comparisons could not be concluded between technology-based feedback methods and non-technology feedback methods.

Participants for this study were undergraduate students – freshman, sophomore, and junior level – who were enrolled in the School of Business at Duquesne University, located in Pittsburgh, Pennsylvania, during the fall term of 2007. Two student groups were selected by randomly assigning classes to two different pedagogies; classes that integrated PRSs (the treatment group) and those that did not (the control group). Full-time business faculty members, representing either analytical or behavioral courses, acted as facilitators and data gatherers for the study. The research was conducted within a single term by including participants from the business program at Duquesne University. Class size was dependent upon enrollment for the term, and was not a factor for the study. Class sizes ranged from a low of 34 to a high of 37.

Students' technical skills were at an equal baseline. Prior to registering for business courses, students are required to take Research and Information Skills, facilitated through Duquesne University's Gumberg Library and part of the university's undergraduate core curriculum. This course offers an introduction to fundamental computer skills needed for using the Windows operating system, word processing, spreadsheet, presentation, and email software. In addition, students learn skills associated with information literacy—the ability to locate, evaluate, and use information for independent learning. The course's main objective focuses on basic skills needed by every student regardless of major, and examines selected ethical issues surrounding computing.

In following up on current antidotal evidence on the positive learning aspects of using the PRS, the primary aim of this study was to quantitatively access the affects of student achievement and two-sample t-tests were used for two analyses to assess whether an increase in student achievement has occurred. First, a two-sample t-test was used to determine if students in the treatment group have statistically significant higher scores on comprehensive final exams than those in the control group. Final exam percentage scores were provided by participating faculty at the conclusion of the study and the researcher used mean scores to determine this analysis.

The total number of participants whose data were used was 196. Of this number, 119 were male and 77 were female. Participants ranged in age from 19 to 25. A total of seven classes participated in the study, two in marketing, three in quantitative science, and two in information systems management. Of the seven classes, 196 students consented to participate in the study. Two students did not participate in the final inventory because of absence from class. Seven participants' grade point average were not available and five participants failed to indicate their racial background. Table 1 contains data on the participant demographics, including summary statistics (means, standard deviations, and proportions) for participants' GPA inventories, age, and race within the control and treatment group. The data indicate that there was a statistically significant difference between the control and treatment groups with respect to gender ($p < .05$) and no significant difference between the control and treatment groups with respect to the demographic variables observed including GPA, age, and race.

Table 1

Descriptive Statistics of Participant Demographics Including Gender, Grade Point Average, Age, and Race

			Control n=82	Treatment n=114	Total n=196
Gender*	Male	N	56	63	119
		%	68.29%	55.26%	60.71%
GPA	Mean ± SD		3.25 ± .45	3.18 ± .50	3.21 ± .48
Age	Mean ± SD		20.05 ± 1.04	19.92 ± .82	19.97 ± .92
Race	Caucasian	%	97.60%	90.40%	91.33%
	Other	%	7.32%	9.65%	8.67%
	International	%	2.40%	9.60%	8.10%

Notes. Gender % = Percent of total number of participants who are male; *p*-value = 0.032
GPA = Grade point average on a 4.0 scale; *p*-value = 0.854
Age = Years old; *p*-value = 0.821
Race % = Percent of total number of participants who are Caucasian; *p*-value between gender and race = .071
Other = Percent of total number of participants who are not Caucasian; this category includes those students who chose not to respond to this question
International = Percent of total number of participants who are international or foreign national students; this category includes Caucasian international students
*statistically significant at = .05

Table 2 shows summary statistics and includes mean, minimum, maximum, and standard deviations for the final exam scores by group types for final exam scores. This data were used to determine if students in the treatment group have statistically significant higher scores on comprehensive final exams than those in the control group. The results suggest that there was not a statistically significant increase in the mean final exam scores for all students who received instruction via PRS.

Table 2

Summarized Mean Final Exam Scores by Group Type

Group Type	N	Min.	Max.	Mean	SD
Control	81	43	100	79.36	11.80
Treatment	113	26	100	75.76	13.00

Notes. Estimate for difference = 3.60
95% upper bound for difference = 6.56
T-test of difference = 0 (vs. <), t-value = 2.01, p-value = 0.977, df = 181

Based upon the findings of this research we accept the null hypothesis. Results of the data analysis revealed that the implementation of a PRS in a post-secondary classroom environment did not result in statistically significant positive difference in student achievement when compared to students receiving the more traditional written and verbal response contingent feedback methods.

These results support the conclusion that students remained about the same in regard to student achievement when using a PRS as a primary feedback method. This conclusion was reached based on the findings that students' final exam scores were not significantly higher on final exams when a PRS was integrated into the classroom.

The recommendations of this study were to continue researching and testing the use of PRSs in undergraduate business classes. Replications and further study of this technology should continue to investigate whether using a PRS improves student achievement and that the technology has a positive impact on the classroom environment. Because each professor in this study integrated this technology to their own liking, perhaps more structured implementation needs to be established to ensure that all participants are acquiring the same experience (e.g., similar type, level, and quantity of questions) regardless of which course they attend. Furthermore, including other students and classes from surrounding universities may aid in providing a broader range of academic ability and present an improved perspective of PRSs as a method of formative assessment.

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Green and Sustainable Information Technology: A Foundation for Students

Thomas A. Pollack
Duquesne University
600 Forbes Avenue
Pittsburgh, PA 15282
412.396.1639
pollack@duq.edu

Abstract

Seldom does a day pass in which we don't hear or read about sustainability or "going green." Environmental concerns are constantly in news headlines, and the impact of technology on our environment is significant. Large technology organizations such as Dell, HP, ISM, Sun, Hitachi, and Fujitsu have introduced green and sustainable initiatives. "Green" is generally understood to mean "Friendly to the environment and energy efficient." Sustainable implies planning and investing in a technology infrastructure that serves the needs of today as well as the needs of tomorrow while conserving resources and saving money. Organizations are quite concerned with environmental issues, but they have also come to realize that sustainable business practices can significantly enhance the bottom line. This paper will discuss the features of green and sustainable information technology practices, and suggest a basic knowledge foundation that will serve our future technology professionals.

Introduction

In a recent Info World article, author Ted Samson drew a distinction between "green" versus "sustainable" technology (2007). Frequently we hear the terms being used interchangeably, but technically there should be a distinction. "Green" generally means "environmentally friendly" and energy efficient. On the other hand "sustainable reflects planning and investing in a technology infrastructure that will serve today's and tomorrow's needs while helping to save money on wasted resources such as energy and paper." Thus the use of green technology helps to ensure sustainability (Samson) and thus the interrelationship between the two terms.

GreenerComputing.com (2008) reports that a recent industry survey indicated that at least 65 percent of IT Managers are employing energy efficiency measures in some form to reduce costs and environmental impact. Among the leading practices being employed are the following:

- Use of blanking panels to minimize recirculation of hot air (65%);
- Sealing the floor to prevent cooling losses (56%);
- Identification of hotspots and optimization of airflow within the facility (25%).

The survey compiled by GreenerComputing (2008) also reports the following obstacles:

- Lack of top management encouragement (40%)
- Unawareness of cost/benefit relationship of energy efficiency (36%)

- Fear of risking reliability (35%)
- Lack of communications between IT and facilities departments (33%).

One problem with the greening of IT is that it forces organizations to buy more. Plans usually call for things like more energy efficient servers, intelligent sensors for data center cooling, server virtualization software, low power monitors and devices that turn off dormant computers (Baines, 2007). This implies significant capital outlays before any gains are realized. Of course, organizations are then forced to evaluate the bottom line impact and payback period for such investments, independent of vendor and consultant claims (Baines). Dave Douglas of Sun Microsystems contends that power consumption of data centers doubled between 2000 and 2005, and energy costs consume 25% of an IT budget. He opines, therefore, that what is good for the environment is also good for business. The EPA estimated that servers and data centers across the nation consumed more than 61 billion kilowatt hours of electricity in 2006 at a cost of about $4.5 billion. This is more than the electricity consumed by all the nation's color televisions and similar to the amount consumed by 5.8 million households (Marsan, p.26). Douglas predicts that by 2009, one third of IT organizations will have "improved environmental sustainability" as a top IT management objective (2006).

However, there is ambivalence as to the reasons for green initiatives. Only 30 percent of respondents to a recent E-Week survey indicated that economic considerations were the most important factor. The majority of respondents to this survey indicated that the green initiative is not part of their budget. One might conclude, therefore that IT professionals recognize the environmental impact of IT activities, but most businesses are not willing to spend additional money for eco-friendly measures unless there is a commensurate payback (Gibson, p.53). The two issues must go hand-in-hand.

Getting Started

Many organizations are expressing a buy-in to "sustainable" or "green" IT. They have come to generally understand these terms to describe the manufacture, management, use and disposal of information technology in such a way that minimizes damage to the environment. Gartner Research reports that power consumption by computers accounts for two percent of global carbon dioxide (CO_2) emissions, roughly equal to the carbon output of the airline industry (Walsh, 2007).

Walsh (2007) defines sustainable IT management and use as follows:

> "Sustainable IT management and use has to do with the way a company manages its IT assets. It includes purchasing energy-efficient desktops, notebooks, servers and other IT equipment, as well as managing the power consumption of that equipment. It also refers to the environmentally safe disposal of that equipment, through recycling or donation at the end of the lifecycle."

Converting to a "green data center" is not a simple task, but there are many suggestions and techniques available. Gibson (2008) indicates that "green IT" is still in its early stages. However, greenness is seeping into organizations even when there is no green initiative when more energy efficient equipment replaces older less efficient equipment. It is suggested that the conversion to a green process can occur in steps to reduce risks and also to produce benefits along the way (Dietrich, p.3). Typical data center inefficiencies result in the use of two to three times the power required for IT equipment because typical designs are oversized for maximum capacity, and older infrastructure components are very inefficient; thus total cost of ownership for data center facilities and IT systems is excessive (Dietrich, p. 4). Considerable research has been done on devising plans to convert to a "green IT environment," and therefore when an organization is ready to convert, prescriptive guidelines and suggestions are available.

A set of recommended factors for consideration to begin the conversion to a "green data center" include the following (Dietrich, p.8):

- An inventory of your current systems, their power usage and locations
- Your company's business and growth plans -- to help forecast future needs
- Current or planned governmental energy efficiency regulations in your area
- Available energy efficiency rebates or economic incentives from government sources or your energy provider
- Any already established goals for reducing your company's carbon footprint -- and the timeframe set for achieving those goals.

Complementary to the above, Mines (2007) recommends four steps for the creation of a "Green IT Action Plan." These steps are stated in general terms and might be considered as a blueprint for migration to "green IT." The recommended steps include the following:

- Indentify and prioritize the goals of a green IT initiative
- Assess the current situation relative to high-priority goals
- Find and execute quick wins
- Craft and communicate an action plan

Mines' Forrester Research publication then proceeds to recommend a four section format for an action plan. The sections recommended for the action plan are (p. 7):

- Revising processes and metrics
- Optimizing efficiency of existing IT assets
- Revamping architecture and infrastructure
- Positioning IT to enable green business practices

The above points, when taken into consideration, should be helpful in providing organizations with a starting point and a framework for beginning the move to a green and sustainable IT organization.

Challenges

The point has been made that there have been significant increases in power consumption in data centers since 2000. Weinberg reports the following breakdown of usage derived from a power study conducted by the Emerson Network (p. 34):

- Air Conditioning 50%
- Servers and Storage 26%
- Communication Equipment 11%
- Power Distribution Equipment 10%
- Lighting 3%

In terms of global CO_2 emissions, Simon Mingay, Gartner analyst provides the following breakdown in accounting for emissions (Weinberg, p. 34).

- PCs and Monitors 40%
- Servers 23%
- Fixed-line Telecommunications 15%
- Mobile Telecommunications 9%
- LANs and Office Telecom 7%
- Printers 6%

The above charts provide a good indication of the biggest problem areas from an energy and CO_2 perspective. The remaining sections of this paper begin to explore some of the measures individuals and organizations can take to initiate the move to a "green IT" environment.

Energy efficiency improvement measures can range from a series of simple and inexpensive actions to much more expensive infrastructure upgrades. Some of the simpler and less expensive measures include:

- Blocking cable openings to prevent cold air waste in the hot aisle
- Removing under-floor cable blockages that impede airflow

- Turning off servers that are not doing any work
- Turning off computer room air conditioning (CRAC) units in areas that are over provisioned for cooling (Dietrich, p. 9).
- Data deduplication (scouring data for redundant instances and eliminating them – cutting storage needs for the same data by 50 percent or more) (Gibson).
- Printing less and more efficiently (Mitchell, 2008).
- Employing intelligent cooling by cooling only when necessary (Baines, 2007).
- Turning off PCs when not in use (Baines).

Power and cooling efficiency, in conjunction with reducing the heat generated in the data center can serve to increase energy efficiency without a large upfront investment. For example, improvements in rack and room layout can lead to significant energy savings (Dietrich, p.10). Thermal mapping tools can help identify hot spots and cold spots. Once identified, in-row, on rack cooling systems can be designed so that cold air can be brought just to hot spots or server aisles can be rearranged so that air conditioning is aimed at hot aisles (Walsh, 2007).

The following opportunities for improved energy efficiency have been identified:

- Organizing IT equipment into a hot aisle and cold aisle configuration
- Positioning the equipment so that you can control the airflow between the hot and cold aisles and prevent hot air from recirculating back to the IT equipment cooling intakes
- Leveraging low-cost supplemental cooling options -- such as water or refrigerant heat exchangers
- Improving rack cooling efficiency by employing a rear door heat exchanger or an enclosed racking system to dissipate heat from high-density computer systems before it enters the room.
- Taking advantage of the current capacity by clearing under-floor blockages and implementing effective cable management
- Ensuring that floor openings match the equipment thermal load by adding or removing perforated tiles at the equipment air intakes
- Considering the addition of ducted returns (Dietrich, 2007)
- Purchasing low power processors that do not generate as much heat (Baines, 2007)
- Retrofitting offices with motion sensors that shut off lights if there is no motion (Gibson, 2008)

It becomes quite apparent that data centers and their significant energy usage are attracting a great deal of attention. It is not uncommon to have a roomful of servers running at 10 percent utilization. Virtualization is a hot issue because it can help consolidate servers, run the data center more efficiently, and allocate server resources to match business requirements (Weinberg, p.33). Virtualization is technology for everyone, not just the large organization. It yields cost reductions via server consolidations and makes effective use of underutilized hardware, thereby requiring less power and cooling (Coyotepoint, p.2).

According to a recent survey by Chadwick Martin Bailey, the top five reasons for implementing server virtualization are (Weinberg):

1) Consolidation of server utilization

2) Lower data center operating costs

3) Improved disaster recovery and backup capabilities

4) More effective software development and testing environment

5) Lower IT administration costs

Virtualization however adds a layer of complexity to the data center. This compounds a concern expressed in a Computerworld survey where nearly 70% of the respondents indicated that their current staffers do not have the skills to manage the complexity of their data centers (Hall, P. 24). Vendors have also been improving server efficiency through more efficient chips and power supplies. Organizations can use the Electronic Product Environmental Assessment Tool (EPEAT) developed by the Zero Waste Alliance to evaluate purchases. Products meeting the EPEAT standards have smaller levels of mercury, cadmium and lead, are more energy efficient and are easier to recycle. They also carry the EPA's Energy Star 4 label.

Power management tools that shut down or put machines in sleep mode can also be employed to save energy (Walsh). PCs and monitors are the biggest problem, but the most difficult to address because it is difficult to control user behavior. Gartner's Simon Mingay suggests low power use or off at the end of the day and the use of power management features. He estimates CO_2 emissions and related power costs from operations of PCs could be cut by as much as 40 percent (Weinberg, p. 34).

Disposal of IT equipment is also a matter of significant importance. Environmentally responsible disposal of used and obsolete equipment has taken on added importance in recent years. Most computer equipment managers offer take-back programs and therefore assume responsibility for proper disposal. Dell and Sony take back their products for free and Toshiba will take back laptops. Apple and HP charge a fee, but will credit to future purchases. There are also companies that will dispose of IT equipment for a fee. It should be noted that only about one-third of all U.S. companies have an IT asset disposal policy (Walsh, p.6).

Data centers are among the hardest commercial buildings to make energy efficient because computer systems require so much electricity and give off so much heat. The challenge in meeting the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) standards is the energy load. Earlier versions of LEED standards excluded energy used for data processing, but latest versions (2.2 and higher) don't permit this exclusion (Marsan, Buildings Go Green).

To cut energy usage with new data centers, the following measures are effective (Marsan, p.22):

- Build using locally supplied and recycled materials
- Minimize waste during construction
- Use lots of windows for extensive natural lighting
- Use fluorescent lighting with dimming throughout
- Use occupancy sensors to automatically control lights and temperature
- Use raised flooring with under floor heating and cooling throughout, not just in computer rooms.

Most green buildings don't look like typical office buildings. They often have stark, modernistic designs and are made of space-age materials. On the inside, there are typically large open spaces with movable wall systems and modular furniture. Green buildings typically don't have electric outlets in the wall, but instead have in-floor boxes to provide power and data communication. They have fewer electrical outlets so employees can't have coffee pots, hot plates, microwaves, or refrigerators. Also, there are no personal heaters, fans or desk lamps. The general rule is two coffee pots for every twelve people. A coffee maker uses about 1000 watts to brew and it cycles on and off. A hot plate is a constant 250 watts. Green data centers usually eliminate personal printers for most employees and create shared printing and copy rooms on each floor vented directly to the outside to keep it cool. Adjustment is difficult for employees who have been accustomed to a private office and now work in a large open space. Positive features of green buildings include lots of natural light, making maximum use of sunlight, fluorescent lights with automatic dimmers that adjust to sunlight and turn off when the room is unoccupied, and all employees positioned within 65 feet of natural light. The biggest complaints involve loss of personal printers, copiers and coffee pots (Marsan, Buildings Go Green).

In an effort to conserve energy, Verizon has replaced 7,000 PCs in call centers with Sun Ray thin clients and has also begun a company-wide migration to LCD monitors. The thin clients use about 30% less power than PCs and Verizon's overall savings is in the neighborhood of $900,000 annually (Mitchell, 2008).

Research firm IDC estimated 900 million desktops in use worldwide in 2006. Even if all units were Energy Star 2006 compliant, they would consume 426 billion kilowatt hours of power annually. If the equipment met the 2007 Energy Star specification, power consumption would be 27% lower. That would save enough energy to power all of Switzerland for nearly two years and cut greenhouse gas emissions by about 178 billion pounds (Mitchell, p.21).

Mitchell goes on to suggest five tips to achieve a greener desktop (p.22). They include:

1. Do an energy audit. Some organizations have learned that computer equipment was consuming nearly as much power after hours as it was during work hours.

2. Adopt and enforce power management. The greatest power savings is realized when you get systems to go to sleep. Lenovo recommends a configuration whereby laptop disk drivers spin down after five minutes of inactivity, monitors go blank after 10 minutes and machines go into standby mode after being inactive for 20 minutes.

3. Dump your CRTs. They are your biggest offenders and upon replacement with more efficient LCDs, which use about one-third the power, will produce substantial savings in electricity costs.

4. Slim down the client. Select desktop computers that are Energy Star 4.0 compliant. Energy Star- rated equipment can save energy and space and decreased power consumption will significantly reduce the need for cooling in office areas. Replace PCs with thin clients where possible.

5. Print more efficiently. Energy Star labeled models can cut energy costs by as much as 5%.

Conclusion

The U.S. Federal Government, which has tracked energy usage in buildings for more than 20 years, is spearheading the green data center movement. The EPA reported to Congress that the amount of electricity used in data centers more than doubled between 2000 and 2006 (Marsan, Green Data Centers). Gibson (2007) stated that sharp spikes in data center energy use have captured the attention of IT executives. However, Gartner Group analyst Simon Mingay reports that "most organizations may choose to paint it green, but the reality is they're focused on saving energy and therefore money. And their willingness to cut CO_2 emissions is significantly limited to their interest in cutting their electric bill (Gibson, p. 46). Thus it is widely recognized that IT professionals recognize the environmental impact of IT activities, but most businesses are not willing to spend additional money for eco-friendly measures unless there is a commensurate payback (Gibson, p.53).

Organizations moving toward a "green data center" can classify actions taken as major, requiring infrastructure changes and significant costs or minor requiring less costs but sometimes significant efforts to change long-established habits and ways of doing things. Simple changes can make a difference.

It is the author's contention that our IT-related educational programs need to develop as strong sense of both the major and minor initiatives that can be undertaken to achieve a "green and sustainable" IT environment. Higher education must also demonstrate a sense of commitment to these practices through demonstrated actions. Colleges and universities are charged with the awesome task of developing the leaders of tomorrow. Building a strong sense of awareness of green and sustainable practices may produce some magnificent ideas for conservation of energy and preservation of our environment.

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Learning Spaces and Shared Decision Making

Jack W. Pope
Mathematics and Computer Science,
University of San Diego
5998 Alcala Park
San Diego, CA 92110
pope@sandiego.edu

Barton D Thurber
English
University of San Diego
5998 Alcala Park
San Diego, CA 92110
thurber@sandiego.edu

Introduction

This paper investigates very different ways of using digital technologies in college classrooms -- each based on common concerns of a certain group of disciplines, mathematics in the first instance and English and the humanities in the second. The authors have noted in previous papers that differences in the discipline do account for widely varying levels of utilization (or non-utilization) of technology in the college classroom. First there is a review of the status of typical classrooms or learning spaces in today's college or university; then the authors look at how two disciplines use (or do not use) available technology today. Finally, they speculate about mechanisms that might improve the useful design and construction of learning spaces that impact their own disciplines.

Today's Classroom

"Learning spaces" as an object of design and study have received much attention in the higher education community in the past 5 years. Indeed, Diane Oblinger put together a collection of interesting and innovative studies on the need for rethinking the design of the traditional classroom in an Educause/ELI publication of the same name [Oblinger, Learning Spaces]

The traditional lecture room-the instructor in front, students in rows facing forward-- is still the most common physical classroom model on college campuses today. The furnishings are usually more flexible and, except for very large lecture halls, today's classrooms rarely have furnishings fixed to the floor. Nevertheless, board and lecture space is typically at the front, placing the focus on the front of the room (and on the instructor as the source of primary content). Essentially unchanged for centuries, that model is nevertheless in rapid flux: most campuses now feature easy access to computer, Internet and electronic media tools in every (or virtually every) classroom. Indeed, in some contexts it is not unusual to have several display screens.

As Malcolm Brown of Dartmouth [Brown in Oblinger, Learning Spaces, Chapter 12] put it: "As recently as a decade ago, classrooms were the primary locus for learning in higher education. …Since then, a great deal has changed. The World Wide Web has emerged as the primary way most people use the Internet. … Laptop prices have declined … to the point that their use exceeds that of desktops for most students. … These developments impact the locus of learning in higher education. The notion of the classroom has both expanded and evolved; virtual space has taken its place alongside physical space."

What one would hope to see, then, as the technology and our ability to use the technology evolve, is a shift from technologically-enabled traditional classrooms to the learning space, in which the technology becomes part of the learning space itself.

This is happening in some limited contexts. For example, on our own campus, the recent construction of a new School of Education Leadership building involved dedicated faculty input from the planning stages onward, and the resulting learning spaces incorporate collaborative learning designs as well as the unobtrusive use of technology. The Wallenberg project at Stanford University provides a flexible and experimental learning environment to assess the impact of new technologies in teaching, primarily through the use of (1) enhanced interactive digital media in the room itself and (2) adjacent breakout areas, also equipped with interactive digital media. (Wallenberg, Classroom Details)

Nevertheless, at all too many universities new ways of thinking about learning spaces lead to, at best, modest changes in classroom design. There are several reasons for this. One is lack of either faculty participation or faculty interest. In the case of a new building, faculty interest is high, but in the case of limited renovation (far more common on college campuses) faculty interest and involvement drops considerably. Secondly, while facility project managers and instructional technologists involved in the design of new classrooms or learning spaces may encourage and desperately seek faculty input, their own interest in the facility tends toward the technology rather than the pedagogy. The result can often be a traditional classroom retrofitted with grand (or not) technology. Thirdly, budget issues often constrain those design goals that might most significantly impact a changed 'learning environment.' Finally, most classrooms are shared facilities. This means that the design reflects the most commonly utilized technology – in effect, the least common denominator. While this works well in some instances, it does not foster much in the way of innovation. When demolition and structural costs remain fixed, what most often suffers is innovative furnishings and, to some limited extent, technology innovation.

It is, in fact, true that specialized teaching environments exist – labs for the scientists, performance rooms for drama, and even some specialized general purpose learning spaces. But, sadly, this is not true for most disciplines in the humanities.(In fact, the philosophy of specialized learning spaces for the humanities has yet to be developed—what do the humanities do, why do they do them, and how can digital technologies help? (Questions without, thus far, answers.) While other disciplines have made the case for alternative designs decades (at least) ago, the impact of these new digital technologies has tended to differ markedly depending on the discipline.

All that being said, what passes for the standard classroom today is usually – though by no means always – a traditional forward-facing classroom with relatively user-friendly technology and lightweight, flexible student desks. This latter improvement accommodates, but does not necessarily encourage, a flexible, and easily changeable environment. Any change in curriculum and pedagogy must take this fact into account even as changes in classroom design evolve.

A Mathematics Class in this Environment.

Teaching and learning research supports the role of technology in the mathematics and the science classroom. The National Research Council document "Evaluating and Improving Undergraduate Teaching in Science, Technology, Engineering, and Mathematics" emphasizes that teaching faculty cannot merely be experts in a discipline; they also must possess a wide range of experiences and skills with appropriate pedagogies and technologies used in that discipline. "…Instructional changes made possible through information technology are profound and have already imbued research communities in the natural science, mathematics and engineering. ...As with other areas of pedagogy, [science and mathematics] faculty will have to learn appropriate and effective uses of hardware and software that are coupled with new ways of learning and teaching." (Fox, Hackerman, 2003, 28-29)

The crucial point in learning mathematics is not primarily the procedural or instrumental aspects of the discipline. True learning involves the understanding of the conceptual framework in which the procedural aspects of the discipline and related concepts interact, and can thence be used for creative application to other mathematical problems. Put another way, procedural learning complements and outlines conceptual learning (Goodchild & English, 2002, 121). Learning concepts involves more than learning methods. Expert knowledge and function includes the organization and understanding of concepts that underlie these procedural methods (Bransford, Brown, Cocking, 1999, 19ff). The question, of course, is: "To what extent do new interactive, digital learning tools facilitate conceptual learning in the mathematics classroom?"

Document cameras, data projection displays and perhaps the use of a distributed learning system such as Blackboard or WebCT are all common features of a college mathematics classroom today. Calculators are an essential tool in many mathematics courses and specifically in algebra classrooms both at the secondary and college level. Indeed, as far back as the mid 1980s, researchers (Hembree, Dessart, 1986, 83-89) have emphasized the impact of hand held calculators in pre-college mathematics education. Graphing calculators have further accelerated the interest of mathematics educators (Murdock et al, 1998). But, other than calculators, tools that are aimed at the discipline of mathematics or encourage collaborative and group learning are less frequently encountered in lower division mathematics classes.

There are some collaborative teaching tools gaining a foothold in undergraduate mathematics courses. Audience Response systems (aka 'clickers') are gaining in popularity with many faculty in science and mathematics because they may be used to easily test and gauge the level of understanding for a particular concept being taught. These systems include inexpensive polling devices and a one-time expense for a wireless reception device that can be packaged with a text and then used by the instructor to poll and instantly categorize responses using either the web or other delivery application (e.g., PowerPoint).

But what of interactive technologies specifically aimed at the teaching of mathematics? These are the tools at the heart of change in teaching mathematics. Mathematics involves hands-on activity with a complex symbol set. There are computational engines such as Mathematica or Maple that allow for sophisticated manipulation of complex symbolic math, but these are rarely seen in secondary level or lower division college algebra or survey of calculus classes. There are a few rather interesting exceptions. For example, Abby Brown, of Torrey Pines High School, used Mathematica with her calculus as well as algebra classes and has even published students' work using the tool (Brown, 2005). But using such computationally powerful teaching tools is the exception rather than the rule even in the upper division college classroom. The Geometer's sketchpad is perhaps a more appropriate tool for experimentation at the lower division college mathematics level.

Currently, lower division mathematics courses are increasingly using publisher-based online problem tools that are a vast improvement over the drill and practice computer-based instruction programs of the late 1980s and early 1990s. And, like any other discipline, there is a wealth of auxiliary educational video and media materials that might be used in exploring mathematical concepts.

The classroom in which these tools are used is, in practice, effective enough. The design of the classroom is still that of a lecture classroom and collaborative work requires reconfiguration – not a major problem, but still time consuming. So, while there are liberally spaced opportunities to have students work together, they do not and, indeed, would not in any case, take up a majority of class time.

Also, while the class size is not large, nevertheless, the class usually has 30 or more students of varying abilities and there has to be ample opportunity for individual exercises to build computational and problem solving skills. Even with a grader, assessment of students' work is time consuming – especially if the instructor takes seriously his role of asking questions and also pointing out alternative approaches. Thus, in the author's own college algebra courses, the instructor uses an online teaching tool that supplements written and text book exercises. Online homework assignments use MyMathLab – a publisher based instructional tool (Pearson Publishing). This is an interactive problem solving tool that uses a moderately rich tool set which instructors can use to assign both assessments and assignments that students can do on their own time from any windows-based workstation. The strong point of this approach is that students can not only learn at their own pace, they also receive help in working through the problems step by step. MyMathLab does not just present problems. If the student has difficulty with any stage of understanding the topic under review, it guides the student through similar examples and offers helpful review. Based on student evaluations over the past 3 years, the students find the tool easy to use and prefer it to written assignments which the author still requires. This result mirrors the experience of others using the tool (Trigsted, 2006).

Also, the author provides a limited number of online flash modules that explain particularly difficult concepts and provide some limited examples of both problem solving and graphical analysis skills. These are not intended to substitute for lecture, but they do provide an 'any time' exercise

So, while there are a substantial number of illustrative content modules that secondary and college mathematics faculty can draw upon in illustrating mathematical concepts, these tools differ in both in quality and ease of use. Wolfram Research Incorporated (Wolfram, 2007) provides a Mathematica Player for use in teaching and education and provides a website where interested instructors can search for illustrative modules on particular topics. However, most of the examples are aimed at majors' level calculus or abstract algebra as opposed to lower division algebra topics. One particularly apt example involves sketching a rational function where the user manipulates both the roots and asymptotes, yielding real-time graphical proof rational functions are affected by roots and asymptotes, occurring as changes of sign for continuous functions.

The Humanities in this Context

Nothing like these tools exist for the humanities disciplines; nor, we would argue, could they.

This is not to say that the humanities have not been affected by the digital revolution; they have been, in profound ways. Simple word processing was (and is) in itself a revolution, compared to the typewriter; email has been similarly revolutionary, if we remember (a) that the only alternatives had been snail mail and the telephone, and (b) that writing is at the heart of what the humanities disciplines try to accomplish. More important still has been the web, primarily because it has offered (and soon will offer more) access to content that previously would have been difficult or impossible to obtain. Cultural artifacts of all kinds, but especially the most ephemeral—pamphlets, posters, manifestos, hastily scribbled notes, not to mention accurate digital representations of ancient and/or fragmentary texts, have revolutionized scholarly work in the humanities, where for generations simple access to texts had been an enormous and time-consuming problem. Given that the mission of the humanities (CHAT, About) is to find, explore, and articulate the meaning both of cultural artifacts and the methods we use to look at them, the impact of this revolution can hardly be understated.

And yet: word-processing and email have impacted everyone, not just students of the humanities; and while access to content is now light-years ahead of where it had been, "access to content" is essentially the function of a library. We have, that is, a far better library than we have had before. While this is an enormous gain, it is not in itself revolutionary, if we ask how any of this could or should impact *teaching in the humanities disciplines. The issue, actually, is complex. What and how we teach is in part a function of what we understand the purposes of the humanities to be, and here consensus is difficult to find—largely because, in a post-theory age, the "author" as the sole source of meaning in the text has been co-opted by culture, by gender, sexual orientation or indeed by language itself; such that words like "purpose" or "goal" in the humanities disciplines have become increasingly more contingent, endlessly receding before us like a desert mirage. In circumstances such as this, what, exactly, would digital technologies help us do? (We note in passing that in mathematics, as in many other disciplines, "purpose" is by comparison unambiguous.)

How Might We Do this Better?

We are struck by the fact that, while faculty in some disciplines are, by virtue of their own interests and the needs of their disciplines, attuned to and interested in the use of digital technologies in the classroom, others are not. We are also struck by the (apparent) fact that instructors in the humanities disciplines have no particular use for the technologies Pope describes….nor could they, given the state of (the culture of) their own disciplines. Humanities faculty don't know what to do, beyond what is already available, with technology; nor *can* they know, given the state of their disciplines

The problem is compounded by IT departments that, by virtue of their mission, must serve many departments (including administrative departments). Unless a new building is planned, or a massive reconstruction, department-based faculty tend to be less involved unless they will be specific users of that structure. We think, then, that the central problem on university campuses regarding IT issues reduces to

(a) A tendency on the part of IT staff to plan for the entire institution, when in fact disciplinary needs vary widely; they don't know what they don't know.

(b) A tendency on the part of certain (humanities) departments not to address (for good reasons) their own core needs and practices; they don't know what they don't know.

What to do? Dialog is the best answer (it usually is), but dialog conducted on a different basis than it tends to be now. Instead of working primarily with those faculty who are already interested, IT staff need to actively, personally, address departments regarding their needs and interests. Often, however, such sessions reduce to which faculty needs which service or piece of equipment, or which isn't working. The question needs to be framed differently: what is it that your discipline (your commitment) requires you to do? (Not, that is, what the latest technology will let you do. That may be relevant, but it also may not be.) What kinds of experiences do you want your students to have, and how do you want them mediated? Beyond the experiences your students are having now, what kinds of experiences would you like them to have (forgetting, for the moment, whether they are feasible or not). The discussion, that is, is not about the technology. It is about them.

The answers may be—almost certainly will be—various. And yet this is the kind of discussion we need to have, if IT departments really do want to serve all their customers equally. Asking questions like these, moreover, will bring to the fore questions much debated in the current cultural climate within the humanities; the debate will not end, but in looking at these questions collectively each department will—not achieve consensus; but make some progress in thinking about technology *for* them, instead of technology thrust *at* them. This in itself would be an improvement over the current situation.

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Create Flash-Based Tutorials Without Turning on the Flash – Two Tools for your Toolbox!

Steve Anderson
University of South Carolina – Sumter
2951 Waverly Drive
Sumter, SC 29154
stevea@sc.edu

Abstract: A 45 minute show-and-tell illustrating the features of Camtasia and Lecturescribe for those unable to attend the half day workshop. These programs are very inexpensive, yet wonderfully full featured and easy to use pieces of software for creating video tutorials.

Note: This paper was not available when the proceedings went to print. The author will provide handouts at the conference or via the web or email.

Using On-Campus Centers to Enhance Course Content

Joseph D. Brownsmith
Computer Science Department
UNC Asheville
Asheville, NC 28804
828.280.3733
brownsmith@unca.edu

James Fox
Director, UNC Asheville's National Environmental Modeling and Analysis Center
UNC Asheville
Asheville, NC
828.301.2075
jfox@unca.edu

UNC Asheville is an undergraduate, liberal arts institution with a strong research program. As is common in most colleges and universities, UNC Asheville houses centers that provide opportunities for student employment, faculty participation and staff career opportunities. They also provide rich and varied opportunities for student research. Often overlooked is the impact that both faculty participation in centers/programs and center management/staff can have on enhancing the academic classroom experience with timely, real-world issues, practices and problems. This contributes directly to the university mission of preparing students for productive careers. This paper provides examples of recent faculty-Center collaborations at UNC Asheville. These collaborations resulted in (a) creating course content through Center-defined projects, (b) enhanced student learning opportunities, and (c) progress made on Center projects. This paper can be used as a guide for recognizing Center projects that can lead to successful course enhancements.

UNC Asheville centers and programs highlighted in this report are: National Environmental Modeling and Analysis Center (NEMAC) [1], the North Carolina Center for Creative Retirement (NCCCR) [2], the Health and Wellness Program (HWP) [3] and the Environmental Quality Institute's Lead Poison Prevention Program (LPPP) [4]. NEMAC is an applied research oriented center focused on approaches to solving fundamental environmental challenges using multidisciplinary strategies; (it seeks to form diverse collaborations form the academic community, from government, and from private enterprise). As such, it is a prime source of interesting research ideas, student projects, guest speakers, and funding opportunities. The collaborations with this center are the major impetus for this paper. The other centers/programs, (i.e., with NCCCR, HWP and LPPP), are primarily service oriented (not research oriented). They too provide opportunities for student projects, examples of which are discussed in this paper.

The primary author teaches several courses in database, analysis and design, and programming languages. Thus it should comes as no surprise to the reader that most projects highlighted in this paper involve planning, analysis, design and implementation of database projects.

Background

The premise of this paper is that the key to learning is the interaction of knowledge with experience and application (applied research). Projects help shift the emphasis from teaching to learning and from individual learning to collaborative learning. Projects can offer concept reinforcement to open-ended, critical thinking academic learning, thus raising the quality and level of students' engagement and achievement as well as the ability to apply the course subject matter in contexts beyond the classroom. [5,6,7]

Projects in Computer Science courses can be used to enhance course content so that it remains current, relevant, fresh, and interesting. Every educator teaching these courses today faces these content challenges. And since the computer industry innovates rapidly, course content can become stale when not referencing and including real-world issues, practices and problems. I have found that using on-campus Centers is an effective way to identify, prepare, and include projects in Computer Science courses.

A project is an organized attack on an unorganized problem. A project "…consists of a temporary endeavor undertaken to create a product or service. …Business and science projects involve a collaborative enterprise, frequently involving research or design that is carefully planned to achieve a particular aim"." (www.Wikipedia.org)

Benefits for students: Deepening comprehension of course content, strengthening the sense of social responsibility, integrating theory with practice, sharpening abilities to solve problems creatively.

Benefits for faculty: New opportunities to orient research, current awareness of problems faced by small to medium sized organizations, enriched course content.

Benefits to the Center: Deeper insight and awareness of the problem, documentation, prototype solution, collaboration with faculty who have an interest in the problem domain. Projects also have the potential to make unique contributions to addressing unmet needs.

Part 1 – Planning and Implementing a Project

Part 1 is a reflection on projects we have undertaken. Our focus here is on the factors that lead toward or away from success. We also address the roles of the center, the instructor, and the students in the project.

Lessons learned: Factors Favoring a Successful Project

Overall:

- The project should be integrated into the central concept/topic of the class.
- The project should support the Center to meet its needs.
- The project should be designed to be completed within a semester with achievable goals.
- The project experience itself does not ensure that significant learning or effective center support will occur.

The Center:

- Identifies a meaningful project suitable for inclusion in an undergraduate class.
- Provides a contact person/manager for the project.

- Provides funding.
- Controls the project definition and scope.
- Provides necessary documentation for understanding the project
- Obtains necessary permissions for use of Center resources (documentation, data, equipment, people, etc.).
- Coordinates with the instructor on expected outcomes.
- Participates in the conduct of the project as coordinated by the Instructor.
- Provides ongoing feedback to the Instructor during the project.
- Receives and evaluates the results of the project.
- Provides feedback to the Instructor at the end of the project.

Initial meetings between the Center and the Instructor are crucial for setting expectations of the result of the project. Student projects will typically not result in a production-ready system.

Worthwhile projects can also be initiated that involve other universities and non-profit organizations. (Projects involving for-profit organizations would entail a consulting agreement). Projects with outside organizations require more coordination and, although beneficial to the community, would not directly benefit your university.

The Instructor:

- Articulates clear project goals for the Center and the student participation.
- Expects active, sustained Center commitment.
- Insures that the project is necessary and important to the Center.
- Assures that the time commitment is appropriate to the learning goals.
- Coordinates project information flow between the Center and the students.
- Provides direction to the students in implementing the project.
- Provides for meaningful student reflection on the experience.
- Evaluates the impact of the project on the students' learning and on the Center

The instructor without sufficient project experience should undertake projects in a sequential, non-overlapping, fashion until a skill base is established and success factors are well understood. Projects tend to accumulate – they are easy to start and hard to terminate.

The Students:

In addition to the normal requirements expected of students (attendance, participation, problem solving ability, etc.), the following factors are emphasized during a project:

- Works well in collaboration with other students.
- Asks questions to clarify unclear goals and concepts.
- Is able to work with "messy" assignments (i.e., ones not as neatly laid out as textbook exercises).

Upper level undergraduate students tend to be more project-ready than freshmen and sophomores.

Lessons learned: Factors Contributing to an Unsuccessful Project.

The following factors are identified:

- The project is too complicated for the student competency level.
- The project involves proprietary systems and data
- The project evolves rapidly from the initial understanding.

An early experience was with a Center that defined a project that was too complex for the time allowed and student level of sophistication. The student experience was not satisfactory since they felt that they did not complete the project while the Center had hoped for more. With more experience, we have learned to be more cautious about what can be delivered. The mistake in this case was in not recognizing that projects tend to get more complicated once they are underway.

Another experience was with a project that did not get past the planning stage. The reason it was abandoned was the several proprietary computer systems and customer data that the students would need to understand. The Center was not able/willing to invest in creating a non-confidential environment for the students to study.

Part 2. Examples of Recent Projects

Section 2 is the "ideas" part of the paper. Curriculum-enhancing projects can come from unexpected sources. You can use this section to stimulate your thinking on where your next project could come from.

Over the past year, we have partnered primarily with UNC Asheville Centers in an effort to infuse curriculum with real-world problems. Many of the Centers mentioned above operate as mini-business with more or less well defined business processes and multiple collections of data (manually maintained data collections, spreadsheets, and databases). The following sections outline several content-enhancing projects.

Examples of UNC Asheville Database Projects for Students.

Centers that maintain data in spreadsheets can be prime candidates for upgrading to a database. We found the following centers willing to work with students directly and with faculty to define class-based database projects.

Health and Wellness Program: This organization used spreadsheet to record companies, internships the companies offered. In addition, spreadsheet data tracked students who enrolled in courses representing an internship. This unwieldy situation was resolved by designing a small database system. Students designed and implemented the solution as part of a database course.

Lead Poison Prevention Program (LPPP): This program also used a spreadsheet to record lead levels at multiple sites within residences. The recorded data also included people (contacts, occupants, physicians, etc.). They now use a database designed by students in a projects course.

North Carolina Center for Creative Retirement (NCCCR): Although this center already had an Access database for volunteers, it was not being used since it was part of a complex larger system and did not handle all the requirements. A simple two-form design – one for volunteers and their skills, and one for the requests that needed specific skills – satisfied their needs.

These activities happened due to active faculty involvement in the UNC Asheville community, and the willingness of faculty to get involved, take risks, and create. The benefits from these projects were student involvement in design and implementation-beyond-textbook learning, faculty solidification of practical knowledge for future classes, and, for the Center, a useful database system. Without these centers and participation of their staff, these curriculum benefits would not have occurred.

Examples of Other Database Projects for Students.

Worthwhile projects can also involve other universities and non-profit organizations. These projects enhanced the course offering by providing the students (and instructor) a wider view of the community needs and engaging them in active involvement in the local community.

Student Registration Database: A-B Tech Basic Skills Department [8]. This project started as a two-week course project in a database class for juniors and seniors and evolved into a production system that is in-use today and completely replaces a paper-driven system. The result is higher quality (fewer errors and omissions) and less effort required.

Artists' Resource Database: Arts 2 People [9]: This project started as a course project in a database class for juniors and seniors. It involved developing a database for a local non-profit agency from a collection of resource information of use to artists seeking professional development opportunities. The database information will be delivered to the local artist community via the Web (but that's another project).

Book Review Process Database: This project supports book reviewers for the Theatre Design and Technology Journal (published by the non-profit United States Institute for Theatre Technology). The database tracks book review status for a multi-step review process for published books. This project was initiated as a project in a Database Projects course.

Example of New Courses Created

The National Environmental Modeling and Analysis Center (NEMAC), in working with its partner, the US Forest Service, identified a system integration project suitable for a semester long Computer Science course.

> **CSCI 446 System Analysis and Design Project (Middleware)** (3 contact hours) Spring.. Required for Information Systems Concentration. Instructor: Dr. Joe Brownsmith. This projects course was developed in collaboration with NEMAC and its partner, the US Forest Service (USFS) [10]. The USFS Eastern Forest Environmental Threat Assessment Center identified a need for a rules-based business system to automate the updating of expired data in its databases. Student teams designed and implemented seven cooperating software components (including databases, email, Web components and a rules engine) to accomplish this comprehensive objective.
>
> **CSCI 373 Database Projects** (3 contact hours) Spring and Fall. This innovative course provides an opportunity for studying and applying database techniques to a variety of problems in a real-world setting. In this course students participate in the analysis, design, and implementation of small to medium-sized real-world database projects. In a past offering of this course, several database projects were undertaken in collaboration with UNCA Centers and departments.

Reflection: The Middleware course was created due to active faculty involvement in NEMAC and the recognition of the need for a vision for automated business processes. The project motivated clarity of concepts through design, and focused the implementation efforts. This probably would not have been achieved as rapidly without the course offering and the students work. A further result is that the customer benefited from the rigor imposed by the classroom experience. The students achieved a sense of accomplishment due to their team's component working to achieve an integrated result.

The database projects course was created in response to recognizing the student need for a course whose focus is project-centric.

Example of Center Management Participation

The National Environmental Modeling and Analysis Center (NEMAC) management have participated in the following course as case study.

> **CSCI 342 Systems Analysis and Design Methods** (3 contact hours). Spring. Required for Information Systems concentration. This course included real-time tracking of a project-in-progress. The project involved making bibliographic reference data available for reference and update on the Web. The current (problem) system was studied to determine its capabilities and several alternatives were analyzed. The project was real (and completed) during the semester by NEMAC staff. The students compared the models (documentation, diagrams, etc.) of the project with the textbook recommendations.
>
> **CSCI 446 System Analysis and Design Project (Middleware).** This course, described above, required NEMAC project management participation in the problem requirements and scope. The final exam included a demonstration of the working system to this management.

Reflection: This activity was defined by proactive faculty who envision student learning on encountering and reflection upon the textbook materials and contrasting it with modern business practice.

Example of Use of Center Intellectual Property (IP)

Research oriented centers such as NEMAC develop intellectual property (IP) that can be used in the classroom. The advantages of using Center developed IP software are: The IP was developed locally and the Center employs someone who understands it, its' purpose and coding details; and who can explain it. The IP may also contain unique or advanced features that can be studied in context.

CSCI 373 Special Topics in Computer Science: Software performance

Evaluation (3 contact hours) one section, 7 students, Fall. Instructor Dr. Joe Brownsmith. This course uses NEMAC intellectual property, i.e., CEDAR system software, to illustrate performance principles and techniques. This software exhibits many advanced and professional techniques that students would not otherwise experience.

Reflection: This useful result occurred since the author sought to explain and focus textbook learning by using a known system.

The examples in the previous section highlight the importance of proactive faculty who are engaged in the University community, and who seek collaboration within to enhance the educational experience for students.

Examples of Center Management and Staff Involvement in Curriculum

Research centers can provide a rich source of guest speakers on a variety of topics. Here are some recent examples of guest lectures given by NEMAC staff;

ENVR 230 Energy and Society: "Fossil Fuel Exploration," Guest Lecturer: Jim Fox.

MLA 560 Seminars on Science and Human Values: Climate and Culture,

"Uncertainty and Decision Making, "Guest Lecturer: Jim Fox

ENVR 384 Introduction to GIS:

"Visualization Techniques," Instruction Brandie Farris, Guest Lecturer: Greg Dobson. "GIS Application for Informal Education," Instructor Brandie Farris. Guest Lecturer: Jim Fox. "Use of GIS, Databases and Modeling in Forest Management," Instructor Brandie Farris, Guest Lecturer Dr. Todd Pierce.

CSCI 431 Organizations of Programming Languages: "Yahoo! Pipes, and Linden Scripting Language". Guest Lecturer: Dr. Todd Pierce.

CSCI 373 – Science Visualization. Team Teaching: Jim Fox (NEMAC) team taught with Susan Reiser an extended lab/lecture. Jim helped teach the lab for the first four weeks when we constructed the modules for the Haze Forecast Kiosk. The kiosk is on display at the Colburn Earth Science Museum in Asheville.

Reflection: Research centers are engaged in recent and evolving technology in collaborations with the community. Bringing this to the classroom engages the students in current activities and projects for informs and shapes their learning, and in doing so helps prepare them for.

Summary

This paper has presented examples of curriculum enhancement that are driven by a combination of factors; namely, university centers that engage in research and real-world problems, and pro-active faculty who desire to focus textbook material through examples and projects for the generation of in-depth learning. Centers, such as NEMAC, that actively seek wide collaborations among adademe, government and private enterprises are especially useful in crating multiple curriculum enchantment opportunities.

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Introducing Instructional Technology to a Rural College Campus

Rachael Esterly
Instructional Technology
resterly@kent.edu

Robert Logan
College of Technology
rlogan@kent.edu

Kent State University, Salem Campus
22491 State Route 45 South
Salem, Ohio 44460-9412
330-332-0361

Introduction

In the face of increasing competition from online colleges and universities, as well as increased interest among some faculty to incorporate newer technologies into their teaching, our campus hired an Instructional Technologist to help with faculty needs. However, this does not mean the general campus population has been ready to accept the help or any subsequently recommended changes to the campus technology infrastructure. The areas that need to work together and that come to odds frequently are the people, the technology and the financial needs.

These three areas often overlap or have constraints placed within them that are beyond anyone's control. These constraints could be hardware upgrades required for mandated software upgrades, accreditation changes in an academic program, or budget cuts from the state. These constraints should not keep campuses from moving toward a better use of technology. The Salem Campus of KSU has experience working with people, and technology within financial constraints to improve technology use.

People

A general understanding of behavior and how people adjust to change is important to introducing anything new. In general, people resist change. In order to help with this we have implemented changes gradually. This has allowed the opportunity to announce the change early then let them get use to the idea of the change that is coming. Then a training session is offered for the user that is anxious about the change. Knowledge about the change and how it impacts them reduces questions and offers a feeling of empowerment. Next we implement the change to the users or departments that are interested or excited about the change. The positive discussions and attitudes are passed to the less interested and help with acceptance. These trendsetters also help us work out any unforeseen bugs or problems that may creep up with other user styles. Having a small group of people to work with also helps us with support issues as they arise. After things settle down, we finish the rollout to the masses. We now have a larger base of users on campus who can answer small questions and a smaller group of users that will call for help. The small groups will allow for quicker response times. Quicker response times are very important to keep anxiety down and user satisfaction up.

The idea of quick response time is in line with customer service. Customer service is a people issue from the user side and the technician side. There are many different ideas on campus about what the level of customer service should be and who should be receiving that level of service. Interestingly, there are also many different opinions of the level of customer service received by the faculty here. The campus needs to balance that service level to a manageable level. To begin building trust we started talking to people, asking what they wanted, offering help, and just smiling in the hallway. Small things seemed to help build their trust in the new department and when they ask for something it was important to respond to it quicker than they expected. Following up a little while later also helped earn trust. Now the reputation for customer service appears to be moving up and more people are bringing ideas to us. This also means that when a change is introduced there is more trust that the department won't leave them without support and in return reduces resistances to change.

There is often a small turn out at training sessions and this is often very frustrating when education is key to getting a new concept into employees hands. The university implemented a new software package for travel reimbursement shortly before the department was established. Training was offered before it was mandatory to use the new software and turnout was low. Usage of this new software was low and individuals' money wasn't arriving when expected because items were done wrong. In order to get the training to the people the business office and the trainers worked together. When a reimbursement came in that was wrong the business office alerted the traveler they needed to make an appointment with the trainer to solve the problem. We as trainers took the opportunity to train on the entire product as well as solve the problem. The word got out to friends that if you were unsure how to fill out the travel form, contact the trainer first and you'll get your money faster. Training became important when there was an immediate need. This has happened in other software areas as well. It's important to offer training when the need is there. Unfortunately, that "need" will not always be the same for everyone or be realized at the same time and one-on-one training may be required.

Policy and procedural issues will often be cause for conflict. When working with faculty members about the pros and cons of using the online testing feature within a course management package always include in this process an explanation that they or a designated person should type in the questions. This is a departmental policy on this campus because the error rate of typing a test for an unfamiliar subject is too high. A formal grievance could be filed against a faculty member for a mistake that our department made. Recently a refusal to type a test for a faculty member ended in a person refusing to use the product. As the trainers we had to review the policy and decide which was worse – breaking the policy or discouraging a faculty member from moving into the technology age. After reviewing some history of the faculty member it was decided to protect the department and faculty member. In a previous location of employment laptops were offered to faculty instead of desktop computers. A policy for support and a clear definition of what could be saved on the laptop was established. However, the policy failed to address how often the university should inventory the device and be permitted to verify that proper software patches are being applied. Some of the faculty were leaving their laptop elsewhere and monopolizing a very small faculty computer lab.

Issues are now arising that faculty members are trying to use technology for instruction and the students are not prepared. Some complaints have been that students don't know their password; they are unfamiliar with the course management system, and they don't understand how to send attachments with e-mail. There is a limited amount of contact hours an instructor has with the student to teach content and now they have to teach the technology. The subject area suffers and many faculty drop the technology to preserve the content. As trainers it's important to understand this weakness and work to correct it. The first thing we implemented was the availability of tutoring in our Academic Tutoring Center. By generating a handbook with handouts and quick guides that the tutor could use or copy for the student the anxiety was kept low and willingness to try was high. Another location successfully changed the way the curriculum of university orientation was taught. The change forces the new students to use the course management system and e-mail regularly so they remember their password and how to use the technologies. Hopefully this change can be made at this location as well. There are also plans to offer workshops that the faculty can require students to attend if they plan to utilize certain technologies in their classrooms. This takes the teaching of the technology out the classroom and makes it the responsibility of the student.

Sometimes the idea of change takes much longer to be accepted than we are comfortable with. We just need to stop and look back at the changes that have already occurred and learn to be patient. When the instructional technology department was established at this campus, technology requests were still being handled by paper and pencil and they still are. The instructor has to be on campus to request most types of technology and then they need to wait for the paper to work its way through the departments to know if they can use it. There are several employees on campus that have a hard time with using such a slow process when faculty need to adjust quickly to the needs of the students. It's very important to stop and realize there isn't enough need yet for a process greater than paper and pencil and with a little patience change will happen. With enough need, others will push the implementations for us. Many of the challenges our department has faced have been with the computer department who have handled problems for many years with a hard-line security policy to prevent problems. Understanding that and trying to break down those policies gradually appears to be the best way to handle these strict policies without creating adversaries. Some of the policies have to be adjusted to allow for technology upgrades and progression, so again patience allows for change without requiring battles.

It is very important that you understand someone's job when you are advising them how they could change to do it better. We certainly don't all understand chemistry or genetics but can get training and experience in using technology to enhance education. Recently a faculty member got really irritated with the department because we didn't understand how upset her students got when things changed in her classroom. This was in response to trying to help with a problem she was having. She pointed out how long she had been teaching and how we couldn't relate to her and her students because of that fact. If you are aware of someone's biases like this instructor it is important to give them facts about how changing will benefit them. It's really hard to give real classroom examples without having an understanding of pedagogy. Begin working with faculty by asking how they currently teach a class or what is not working with their current instruction. Then offer several suggestions on how things can be improved with different types of technology using examples in their discipline. Having a general knowledge of their technology history and suaveness will dictate the types of suggestions to make. It's important to not set anyone up for failure, success breeds more success. When the novice person is excited about the change in their classroom then they will share and more novice people want to talk with you.

Technology

Our campus is running out of classroom space due to our increased enrollment and need for computer labs. Also wireless technology is becoming popular if not second nature throughout the world. Therefore, one of the first projects the department was asked to complete on campus was getting one hundred percent wireless coverage on campus. The computer department was concerned about security issues and when they were pushed to implement it, only implemented the technology in the small student lounge and library. There was little or no publicity of the added feature and faculty were upset they did not have access in the classrooms. Our department had worked with the university's various areas concerning wireless so we started all the paperwork and planning for the completion of the project. Once the plans started coming together and technicians were going to start showing up on site the computer technicians on our campus took over the project without being asked. When the wireless was available throughout the campus a wireless laptop cart with 26 laptops was purchased to help alleviate double booking of the computer labs and computer lab availability.

There are a few faculty that are interested in using some new software that is more hardware intensive then the current labs are capable of handling. The campus has a policy of upgrading all the labs every three years. After the third year the computers go to faculty offices. This has worked well for support issues and maintenance of the computers as they age. As technology increases at an exponential rate the computer processing speed and memory cannot maintain the campus computing needs for three to four years. In order to offer at least one lab every year that is top of the line, a proposal was made that every year at least one lab is updated. The only drawback to the new plan is how faculty will get the computers after the third year. There will not be enough computers every year for every faculty member to get a new computer nor is it practical. Ideally, all faculty need to get new computers not computers that are 3 years old. As we encourage them to use technology more we should be giving them the resources they need to accomplish their goals. However, financially this may not be possible.

There is currently a technology committee that advises the computer department, the business department, and the deans' office. The committee advises how to spend allocations of funds, which direction to move technology, when to upgrade, technology policy changes, etc. The committees consist of faculty from various disciplines as well as administration from the computing department, business department, and dean's office. The committee can be very large with many different agenda's on the table. This creates restraints on how fast we progress and on the items we can all agree on. There are concerns about the validity this committee holds among all parties. There have been recommendations stalled by administration because they didn't approve of them and only certain items sent to them for review before completing an item. It appears the committee has been used as an escape goat when needed and bypassed when it's better. Possibly a different format for this committee would keep this type of decision making from happening. A format where campus needs are reviewed and ranked without concern to funding availability would be preferred. Then when funding is available the needs would be addressed in the order of rank.

There are several pieces of technology on campus that were bought with grant money or out of departmental budgets that are sitting unused and affecting peoples reputations. One such item is a set of personal response systems. Training for these items wasn't enough for faculty to want to jump into a classroom with them. A plan to offer a student activity with the response systems including the faculty in a "get to know your faculty" or a student competition setting where faculty create the questions hopefully will help with those feelings. This format creates a fun way to use the "clickers" and generates an interest in the technology from both the students and the faculty.

Technology can also be driven by an individual faculty's interest in an area. One faculty member found he liked to download and listen to podcasts as entertainment and wanted to try something new in one of his courses. Investigation then began into podcasting and discussing how to incorporate this interest into his discipline. The ideas and enthusiasm turned into an office full of production equipment, a designated course with podcasting as its focus, and a classroom full of students. The output from the course is going to be used to educate community members on various child care issues on a local public access channel and on topic appropriate web page. This new teaching opportunity that now has the needed technology will hopefully generate excitement about trying this new form of technology.

Financial

The Technology department that is currently on campus has expertise in hardware and networking experience. Their work boundaries have been limited to those areas. Therefore areas such as phones that are plugged into the data rack were assigned to the business assistant that had no idea how the technology worked. Some in house work could be done with some basic knowledge of the data closet and the phone system. Communicating with telephone services and doing some onsite trouble shooting can be done without costing a fee. This savings can be used for other technology items. The knowledge of the phone system can also help when a conference call is needed in a different room or a video phone needs to be moved into a larger area. Both items are good educational opportunities.

There are departments that need to work with technology that will take financial short cuts to stay within their budget without meeting the overall goals of the original project. The maintenance department is responsible for hanging equipment and running electric to areas for technology. There have been many times when the project is complete, items need to be redone or faculty have to accept less than adequate teaching conditions because maintenance lacked the manpower hours and financial support to do the job to specifications. On this campus it has been as simple as hanging screens in an area where students cannot see them, to laying out a classroom backwards, to purchasing equipment that wasn't not what was requested. The business office and the instructional technologist need to communicate in order to have all these needs and requirements setup ahead of time with a plan on how each item will be handled.

At the same time that the campus is supporting the use of more technology the business office is concerned that the campus has too many computer labs to maintain and approached the instructional technology department to see if all the labs were indeed needed. Data was collected back three years and then we looked at what classes were formally scheduled in labs as well as the extra functions that were planned in the same labs. Usage turned out to be low enough that with some more creative scheduling of classes and greater usage of the recently purchased wireless laptop cart at least two labs could be closed. With two less labs to support the refresh/upgrade of the computers could happen more frequently and tech support would have more time to focus on other areas. This has not occurred yet because the people component has some issues that need addressed.

It's very hard to spend money on technology items when you're really not sure if they will be used or sit in a closet somewhere. Sometimes you have a request that will take all the money that is allocated to you but will only be used by a few people. When you are making decisions on how to spend a limited amount of money, always go for the item that will affect the most users. You are basically getting the most "bang for your buck". It's hard to not endorse the cutting edge users but the more users you make happy the more difference in the overall technology lives you will make.

Conclusion

Technology is everywhere now. Our students can use it to get the news, weather, do their banking, communicate, getting their grades, file their taxes, and much much more. These items would not be continuing to be developed and introduced if people were not using them. As educators we need to understand that our students are part of this population and continue to reinvent our teaching methods.

People play the biggest role in introducing changes on rural college campuses. Even within the financial and technology component you can see the people component throughout. Without a good foundation of technical support and a personal touch introducing technology will be a struggle but not impossible. Changes can be made and excitement generated with little or no financial support.

Juniata's Student IT Managers

David J. Fusco
Assoc VP & CIO
Juniata College
1700 Moore Street
Huntington, PA 16652
814-641-3684
fusco@juniata.edu

Abstract

Two thirds of the IT staff at Juniata College are students who manage budgets, employees, purchasing, etc. Learn how the college developed this program and what they are accomplishing.

Note: This will be a powerpoint presentation and no paper is expected. The slides can be found at http://faculty.juniata.edu/fusco/ACUTA.pptx

What Happens When Math and Rhetoric Combine with Technology

Chandra Gigliotti-Guridi
Assistant Library Director / Instructional Technologist
Hampden-Sydney College
257 Via Sacra
Hampden-Sydney, VA 23943
(434) 223-6194
cgigliotti-guridi@hsc.edu

Abstract

What do Math 100 and Rhetoric 100 have in common? Each requires students to have specific computer and information literacy skills. This presentation will examine a pilot program started in the fall of 2007 at Hampden-Sydney College, funded through a VFIC-Verizon grant, which added a lab course for those enrolled simultaneously in Math 100 and Rhetoric 100. A collaborative effort, the lab faculty included Math and Rhetoric professors, the Public Services Librarian, the Instructional Technologist, and a group of student tutor / mentors. The content of the lab addressed not only computer and information skills necessary for both Math and Rhetoric but included some basic computing skills needed by all students at Hampden-Sydney College. Assessment measures, lab content, outcomes, lessons learned, and future plans will all be discussed during the presentation

Introduction

Hampden-Sydney College is a four-year traditional liberal arts college for men located on a 660-acre campus in rural southern Virginia. Founded in 1775, H-SC is the tenth oldest college in the country. The mission of the College is "to form good men and good citizens in an atmosphere of sound learning."

Hampden-Sydney men are traditional aged and reside on the campus. Enrollment is approximately 1100 students. The College has no computer requirement for students; however, for the past several years 99% of freshmen arrive on campus with a computer (laptops out numbering desktops).

In this digital age, when communication is electronic, becoming an educated, responsible member of society also requires developing strong skills in information and computer technology. We expect that graduates should be able to access available information, judge its accuracy, understand the fundamentals of computers and information systems, manage the information acquired, and create spreadsheets and other documents that use that information to accomplish a specific purpose.

In an effort to meet this ever-increasing need for information and computer literacy, in the fall of 2006 we applied for and received grant funds from the Verizon Foundation and the Virginia Foundation of Independent Colleges to develop a computing lab class for incoming Hampden-Sydney College freshmen from challenged backgrounds – lower income, racial minority, and first-generation college students (a population criteria of the grant).

Over the past two and a half years, the College has been conducting an assessment study to determine the computer skills levels of incoming freshmen and graduating seniors. Through detailed analysis of individual student results, we identified skills for which some incoming freshmen need assistance as they begin their academic careers. These skills include basic spreadsheet creation, manipulation, and calculation, advanced word processing, and use of commenting, tracking changes, and other editing features. As the spreadsheet skills are required in Math 100 and the word-processing skills are required in Rhetoric 100, adding a lab experience to address both assists students in developing basic computer competency skills, as well as facilitating better performance throughout the curriculum.

The idea of such a computer lab is not a new one at Hampden-Sydney. Several years ago, we conducted a pilot project to add a lab experience to the upper-level Rhetoric classes (101 and 102). Two sections for two semesters each were taught. Because of technical problems encountered during the trial, however, it was decided not to add the lab permanently to either rhetoric class. Further, the College was in transition from a Macintosh to a PC environment at that time: files written on one platform could not be accessed by the other. The challenge this presented to the students and the faculty overshadowed any benefit that teaching computer and information literacy skills may have offered. With the adoption of a single platform (Windows for PC) for the College and a single, supported software package (Microsoft Office), these technical difficulties are no longer a concern. The addition of the Blackboard course management system also eliminated the file management issues we experienced earlier.

An earlier grant from the Verizon Foundation and the Virginia Foundation of Independent Colleges funded an initial technology-equipped classroom for the Rhetoric department and led to the addition of similar classrooms across the College. The new library, offering technology-equipped classrooms and wireless access throughout, expands and enhances our commitment to technology, while encouraging the co-integration of old technology (the book) with new technology (the Internet). Over the past ten years, the Instructional Technologist has conducted scores of instructional sessions for faculty and students on both the technical and the practical uses of technology; for four years, the Public Services Librarian has worked exclusively with students on the development and integration of information literacy skills. Faculty members have responded to these advances by enhancing their teaching with technology, to the extent that students expect and demand the integration of technology in the classrooms.

All of these factors make this the right time to add a lab experience to the basic Math and rhetoric classes, to assist students in acquiring and developing computer literacy. With a continued emphasis on technology-enhanced learning and the proliferation of technology in their everyday lives it makes it vital that students not only become proficient in their computer skills but use them without effort.

Project Description

As a two year pilot project each fall semester for 2007 and 2008, a maximum of 14 students who meet the population criteria and whose scores on existing College placement examinations indicate their need for Rhetoric 100 and Math 100 preparatory classes are enrolled in a weekly two-and-a-half-hour lab designed to develop the computer and information skills required not only for Rhetoric 100 and Math 100 but for future use throughout their college experience. (If there are not enough students meeting the population criteria then any student enrolled in both Rhetoric 100 and Math 100 is selected to participate.) The lab is held in a technologically equipped classroom in the College's new library, which opened in August 2007. Each lab class incorporates practice sets and assignments, mixing elements from Math, Rhetoric, information literacy, and computer / internet skills. In order to accomplish this blended instructional atmosphere the teaching of the lab is a team effort which draws faculty and support staff from various areas of the college. The Rhetoric and Math classroom faculty act as consultants and offer instruction when needed to supplement the lab and provide cohesion with the traditional classroom instruction; the Public Services Librarian works with the students on skills in information literacy (the ability to locate, synthesize, and use information effectively); and the Instructional Technologist, who is the academic coordinator for the program, instruct the students in basic spreadsheet creation, manipulation, and calculation, and advanced word processing and editing; the Associate in Instructional Technology and Media assists the Instructional Technologist and works with the students on presentation software and imbedding media in spreadsheets, presentations, and text documents. Student mentors (one for each two students), upperclassmen trained in computer and information technology as well as mathematical and rhetorical procedures, assist the students with lab assignments, offer an upperclassman's perspective on topics, encourage those who struggle to learn new skills, and generally serve as a big brother.

Preparing the Lab

The instruction team for the lab as mentioned above includes the Rhetoric and Math professors to assure that the lab coordinates with classroom instruction, the library's Public Services Librarian to facilitate the information literacy component of the lab, the Assistant in Instructional Technology and Media to assist with teaching computer skills, the Instructional Technologist to teach computer skills and coordinate the overall administration of the lab. The Director of Academic Success participates by assigning herself as the freshman advisor for this selected group of students. Her assistance is extremely beneficial in straightening out student schedules and encouraging the students to continue to participate in the weekly lab.

To prepare for each fall semester's lab, the team meets weekly in the preceding spring semester to lay out a planned syllabus for merging the Math, Rhetoric, and computer and information literacy skills to be addressed in the coming semester. Throughout the fall semester, the team continues to meet weekly to discuss the status of the lab, changes in the syllabus, student progress, and any other issues which arise. The student mentors meet with the team during break periods of the lab and are included in all email conversation between team members.

The Fall 2007 Lab

Each lab met on Wednesday afternoon from 1:30-4:00. The instruction team members all attended each session if possible. Originally the instruction was to be a blend of each subject area using computer and technology skills to accomplish the assigned task. However, shortly after the start of the semester the instruction became broken into two or three definable sections. There would usually be a Math lesson which utilized computer or information skills (spreadsheets, graphs, research on mathematicians) and a Rhetoric lesson which used computers to conduct research or practice grammar skills. If a third lesson was included it was either an information literacy session (using online databases or library collections) or a specific computer skill based lesson (language use in email vs. text messaging, student online footprint, finding, using and citing images). Plans for the fall 2008 lab include returning to the original idea of a more blended instruction.

Challenges

Initially planning was to enroll the students into sections of Rhetoric 100 and Math 100 which included no other students. However, due to staffing difficulties and past trends, the Math Department only offers one section of Math 100 each fall semester. Therefore, students are in one section of Rhetoric 100 by themselves but are part of a larger group in their Math 100 course. Because of this, the lab is officially tied to the Rhetoric course. Grades for work done during the lab are recorded for inclusion in the Rhetoric or Math class depending upon the assignment. At this time, students are not given academic credit for participation in the lab.

What the Grant Money Provides

The grant funds the student mentors as well as providing stipends for the Rhetoric and Math classroom faculty. It also covers the weekly snacks for the students as well as an end of the semester celebration. Each student who participates in the lab receives a 2G USB flash drive which he is required to bring to his Rhetoric and Math classes as well as to the lab. They are also given lifetime access to the Cengage Learning (formerly Thomson Course Technology) Skills Assessment Manager training module which is a tutorial and resource guide for basic computer skills and includes the entire Microsoft Office suite; the College's approved software for word processing, spreadsheets, and presentations.

Assessment

The College currently uses the Skills Assessment Manager (SAM), published by Cengage Learning (formerly Thomson Course Technology), to assess random groups of freshmen and seniors. We use the same assessment with lab class, as pre- and post testing, to assess changes in skill levels. We also plan to follow the progress of the lab students as they work through their Rhetoric 101 and 102 sequences, as well as their future Math courses. Retention rates for these groups will be compared with those of other current students also taking Math 100 and Rhetoric 100 in their first semester. A retrospective analysis of retention rates of past students who would have met the project profile will also be conducted and compared with the pilot group students.

Thus far, the SAM scores for the fall 2007 lab students show that upon completion of the lab course their scores rose to a level comparable with the scores of the freshmen random sample group from the beginning of the semester.

What We Learned

Having completed one of the proposed two pilot semesters, there are several insights which we have gleaned from the experience not the least of which was that it was essential that we provide snacks at each session. The more snacks the greater the participation. An infusion of sugar in the middle of the lab worked wonders on the students, the tutors and the instruction team.

We also learned that we needed to increase our planning team. Including the Director of Academic Success and the tutors in the early planning stages and throughout the semester would help with the flow of the course and increase communication among all interested parties. This would also have helped in maintaining a consistency of method across the entire instruction team. As with most things there is more than one way to accomplish a task. Each one may assume that their method is the only way. In team teaching, we needed to all agree on using the same procedures even if it was just how to open a file or perform copy and paste. Our consistency would have saved confusion for the students.

"Go with the flow" is a good motto in this type of experiment. There were lessons we had spent great amounts of time to prepare that did not spark the students' interest and times when an offhand comment generated meaningful and insightful dialogue. We learned as the semester progressed to not tie ourselves to what had sounded good in planning and to give ourselves up to those teaching gems that seem come from nowhere.

As in all things technological, plan for failure. The new library contained all brand new equipment and software. This was the first trial for the use of everything. Most equipment performed as expected but there were the odd glitches with laptops failing to connect to the wireless network or over sensitive building fire alarms which needed to be adjusted. The team did well to punt through any difficulties and used the technology problems as learning examples for the students.

Because the instructional team had invested so much time in planning for the lab, we had a desire to know that we were making a difference in our students' academic lives. We wanted them to regale us with stories of how they were using the knowledge gained in our lab in other courses. They did not gush forth with such stories although one would occasionally make a reference to using an online database that had been discussed in lab for a paper in another class. Not until later in the spring semester 2008 did we start to hear more stories of how glad they were to have participated in the lab. Now students from the first lab are asking how they can help with the second lab class. We had to be satisfied with delayed gratification for our efforts.

We did, however, see a few immediate benefits to participation in the lab. It had been our hope that by having such a large and diverse team working with the students that they would make more use of the support staff and student tutors than traditional freshman. This did happen almost immediately. Students in the lab began to set up their own study groups and would meet in the library regularly. They were not shy about seeking out the Public Services Librarian for any library assistance they needed nor to visit the Instructional Technology Office for advice on personal computers or projects for which they needed help.

Finally, we came to realize that we needed the lab lessons to be more interactive. What the team thought of as solid interactive lessons was not viewed as such by the students or the tutors. We are aiming for a higher degree of interactivity in the coming fall 2008 lab.

Plans for Fall 2008

The instruction team is working on more thematic, interconnected, interactive lessons for the second offering of the lab. The plans are to have the students out of their seats physically retrieving material from the library, working in groups on differing tasks at stations setup in and out of the lab classroom, participating in game like internet and library hunts, and collecting data from their peers. An example of a lab which is planned has the students polling their peers about the coming presidential election. In the lab they will analyze the data with a spreadsheet, create charts and graph, write a report on the data using word processing, include their charts and graphs into their text and format the entire report so that it is presentation quality. Another project has them being assigned a great mathematician to research using the internet and library print and non-print resources. They will generate a report on the mathematician, and then turn the report into a presentation using presentation software. After practicing their presentations in the library's public speaking center, they will give their presentation to the rest of the class.

For the fall 2008 semester, we have a clearer vision of how to blend the lessons so that the students are thinking with the technology and not about it. The lessons will focus the Math or Rhetoric skills while making use computer or library resources and separating these tools away from the subject instruction.

Future Possibilities

It is possible that after the two year pilot study the College may decide to make the lab a permanent part of the curriculum. It will depend upon the results of the assessment measures outlined previously. There is definite interest among the faculty and the administration to consider the possibility of have a permanent lab for Rhetoric 100 and Math 100 students.

Conclusion

When the idea of linking Math and Rhetoric together was first suggested, there were those who wondered at how two subjects so opposite could ever unite in a lab environment. However, the vision behind the project was that Math and Rhetoric are just two different ways of expressing thought and ideas – one numerical, one written.

With this in mind, the success of the first pilot experience has encouraged the instruction team and the College to look with anticipation toward the second pilot in the fall 2008 semester.

**Acknowledgement – I would like to acknowledge Eunice Carwile, Director of Corporate and Foundation Relations for H-SC, for granting me permission to use some of her text from the original grant proposal for inclusion in this article.

Integrating Quality Matters in the Course Development Process

Andrea Han
Coordinator, Center of Online Learning
Miami University
4200 University Blvd.
Middletown, Ohio 45042
hanan@muohio.edu

Abstract

Building quality assurance into the online course development process assists in the efficient creation of high quality courses. Quality Matters (QM) was originally developed by MarylandOnline as a standards-based rubric to review online courses. At Miami University we have adapted the research based QM standards to build quality into new online courses and course undergoing revision. Using a team approach to course development, the QM standards are integrated throughout the course development process through the use of a variety of resources.

This paper was originally published via the SLOAN-C wiki at
http://www.sloan-cwiki.org/wiki/index.php?title=Miami_University:_Using_Quality_Matters_to_Guide_Online_Course_Development

As online learning becomes more mainstream, institutions are increasingly looking to assure "quality" in their online courses. The research based Quality Matters (QM) program has received national recognition for their approach to this issue. However, Quality Matters is primarily a review tool and was not initially designed to be used in course creation.

Because online learning is relatively new to Miami University, we adapted Quality Matters to guide our course creation process. Rather than developing courses and reviewing quality after the fact, we develop online courses from the start using Quality Matters standards. Our focus is on providing a quality learning experience for students and teaching experience for faculty. We recognize that faculty are not only subject matter experts, but experts on the students they teach. Consequently, faculty are highly involved in the course creation process.

Faculty are typically introduced to the QM at the beginning of the course creation process. In effort to guarantee alignment and encourage innovation in the course, faculty are asked to approach the course creation as if they are developing a "new" course. From the course objectives, faculty determine themes or modules and then specific topics of study within those themes. Measureable, topic-level (or unit level) objectives are then written.

At this point, we introduce faculty to our course planning grid (see Planning Grid with sample content below). The design of the planning grid helps reinforce key QM ideas such as unit level objectives, alignment and learner interaction. The planning grid also helps faculty identify "busy work" or activities not directly related to objectives and eliminate or revise them so they do align with objectives. Faculty then work with an instructional designer to create the course modules. Faculty are expected to generate and post most of their own materials. This allows designers to work with several faculty at once and guarantees that faculty can revise their course as needed.

In an effort to provide a familiar and welcoming online environment for students, we ask faculty to follow a general outline for course structure. This outline also includes required QM statements such as information for students with disabilities or how to access resources. Rather than expecting each faculty member to create these statements from scratch, we offer to import a "template" into their course site that they can customize (examples available upon request). This template offers writing suggestions from experienced online teachers, examples and pre-created links to resources.

Once faculty feel a course is ready to be offered online, we provide them with a course checklist (see Course Checklist below) based on QM standards (standards are referenced on the checklist). This checklist was designed for faculty to evaluate their own courses and is not meant to bar a course from being offered. Like the formal QM review, it is meant to provide the faculty member with guidance on how to improve their course.

Evidence

At this point, anecdotal evidence indicates that faculty are very satisfied with the course development and self-assessment processes. Faculty new to online teaching report that these tools help them feel more equipped to create an online course, and better prepared and "less nervous" about teaching online. Faculty using the checklist to revise existing online courses report decreases in student questions about course expectations. We are experiencing very low dropout rates in courses created following the Quality Matters standards. Several of these courses are experiencing large enough enrollments that additional online sections have been added. Student grades in online courses developed following the Quality Matters standards are consistent with student grades in the face-to-face versions of these courses. We are currently developing formalized assessment tools to assess student satisfaction with the online courses and faculty satisfaction with the development process.

Relation to SLOAN-C Pillars

<u>Learning effectiveness</u> – Our course development process keep content and pedagogy at the forefront: from the "conceptualization" stage through the delivery of the course. The QM focus ensures that all learner interaction is aligned with both unit and course goals and that communication is an integral part of the course.

<u>Cost effectiveness</u> – Combining the QM standards and support materials with a learning community environment allows for the development of high quality online courses without the expense of purchasing pre-packaged courses or hiring a dedicated course developer.

<u>Student satisfaction</u> – Following QM standards ensures that our online courses clearly communicate expectations, content and resources to the students. We have seen a decrease in students claiming to be "confused" about what to do or how to access online resources.

<u>Faculty satisfaction</u> – Faculty appreciate the scaffolding provided by the QM standards and support materials. This combined with the assistance of a course designer allows them to create a high quality course that reflects their personality and teaching style (bringing their "presence" to the online classroom). Furthermore, because faculty do much of the course development work themselves, they are adept at making changes as necessary when the course is being offered.

<u>Access</u> – Because QM standards address access, this become an integral part of the course and not an afterthought.

CoOL Online Course Planning Grid

Course Title: Computer Skills: Using the Internet _____________ Course Number: CIT 101.I ______________________________________

Module Topic: Finding and Evaluating Online Resources________ Module Number: 3____

	Resources and Materials		Learner Interaction		Assessment and Measurement	
Objective(s) and/or Competencies	Readings (Textbook and Supplemental Readings)	Additional Resources and Materials	Learner Interaction w/ Peers and Instructor	Learner Interaction w/ Content (Activities & Short Term Projects)	Long Term Projects (Broken into Components)	Other Measures of Assessment (Quizzes, Tests & Exams)
Explain how a search engine database is constructed.	p. 52-63	Chapter 3 Articulate presentation		Review questions from p.78&79 (as Bb "test")		
Create a search expression that locates multiple web sites addressing a research topic.	p. 64-77	Screen capture of Process using various search engines.	Share research topic, search expression and results on discussion board. Respond to at least 2 other postings	Search engine worksheet – submit answers via email.	Choose research topic and begin to find resources using search engine.	20 questions assessment - 5 T/F, 5 MC and 10 matching (as Bb "Test")
Find 3 full text articles related to topic using Academic Search Premiere.	None	Screen capture of process with audio description.	Share resources from online databases. Discuss experience (successes and problems). Respond to at least 2 other postings		Find resources for project using online databases.	
Apply the 5 Question System for evaluating web sites.	5 Question System article posted to Bb as PDF	"Evaluating Web Sites" Articulate presentation with active link examples.	Respond to at least 2 other postings. From activity to right →	Choose web sites from list and post to discussion board evaluation using 5 Question system.	Begin applying 5 point method to resources found with search engine and online data-	

					base.	
Cite a web site or other online resource using either APA or MLA format.	None	MLA, APA web sites. Citation web page. Citation Machine web page. Maybe screen capture???		Write citation for given web sites. Submit to instructor.	Write citations for research project resources.	
Synthesize the knowledge from this module.	None				Research project – list topic, 3 web site resources, 3 database resources, 1 page evaluation of each addressing 5 questions, complete citation using APA or MLA. Submit project using Blackboard Assignment tool.	

CoOL Course Check

This checklist is based on Quality Matters standards. Quality Matters is a research-based initiative founded by Maryland Online. Quality Matters was devised to assess and assure course quality by assessing components determined through research as necessary in the design of a high-quality online course. This extensive checklist was designed to assist instructors in developing courses that lead to student success.

There are two parts to this assessment. The first section lists required components. The second section lists recommended components. For your course to meet the expectations of Miami's internal peer review, you must meet all components in section one and approximately 2/3 of the components in section two. For additional information on any of the components, check the QM annotated rubric available at
http://www.qualitymatters.org/documents/Rubric%20Annotated%20FY0506.doc

Section One – Essential Components

- ☐ There is an obvious indication of where students need to click to "start" the course. (1.1)
- ☐ A statement provides navigational instructions to students regarding the overall organization of the course. (1.1)
- ☐ A welcome statement from the instructor introduces students to the course. (1.2)
- ☐ A statement describes the structure of the units or modules within the course. (1.2)
- ☐ Course level learning objectives are clearly articulated in terminology understandable by the student and describe student performance in specific, measurable terms. (2.1)
- ☐ Unit/module level learning objectives are clearly articulated in terminology understandable by the student and describe student performance in specific, measurable terms. (2.5)
- ☐ Course level learning objectives address content mastery, critical thinking skills, and core learning skills. (2.2)
- ☐ Unit/module level learning objectives address content mastery, critical thinking skills, and core learning skills. (2.2)
- ☐ Assessments measure and are consistent with the stated learning objectives. (3.1)
- ☐ The grading policy is clearly explained and easy to understand. (3.2)
- ☐ The instructional materials support the stated learning objectives and have sufficient breadth and depth for the student to learn the subject. (4.1)
- ☐ Instructional materials are presented in a format appropriate to the online environment, and are easily accessible to and usable by the student. (4.2)
- ☐ Instructional materials requiring the installation of software, plug-ins, codecs or other controls have been tested for ease of use. (4.2)

- ☐ Instructional materials requiring download have been tested on LAN, cable and dial-up connections. (4.2)
- ☐ The learning activities promote the achievement of stated objectives and learning outcomes. (5.1)
- ☐ A variety of learning activities that foster instructor-student, content-student and student-student interaction are included. (5.2)
- ☐ A statement lists clear standards for instructor response and availability (turn-around time for email, grade posting, etc.). (5.3)
- ☐ The course design prompts the instructor to be present, active, and engaged with the students. (5.5)
- ☐ It is clearly stated how tools and multimedia relate to the course learning objectives. (6.1)
- ☐ Statement in course explains to students how to gain access to ADA services on all three campuses. (8.1)
- ☐ Course is within Blackboard (an ADA approved Course Management System). If the course is not within Blackboard, Disability Services has reviewed the course for accessibility. (8.1)

Section Two – Recommended Components

- ☐ Netiquette expectations with regard to discussions and email communication are clearly stated. (1.3)
- ☐ The self-introduction by the instructor creates a sense of connection between the instructor and the students. It presents the instructor as professional as well as approachable. (1.4)
- ☐ Students are requested to introduce themselves to the class. (1.5)
- ☐ Minimum technology requirements, minimum student skills, and, if applicable, prerequisite knowledge in the discipline, are clearly stated. (1.6)
- ☐ Instructions to students on how to meet the learning objectives (what to do) are adequate and easy to understand. (2.4)
- ☐ The methods used for submitting assessments are appropriate for the distance learning environment. (3.4)
- ☐ "Self-check" or practice types of assignments are provided for quick student feedback. (3.5)
- ☐ The purpose of the course elements (content, instructional methods, technologies, and course materials) is evident. (4.3)
- ☐ The instructional materials, including supporting materials - such as manuals, videos, CD ROMs, and computer software – are consistent in organization. (4.4)

- ☐ All resources and materials used in the online course are appropriately cited. (4.5)
- ☐ The requirements for course interaction are clearly articulated. (5.4)
- ☐ The tools and media enhance student interactivity and guide the student to become a more active learner. (6.2)
- ☐ Technologies required for this course (including software, plug-ins or other controls) are either provided or easily downloadable. (6.3)
- ☐ The tools and media are compatible with existing standards of delivery modes. (6.4)
- ☐ Instructions on how to access resources at a distance are sufficient and easy for students to understand. (6.5)
- ☐ The course takes advantage of current course technologies. (6.6)
- ☐ The course instructions articulate or link to a clear description of the technical support offered. (7.1)
- ☐ Course instructions articulate or link to an explanation of how the institution's academic support system can assist the student in effectively using the resources provided. (7.2)
- ☐ Course instructions articulate or link to an explanation of how the institution's student support services can assist the student in effectively using the resources provided. (7.3)
- ☐ Course instructions articulate or link to tutorials and resources that answer basic questions related to research, writing, technology etc. (7.4)
- ☐ Web pages provide equivalent alternatives to auditory and visual content. (8.2)
- ☐ Web pages have links that are self-describing and meaningful. (8.3)
- ☐ The course demonstrates sensitivity to readability issues for students with disabilities. (8.4)

References

Quality Matters - http://www.qualitymatters.org/

Original article –
http://www.sloan-c-wiki.org/wiki/index.php?title=Miami_University:_Using_Quality_Matters_to_Guide_Online_Course_Development

Integrating Quality Matters in the Course Development Process

Andrea Han
Coordinator, Center of Online Learning
Brad Farr
Coordinator of Computer Labs and Classrooms
Miami University
4200 University Blvd.
Middletown, Ohio 45042
hanan@muohio.edu

Abstract

Social networking has emerged as the most common Web 2.0 technology utilized by students, faculty and staff. In this session we will explore social networking sites and discuss the following questions: What are the most popular social networking sites and how are these sites being used by students? What are the dangers to these sites and how might they impact both privacy and identity? How are these sites being used in education and how might they appropriately and effectively be used to support learning?

Note: This paper was not available when the proceedings were printed. The authors will provide handouts at the session or make them available on the web of via email.

More Cheap and Easy Options for Incorporating Technology into Your Teaching

Janet E. Hurn
Physics Department
Miami University
4200 E. University Blvd.
Middletown, Ohio 45042
513-727-3341
hurnje@muohio.edu

Lee Back
Director of Technology Services
Miami University
4200 E. University Blvd.
Middletown, Ohio 45042
513-727-3418
backld@muohio.edu

This paper will serve as an overview of the tools we will be presenting at the conference. It may not be all inclusive as tools may be discovered after the date of this publication. An updated version will be distributed at the conference.

Collaboration Tools

The web has provided a platform for collaboration with colleagues, students, and friends. Students can interact with students anywhere and everywhere. These are some tools we have found that assist in collaboration.

del.icio.us

Delicious is a social bookmarking site. You can save your bookmarks from anywhere. You choose tags for the sites and then can view them via these chosen tags. You can share you bookmarks with others or even just a certain category. Give them the link and then will always see the latest versions of your bookmarks for that topic.

Link: http://del.icio.us/
Cost: free

Bubbl.us is a mindmaping tool. You can collaborate on projects and brainstorming through bubbl.us. It is simple to use and you can save your mindmaps. You can keep it online or print or save as an image. Students can use it to brainstorm a project.

Link: bubbl.us
Cost: free

Zoho

Zoho is an online suite of collaboration applications.

- Word processor, spreadsheet, presentation
- Notebook
- Planner
- Chat, e-mail
- Projects
- Invoice
- Meeting
- Data bases

Link: http://zoho.com/
Cost: free for basic functionality

Produce digital stories or doodles that can then be commented on by others. Easy to use and comments can even be phoned in. This can be used to present class projects and have others comment on them. Creativity is the limit here.

Link: http://voicethread.com/
Cost: Free for limited functionality.

Slideshare is another great way to share student projects. Slides can have narration or not. They can also be shared publicly or privately. It works with PowerPoint. Also has some very interesting presentations that one might find useful.

Link: http://www.slideshare.net/
Cost: free

File Management

Jungle Disk

Jungle Disk is an application that lets you store files and backup data securely to Amazon.com's S3 ™ Storage Service

- Only pay for what you store.
- Safe and secure from viruses and other disasters.
- Available anytime and anywhere.
- Space is unlimited.
- Only pay for space you are using.

Link: http://www.jungledisk.com/
Cost: $0.15/gigabyte and a small transfer fee. See site for details.

Senduit

Transfer large files that are less than 100MB simply.
Link: http://www.senduit.com/
Cost: Free

TRUECRYPT

This is a free open-source disk encryption software for Windows Vista/XP, Mac OS X, and Linux.

- Encrypt flash drives
- Encrypt hard drives or parts of hard drives

Link: http://www.truecrypt.org/
Cost: Free

BCWipe Software Family

This software allows you to truly delete files from your hard drive or completely wipe clean the hard drive.

Link: http://www.jetico.com/bcwipe.htm
Cost: $39


Videora Ipod Converter

Videora iPod Converter is a free iPod video converter that converts video files from other formats to the Ipod format that can be played on any Ipod.

Link: http://www.videora.com/en-us/Converter/iPod/
Cost: Free

Productivity

jott Beta Get simple back.

This is a simple but very useful tool. It enables you to call in a message to yourself or others. It then converts it to text to be sent to your phone and or your e-mail. It is great when you get that brilliant idea in the car on the way to work.

Link: http://jott.com/
Cost: free

Podcasting

LecShare

This simple software can be used to produce podcasts from PowerPoint. The output can be

- MPEG-4 (podcasts)
- Quicktime
- HTML
- Microsoft handouts

Link: http://www.lecshare.com/
Cost: $69

PodProducer

This is free software to make audio podcasts. It is simple and fairly easy to use.

Link: http://www.podproducer.net/
Cost: free

This software helps to produce the RSS feed XML document you need to produce your own podcast.

Link: http://www.podifier.com/
Cost: free

Collaborative Notetaking in Class with the Tablet PC and DyKnow

Fred Jenny
Instructional Technologist
Grove City College
100 Campus Drive
Grove City, PA 16127
724-458-2071
fjjenny@gcc.edu

Abstract:

DyKnow (www.Dyknow.com) is a Web-based presentation distribution system that features a number of faculty-student activities. Grove City College (GCC) is in its 13th year of a 1-1 laptop program, and its fourth year with tablet pcs. GCC has also been conducting research on the use of the tablet pc by means of a Microsoft Research Grant using DyKnow. For the fall of 2007, the College purchased a campus license for Dyknow. This presentation will feature a demonstration of Dyknow showing some of its collaborative classroom activities.

Note: This paper was not available when the proceedings went to print. The author will provide handouts at the conference or via the web or email.

Circuits to Packets:
Moving to VoIP at a Small College

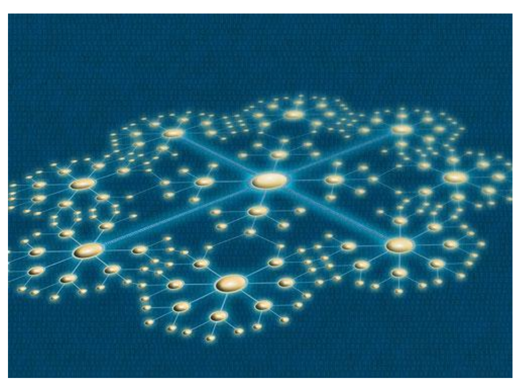
William Kunitz
Manager, Data Systems
Bowdoin College
9630 College Station
Brunswick, ME 04011
207-725-3408
wkunitz@bowdoin.edu

Project

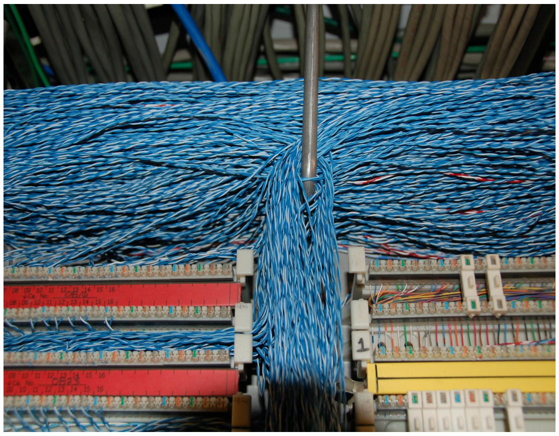
Replace aging Rolm switch with redundant Cisco IP technology by January 15, 2008

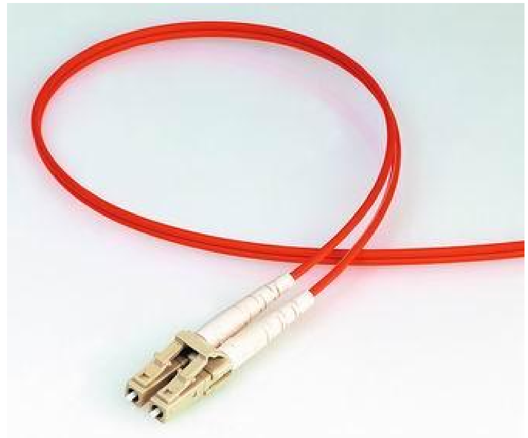
Our Dream:
To go from this … …to this

From circuit switching… …to packet switching

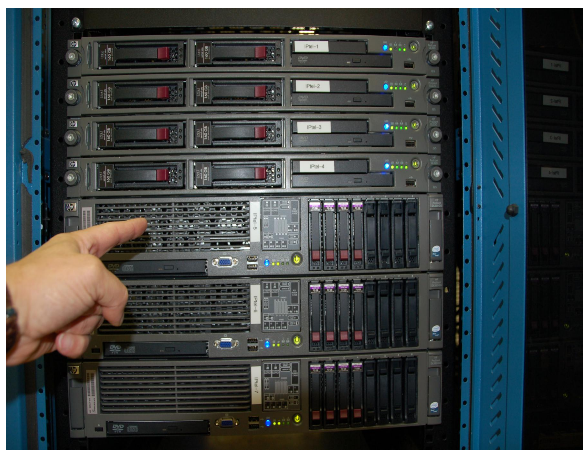


From copper… …to fiber





From big iron… …to small, powerful servers



What this actually means

We were asked to convert an entire telephone system between July 9, 2007 and January 18, 2008 and do it with as little disruption to the college community as possible. We had to:

- Build a new secondary equipment room in the building with our phone switch (Appleton Hall)
  - Racks
  - Power
  - Climate control
  - 2-200 pair; 1-50 pair cabling from switch room

Rack servers, T1 gateways; analog gateways; power injectors; power management; KVM
Crosswire to switch room

- Install new equipment in equipment room in Main IT center (Hubbard Hall)
  Rack servers, T1 gateways; analog gateways; power injectors; power management; KVM
  Add cabling from main room to alternate room in Hubbard
- Install additional batteries in 80 equipment closets around campus
- Swap out 80 non-PoE switches for 3750s w/ PoE
- Complete a port audit for 15,000 ports across campus
- Purchase and build lab servers for testing
- Load software in servers
- Interview all departments re: phone use (extremely important)
- Deal with power and data issues
- Manage VLAN and firewall issues
- Install 1900 phones in offices, labs, dorms
- Remove old phones (not an easy task)
- Move analog phones, fax machines, modems to new system
- Arrange to move and install new trunk lines
- Arrange to move DIDs from old system to new server
- Provide data for PS/ALI db
- Purchase a half-exchange for student lines
- Train and support faculty and staff

The (Principal) Players

We were fortunate that we had an excellent group of people to work on this project. The core group included:

- Project Manager
- Lead Telecom Technician
- Network Manager
- Telecom Manager
- Help Desk Manager
- Security Manager
- Data specialists
- Lead integration engineer
- 3 integration specialists (contracted)
- Bowdoin Technical guru
- Logistics Person
- Systems specialists

Cast of Thousands

In addition to the core group, we brought in the entire IT staff, members of the Treasurer's office, students and even a local moving company in as needed.

We also had an Advisory group consisting of representatives from Security, Residential Life, Admissions, Communications and the Academic Dean's office.

Deployment Process

We began with a small group of 'early' adopters. Unfortunately, we chose some high profile folks. That turned out to be a mistake as the leading edge of the installation was, well, ragged.

The deployment process consisted of:

- Interviews with administrative and academic departments (~40)
- Developing a scheme for marking analog phones
- Setting deployment and cutover schedule (with integrators)
- Setting training schedule
- Arranging for contract integrators to be here for cutover dates

Typical (early) week

Because of the compressed rollout schedule, we had to accomplish several parts of the process simultaneously on a rolling basis:

- Entire week: Interviews for those being deployed two weeks hence
- Monday through Thursday: training for this week's group
- Monday through Thursday am: deployment of phones
- Wednesday: send out reminders to following week's group
- Thursday pm: final clean-up for cutover
- Thursday evening: Cutover; walk-around
- Friday: post cut support

'Floating' Training Lab

We built a training lab consisting of twelve phones, a 3750 switch and some AV equipment. This was moved among two locations at opposite ends of the campus to accommodate various groups. It was on the production system in a separate calling space. Average sessions had nine participants. Entire IT staff was trained first.

What could possibly go wrong?

As with any project, unforeseen problems are the norm. This project had a tremendous number of moving parts and virtually every one suffered a hitch at one point or another:

- Cisco sent IBM machines instead of HP
- Cisco sold us licenses for Mobility but had no software for the devices we use
- Cisco back ordered 800 phones even though they knew three months in advance of the need
- Failures in new equipment – power supplies; components not seated properly
- Our TelCo failed us on several fronts – are in the process of changing companies

- Complications trunking back through the Rolm system
- Pre-made cables came in mirror images of what they should have been
- Three switches (primarily the 4506s) failed to provide PoE and had to have blades replaced
- Had to reconfigure phone rollout and rewire one dorm on the fly
- Mobility server puts out two character state name; VeriSign wants full state name

Mistakes *I* made

Many of the mistakes I, as a project manager, made had to do with truncating or eliminating standard PM practices to accommodate the compressed timeline. Others had to do with assumptions that turned out not to be accurate:

- Assuming Integrators were doing more early-on (great once they got engaged)
- Assuming Cisco had their act together
- good equipment
- lousy logistics
- unbearable bureaucracy
- impossibly complex relationship between Cisco and their distributor, Ingram Micro
- Not enough internal meetings
- Not enough timely communications with campus
- Didn't make a key change in a task assignment until almost too late
- Didn't press stragglers hard enough (too nice?)
- Didn't bring the rest of IT in early enough (responded wonderfully, when brought in)

…and still…

And still, the project was a success: everything – but the port audit - got done! This included two sets of redundant servers; a set of lab servers, extensive infrastructure work, 1,800 new phones plus analog, emergency and fax phones.

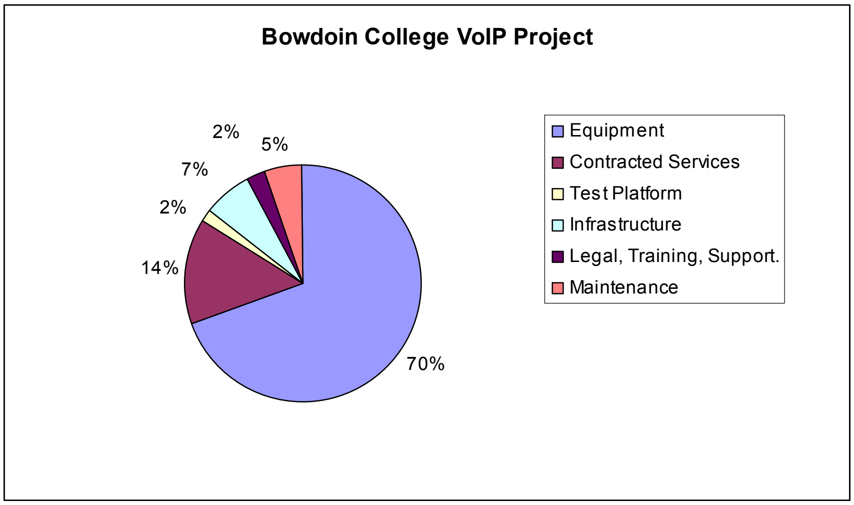
- Target date for deployment: January 14, 2008; actual finish date for deployment: January 18, 2008
- On budget without having to go to contingency funds

Benefits

- Full caller ID, in and out
- High quality, full duplex speaker phone
- Full 911 compliance with state of Maine regulations
- Ability to make and receive multiple calls on each line
- Intuitive user interface: redial, directories, forwarding, etc.
- Voice mail privacy for students; used to share
- Compliance with institutional privacy policies re: caller ID
- Full redundancy (server and location) for all components (except IPCC)
- Call trace and full call detail to track nuisance and threatening calls
- Uses robust fiber network

- Convergence of voice mail and email
- Positioning for future innovations

Cost Distribution



Remaining Issues

As of this writing (April, 2008) work remains on a few items:
Presence and Mobility

- Populating the PS/ALI database – a victim of changing phone companies
- Unity and Exchange – firewall issues between servers
- Full port audit
- Still moving analog lines
- Fax and modem issue

Green Computing – It IS Easy Being Green

Tom Marcais
Academic Computing
Sweet Briar College
Sweet Briar, VA 24595
(434) 381-6542
tmarcais@sbc.edu

Abstract:

Colleges and Universities are undertaking a recent trend toward becoming less wasteful of our natural resources. Unfortunately, computers often have a negative impact on our environment. Yet, there are many easy things we can do to reduce the carbon footprint of our technology. The ideas presented in this session will not only make your institution more ecologically responsible, but can also drastically reduce operating costs. The session will focus on specific examples of how Sweet Briar College is actively pursuing green computing techniques, such as: a CD/DVD recycling program; power management settings; energy conscious purchasing decisions; and much more! Time will be left at the end for questions/discussions.

Introduction:

Think Pink - Go Green! (SBC's school colors are pink and green)

Sweet Briar College is committed to play an active role in the fight against global warming. President Muhlenfeld signed the American College & University Presidents Climate Commitment on January 16th, 2007, which promises to take immediate steps to move toward becoming a carbon neutral institution as well as plan and implement changes in the future that work toward the same goal. It is important to keep in mind that you can make a difference when it comes to issues such as energy conservation and global warming. Technology is an important part of our life, but it is also a constant strain on our energy grid. However, there are ways to reduce the amount of burden our technology puts on our resources. Academic Computing is already implementing many of the suggestions below to reduce our dependence on energy. Why not see how many of these ideas you can follow to help your campus be as green as possible?

Enable Power Management on Your Computer

When a computer is turned on, it's draining power (whether you're using it or not). The operating systems of all modern computers have built-in energy saving settings that you can configure to manage your computers power consumption. Regardless of what operating system you are using, you want to make sure you have your computer set to do the following things:

- Have the energy saving settings active
- Have the display/monitor set to turn off after a specified period of inactivity (We recommend 15 minutes or less)

- Have your hard drive set to turn off after a specified period of inactivity (This should be a longer period than your display, and usually a good setting is 1 hour or less)

Here are the ways you access your energy settings for the 2 most common operating systems used on our campus:

Apple OSX - Access your system preferences by clicking on the Blue Apple in the upper left of your screen and choosing "System Preferences". Once there, choose the "Energy Saver" Preference, and adjust your settings following the guidelines described above.

Windows XP - Access your control panel by clicking on the Start Menu and choosing "Control Panel". Once there, click on the "Performance and Maintenance" category. Then, choose the "Power Options" control panel. At this point, adjust your settings following the guidelines described above.

Why is power management so important? Well... by making these simple adjustments, you can reduce your computer's energy usage by over 80%. That's a savings of almost $50 a year. If all of our students on campus used power management settings on their computers, it could eliminate 250 tons of carbon a year from entering the atmosphere. It takes 66 acres of trees to process that much carbon dioxide.

Turn Off Your Screen Saver

Did you know that running a screen saver year round on a computer is about the same as leaving a 100-watt light bulb on all year long? It costs you about $80 per year in electricity and releases over 1350 pounds of carbon dioxide into the atmosphere. We know that some of you really love to watch those fascinating Windows flying toasters... but is it really worth the cost? Besides... if you're following our suggestions above, your computer display should be turning off after 15 minutes of inactivity anyhow!

Turn Off Your Computer at Night and on Weekends

Even the most efficient settings with power management still consume some energy. So, the best thing to do is turn your computer off when you know you won't be using it for an extended period of time.

Myths:

Turning off your computer will shorten its life span. Although this may have been true in the early days of computers, this is no longer the case. Mechanical components, such as hard-disks, have been manufactured to high quality standards enabling them to easily endure the strains of starting and stopping. Your computer is much more likely to become obsolete before it experiences any sort of harm from being turned off during periods of inactivity.

Turning your computer off uses more energy than leaving it on. While it is true that there is a slight surge in power when a computer is turned on, it is a minimal drain of power. In fact, if your computer is left on for over 10 minutes... you've already used more power than that surge takes up. So... when you go to sleep, turn off your computer. You'll be saving energy.

My computer's safer being left on at night, because that's when I run automated updates. You certainly should be running automated updates for your operating system, anti-virus software and spyware detection software. However, when your computer is left on in the middle of the night... it also may be vulnerable to any hackers on the internet that want to use your computers idle processor for their own devious purposes. By turning off your computer, you remove it from the network for that period of time, reducing your exposure to unwanted attacks. It's best to run your automated updates at another time during the day when you expect that you will not be using your computer (such as lunch time, or while you're in class).

Turn off Printers, Copiers, Scanners & Peripherals When Not in Use

Just like your computer drains power... so do your peripherals. Think about everything that's connected to your computer. It all takes energy to run. Here's some suggestions for the most common peripherals:

Printers/Copiers - If you're using a laser printer in a shared office location, turn the printer off during the evenings and weekends. During the daytime, make sure it is using Power-save settings when it is idle. If you're using an inkjet printer that is connected only to your computer, turn it on only when you're planning to print something, and turn it off when you're finished.

Scanners - Most offices with scanners only use the scanner on an occasional basis. Keep it turned off until you are ready to use it. Speakers - A set of computer speakers with a subwoofer can use 10-15 watts of electricity an hour. Keep the speakers turned off when not in use.

Laptop Power Adaptors - Did you know that your laptop power supply uses energy even when your laptop isn't connected? Unplug the power supply when your battery isn't charging (this goes for any type of charger, including those for PDA's, iPods, and cell-phones!)

Time-saving Tip - Plug all your peripherals into a single power strip. Then, turn the strip off when you are done working on your computer for the day.

Don't Turn Equipment on in the Morning until you Need it

Obviously, if your computer equipment isn't turned on, it isn't using energy. Do you really want to be reading your e-mail before you've had your first cup of coffee anyway? Wait until you actually have to use your computer before you turn it on in the morning.

Buying Equipment

- When you are looking to purchase new equipment, make energy conscious decisions. Things to keep in mind include:
- Make sure the products are Energy Star Compliant.
- When purchasing monitors, keep in mind that an LCD (flat-screen) monitor uses about 40% less energy then traditional CRT style monitors.

- Buy the smallest size monitor you need. Sure, a 21" computer monitor would be nice... but do you really need it for your work? Getting a 17" or 19" would save energy.
- Consider purchasing a laptop rather than a desktop. They consume considerably less energy than a desktop (as much as 50% less!).
- Research the company's environmental policies (Provided in the reference section are links to some of the most common manufactures of equipment used on our campus; Apple, Dell, Epson, Hewlett-Packard)

Reduce Paper Use

Did you know that every ream of paper takes about 6% of a tree to manufacture? Just our computer labs on campus go through at least one tree's worth of paper every week. We notice that half of the material printed just gets left unclaimed, and ends up in the recycle bin. You can help reduce this waste by following some of these simple steps:

- Use "Print Preview" to review your documents before printing them.
- When you're in the "print preview" mode, check to see if you really need ALL the pages of your document printed. If you only need the first 2 pages, rather than choosing print "all" for the page range, choose to print pages from 1 to 2.
- When writing papers, use the smallest size text font that you can comfortably read.
- Archive your email by saving it to a folder, rather than printing it.
- Think twice before printing something from the web... consider bookmarking the page instead and/or emailing yourself a link to the page.
- If you do need to print a website for the text content, consider copying and pasting the content to a word processor, where you can edit out unwanted content and reduce font size.
- If you're printing out Powerpoint presentations, choose "handouts" from the Print What menu of the print dialog box. Then, you can print multiple slides on a single page.
- Printing multiple copies of documents is more energy efficient at the duplicating center. If you need more than one copy of any material, take it to duplicating rather than printing multiple copies on a printer.

Reduce the number of CD's / DVD's you use

CD's and DVD's may seem like convenient ways to store data, but they also have a large impact on our environment. CD's/DVD's and their jewel cases are made primarily of a poly-carbonate plastic, which does not break down quickly in our landfills. They also both contain layers of Aluminum, which some experts believe may be toxic at certain levels. There are billions of CD's/DVD's produced every year. Do we really want this much waste to end up in our landfills?

Ways to help reduce this problem include:

- If storing large amount of data... consider using a single DVD, rather than multiple CD's. A DVD can hold over 6 times the amount of Data than a CD can. E ven better... for temporary storage, use a USB flash drive. These devices are great ways to share files from computer to computer. They're quicker than burning a CD, and are reusable.
- Or... consider saving your files to a shared-network space on campus
- Buy CD's on spindles if you don't need jewel cases for them
- Instead of buying music CD's... purchase music online from places like the iTunes music store, and transfer them directly to your iPod or other MP3 player.
- Did you know that CD's, DVD's and their cases are recyclable? Not many places in the country have the facilities to recycle these products... but we found a company called The CD Recycling Center of America, located in New Hampshire. We take any old CD's, DVD's that are collected on our campus and ship them to be recycled, preventing them from ending up in our landfills. We've set up collection points on our campus in all the computer labs, the library and the post office.

Recycle Ink Jet Printer Cartridges, Cell Phones, Rechargeable Batteries

Thanks to the efforts of Best Buy, it is extremely easy and convenient to recycle ink jet printer cartridges, cell phones and rechargeable batteries. Every Best Buy store in the United States has free recycling kiosks for these items. At SBC, we have set up a central collection point for these items, and our Director of Media Services brings the collected items with her during her purchasing trips to the store. There is absolutely no cost to our college, and the environment benefits.

Recycle Ideas...

If even one person on campus follows some of these suggestions, our world will be a better place. But imagine if everyone on campus was able to implement some of these changes. That's where you can help. Spread the word about this site to your friends, colleagues and families. If you see them wasting resources... talk to them, and explain the importance of computing in an ecologically conscious manner.

References:

Best Buy Recycling - http://69.12.29.100/crnew/recycling.asp

Apple Computer – http://www.apple.com/environment

Dell Computer – http://www.dell.com/content/topics/global.aspx/corp/environment/en/index?c=us&l=en&s=corp&~ck=anavml

Epson – http://www.eea.epson.com/portal/page/portal/home/about_eea/Co-Existence

Hewlett-Packard – http://www.hp.com/hpinfo/globalcitizenship/environment

CD Recycling Center of America – http://cdrecyclingcenter.org

GreenDisk – http://www.greendisk.com

Implementing a virtual server network: It's more than just hardware, software, and savings--- It's about "going green"

Stephen McTigue
Roanoke College
221 College Lane
Salem, VA 24153
mctigue@roanoke.edu

Abstract:

During the past year Roanoke College has implemented a virtual server network that includes HP ProLiant BL460c blade servers, an iSCSI SAN and VMWare ESX server 3.0. This presentation will show how implementing this system was expensive initially when compared against purchasing standard servers; however the return on investment has been extremely short. The new system has allowed the college to quickly deploy new servers without any additional cost; deploy the systems within hours instead of weeks; reduce power consumption; reduce the need for network resources; and offer a highly available network with little downtime. I will discuss the concerns and processes we experienced in implementing our system. I will also demonstrate how our blade servers and virtual server network is managed and how it will be used to expand our network services in the future. Finally, I will explain how all of this has contributed to our college "going green".

Note: This paper was not available when the proceedings went to print. The author will provide handouts at the conference or via the web or email.

Creating Virtual Tours

Beth Moore
Assistant Professor
Education Department
Franklin College
101 Branigin Boulevard
Franklin, IN 46131
(317) 738-8254
bmoore@franklincollege.edu

Vicki Mast
Technology Trainer
Information Technology Services
Adjunct Professor
Education Department
Franklin College
101 Branigin Boulevard
Franklin, IN 46131
(317) 738-8289
vmast@franklincollege.edu

Introduction

During this session, you will discover how to implement a virtual tour into your curriculum. This project was designed for senior elementary majors enrolled in Social Studies Methods for Elementary Teachers, who will be teaching in grades K-6. This project could easily be utilized in K-Higher Education settings. Some questions we will address are:

- What are virtual tours?
- Why use virtual tours?
- How can virtual tours be utilized in an educational setting?
- How an educational virtual tour is designed?
- How to evaluate existing virtual tour sites for validity, credibility, and accuracy?

This project helped each individual student to further develop content and pedagogical skills using the Indiana Standards and various technology tools to create a virtual tour as a means of bringing a destination in Indiana, the United States, or the World into the classroom. Like a "real" field trip, a virtual tour can be either a meaningful learning experience that helps students acquire content and master important processes or an excursion with little educational values. A discussion will occur that relates the positives and negatives of such an endeavor. Virtual tours are becoming a valuable asset to the classroom teacher, due to funding issues, transportation, and other limitations places on taking actual field trips outside the school environment. Virtual tours provide flexibility in design in aligning curriculum to the national/state standards. These elements will be further discussed during our session, along with discussion of our assignment with examples of students' work. In utilizing virtual tours there are unending possibilities of places a classroom can visit around the world!

You will have access to the materials, tools, tutorials and resources to create your own virtual tour, in addition to having concrete examples via our web pages:
http://www.franklincollege.edu/pwp/vmast/Virtual_Tour/01_Index_Virtual_Tour.html

Teaching Audio Recording in College: Innovation in Teaching Music

Scott L. Phillips
Assistant Professor of Music
Transylvania University
791 Tyrus Ct, Lexington, KY 40515
859-273-7367
sphillips@transy.edu

In November 1878, Thomas Edison invented a machine that could record sound. He hoped to use it to relay telegraph messages and to automate speech for transmission by the telephone (which had been invented just 18 months earlier). His invention was called the phonograph, and involved a tinfoil-wrapped cylinder upon which sound vibrations could be engraved then played back (see Figure 1). By the mid-1880s, Bell, Tainter, Berliner, and others were employing dozens of scientists in extensive labs to work out variations on Edison's designs. By the early 1900s, recordings of world-renowned musicians were being produced in studios the size of warehouses and painstakingly reproduced for distribution. By 1910, recording music had become a serious and lucrative business for those who could muster the capital necessary to become involved. For the next 90 years, the recording, editing and distribution of music remained the exclusive business of professionals who had access to expensive recording equipment and expansive studios.

In the late-1980s, some recording studios began to experiment with digital audio processing. The various characteristics of sound vibrations were converted to binary words by the computer. As greater bit depths became available in the 1990s, audio could be better represented digitally, but computers with the highest available processing power and the largest caches of memory and ram were necessary to take advantage of this technology. As in the earlier days of the recording industry, only large, well funded studios could afford the technology to take advantage of these new advances (see Figure 2).

In the past five to seven years, personal computers have become far more powerful and less expensive. The large memory and fast processing speeds required to deal effectively with digital audio are now available on nearly all consumer computers. Additionally, sound cards and other audio interfaces have become increasingly less expensive and easy to use. Several software titles for dealing with digital audio are also now available for free or at little cost for those individuals wishing to experiment with recording their own music. *Garage Band*, for example comes loaded standard on every Macintosh computer, and *Audacity* can be downloaded for free by PC users. Even Digidesign, whose hardware and software are used in nearly every professional recording studio in the world, has developed two affordable versions of their powerful *Pro Tools* software. As a result of these recent developments, anyone interested in creating professional-level recordings can do so.

The recent developments in audio recording present new opportunities for music instruction at the college level. Students are entering our colleges having experimented with audio recording technology. For some of these students, the computer has been the gateway through which they have been introduced to music. They may even consider themselves musicians, but may not have ever participated in a school band, orchestra, or choir, or have taken music lessons. Colleges that offer courses in audio recording provide a place for these students to gain a better understanding of the tools they have been using. Also, through these courses, students with less formal music training can come to realize what gaps exist in their musical background and they can be encouraged to become involved in more traditional music courses and formal study.

The recent trends have provided opportunities for software companies as well. Many companies who catered to professional clients exclusively are beginning to develop less expensive as well as educational offerings in their product lines. One software company whose recent activities illustrate this change in focus is Avid Technologies. Avid first became a presence in the mid-1980s with their professional video editing software. This was used almost exclusively by the film and television industries. In 1984 Avid acquired Digidesign. Like the Avid offerings, Digidesign's audio editing software catered to the largest and wealthiest studios and clients. However, recently they have developed the "LE" and "m-Powered" versions of their Pro Tools software (see Figure 2). Whereas a full Digidesign console can cost tens of thousands of dollars (see Figure 3), an LE system can cost as little as $500. This price point certainly puts the software within the reach of individuals and schools. Another indication of Digidesign's interest in the education market is their 2006 acquisition of Sibelius Inc. Sibelius, whose title product is music notation software, also specializes in educational music software for children and teens. The Sibelius educational offerings and network are so well developed, that within the Avid organization, the Sibelius educational marketing will soon be responsible for educational development sales for all Avid products. This shift towards the educational market underscores the potentially fertile ground that these companies see in the education sector.

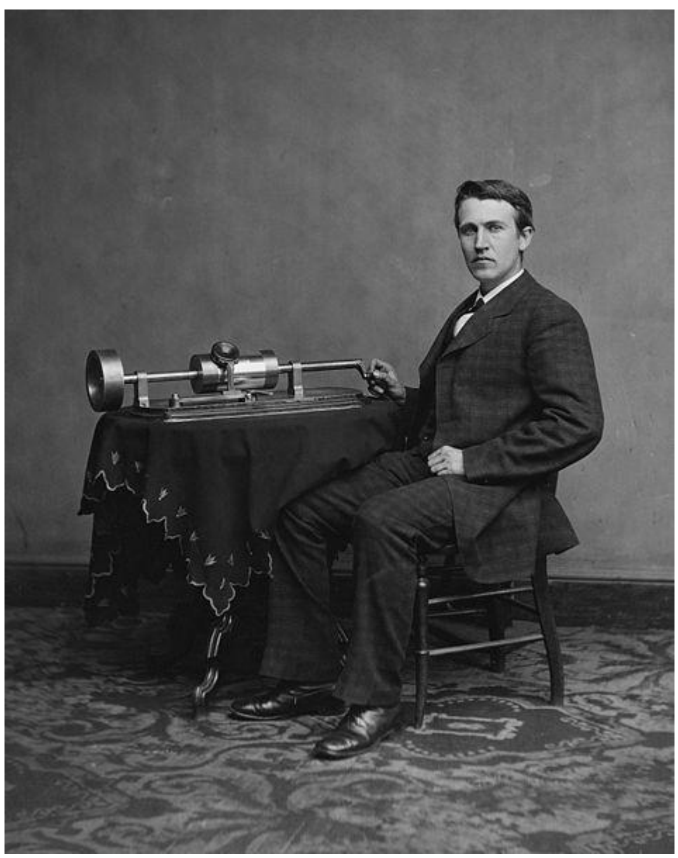


Figure 1. Thomas Edison with his Phonograph, April 18, 1878.

Figure 2. Pro Tools M-Powered box and screen shots.

Figure 3. A digital recording station.

i>clicker: Overview of an Easy and Effective Classroom Response System

Mark Poore
Roanoke College
221 College Lane
Salem, VA 24153
poore@roanoke.edu

Abstract

After evaluating and testing several classroom response systems in 2004-2005, Roanoke College adopted i>clicker for its ease of use and low cost. “Clickers” are now used in several courses across many disciplines with a growing number of faculty utilizing this technology each semester. Best of all, i>clicker requires very little support from IT beyond a 15 minute orientation session.

This session will demonstrate the i>clicker classroom response system and describe how it has been used at Roanoke College. From basic opinion polling to quizzing and participation grading, the i>clicker system is worth a look if you’re in need of an easy, affordable solution that requires very little support.

Note: This session will be a powerpoint presentation without a paper. The author will provide handouts at the conference or via the web or email.

IT Disaster Recovery Planning

Bill Ramsay
Information Systems & Services
Berea College
CPO 2208
Berea, KY 40404
859-985-3342
bill_ramsay@berea.edu

Introduction

As higher education business and learning processes have become more and more dependent on computer technology, protection of those resources from risk has become a major challenge for college and university IT departments. The challenge has become more complex as the technology has become decentralized, involving nearly every person in an institution in computer operations to some degree and creating many possible points of failure. IT professionals logically become wary, always looking over the shoulder for the inevitable. What risks could break down the technical infrastructure and how would that affect the operation of offices and classrooms? How prepared are we for the possibility that a physical disaster, equipment failure, vandalism or operator error could compromise data integrity, data confidentiality or processing availability? How high is the risk? Could we recover? A formal disaster recovery plan can provide a foundation for continually improving management of risks, preparedness and recovery resources.

Disaster planning can be broken down into four focus areas - risk management, business continuation strategies, preparedness activities and recovery planning. A well-rounded plan will address all four areas and will be periodically reviewed to maintain accuracy and to identify opportunities for improvement. This paper will discuss each area and then present a plan document outline that the reader may find useful in beginning his or her own planning project. It should be noted at the outset that our subject is disaster recovery planning such as an IT department would logically undertake. We will endeavor to help the reader understand the elements of a sound risk management and recovery planning effort. We are not attempting to address the broader issue of business continuity planning in which the entire institution would review threats and contingencies for information and communication technology along with risks to other infrastructure, financial or personnel resources.

Terminology

To reduce the risk of confusion, we'll start by defining some terms that may be unfamiliar to some or that may be used in this paper in a particular way.

Disaster recovery planning. Establishment of plans and strategies that would facilitate recovery from damage to information and communication technology infrastructure within a time frame that the business could tolerate.

Business continuation strategies. Establishment of plans and strategies that would allow critical business functions to continue during a recovery period in which information and communication technology infrastructure is impaired due to a disaster event.

Disaster event. Any occurrence which results in significant disruption to business and/or learning processes which are dependent upon information and communication technology infrastructure.

Information and communication technology infrastructure. The computer and networking equipment, software and procedures that support the business activity of an organization.

Recovery Resources. Documents, software installation media, data backup media and other items kept on hand, preferably in protected storage, which would be needed by technicians charged with rebuilding damaged systems on replacement or interim hardware.

Hot Site. A set of facilities and equipment kept on standby and ready for use as an interim processing location by an organization recovering from a disaster event.

Cold Site. A space provided with network cabling and power into which replacement or interim equipment could be installed for use as an interim processing location by an organization recovering from a disaster event.

Recovery Time Objective (RTO). The goal for elapsed time from declaration of a disaster event to restoration of essential operations that has been agreed upon by an organization as an acceptable parameter for disaster recovery planning.

Risk Management

So what are the risks? What can we do to prevent them? What can we afford to do? What should the priorities be? A review of possible risks and consequences is a good place to start our planning. While we are doing so, we will do well to identify which are more likely to occur and which will do the most damage to our operations. Then when we think about risk reduction strategies, we can set higher priority on risks and consequences that would do a lot of damage and are more likely to occur. There are always other areas to consider, but we'll discuss ten risks and four areas of possible loss. Risks include infrastructure failure, hardware failure, accident or vandalism, cyber attack, fire, water damage, software failure, loss of access, operator error, and knowledge loss. Consequences may include loss of data, loss of processing, loss of availability, or loss of confidentiality. Of course, every disaster is unique and a major disaster event such as Hurricane Katrina could cause problems in many areas. However, if we have examined each area separately, we will be more able to deal with them if they happen all at once. In addition, we need to remember that most of the disasters we will be called upon to deal with will be small, but many of our prevention and recovery strategies apply to all types of events.

<u>Risk – Infrastructure Failure</u>. A 2007 study reported that the most common cause of disruptive events among higher education institutions surveyed was infrastructure failure. Of the institutions reporting a disruptive event, 82% had experienced an electrical failure and 60% had experienced a failure of cooling or other environment control systems. In addition, 81% of electrical

failures and 57% of environment control failures impacted many business process or the entire campus.[1] The impact of environment control failure is well known to us at Berea College as we found a few years ago that when the server room cooling system failed, equipment began overheating within an hour or two, even in winter. During an extended electrical outage our backup power system was able to keep servers running for several hours, but they had to be shut them down because there was no backup power for the cooling system. Another area that may be overlooked is electrical circuit capacity. As equipment changes are made, loss of power due to circuit overload has been a frequent problem in my experience. Risk reduction strategies would include battery or generator based backup power systems, supplemental cooling systems for server rooms and network hub spaces, redundant cooling equipment, temperature threshold warning devices and buffer capacity in electrical circuits.

<u>Risk – Hardware Failure</u>. The study referenced above found that hardware failure was the second most common cause of disruptive events, reported by 72% of institutions. Breadth of impact was less than that of infrastructure failure, with 48% of incidents affecting many business processes or the entire campus.[2] Hard drives and power supplies are the most common server components to fail in my experience, but other components such as network interface cards and memory have also caused problems. Risk mitigation strategies include RAID disk configurations, redundant power supplies, redundant network interfaces, spare parts inventory and parallel servers with failover capability.

<u>Risk – Accident or Vandalism</u>. The most common accident reported in the 2007 ECAR study was cable cut – reported by 51% of institutions reporting a disruption and not surprising given that most college campuses consist of multiple buildings connected by lots of buried copper and/or fiber optic cable. Theft, which could be considered a form of vandalism, was experienced by 19% of institutions reporting a disruption in that study.[3] Prevention strategies include maintaining cable location maps, setting up redundant cable paths, requiring IT staff to be present at digs and establishing good access control mechanisms for spaces containing critical equipment.

<u>Risk – Cyber Attack</u>. The incidence of disruption by cyber attack reported in the 2007 ECAR study was equal to that of cable cuts, but the impact was lower with 48% of events affecting many business processes or the entire campus.[4] Cyber attacks would include virus outbreaks and denial of service attacks. Prevention measures to consider would include Internet firewall, antivirus software, network access control systems, intrusion detection systems and automation of workstation software updates.

<u>Risk – </u>Fire. While fire is not as high a risk as some other areas, the potential for widespread harm to infrastructure, equipment and personnel make it worthy of investment in prevention. Strategies include HALON or other automated extinguishing systems for critical spaces, alarm systems, and training of personnel in standard fire prevention practices relating to electrical cords, trash disposal, smoking, etc.

<u>Risk – Water Damage</u>. Roofs leak, pipes burst. I've never experienced a fire, but I have run into water problems here and there. In one incident in a past job, leaking air conditioner plumbing allowed water to build up under a raised floor and we didn't know about it until suddenly our phones stopped working. A water sensor under the raised floor would have alerted us to the problem before any disruption occurred.

Risk – Software Failure. Software bugs can corrupt data, present false information or break down processes. Software companies can go out of business or change policies and leave users with no recourse when problems occur or revisions are required to remain compatible with an operating environment. Disciplined software acquisition and change management processes, software maintenance upgrade contracts and source code escrow are strategies that can mitigate the risks.

Risk – Loss of Access. I recently attempted to pick up a family friend to attend an event and found several blocks around her apartment cordoned off by the police due to a gasoline spill at a service station. I heard a story from Hurricane Andrew in which company IT personnel rented a helicopter and landed on the roof of their building in a flooded area to retrieve backup tapes so recovery processes could be started at an alternate site. While we probably won't maintain a standby helicopter, we do need to think about where problems would occur if we could not gain access to some or all of our facilities. Options for reducing the potential consequences of access loss would include VPN services, avoidance of processes requiring an operator's physical presence, offsite storage of backup media and other recovery resources, and hot site contracts or reciprocal agreements.

Risk – Operator Error. People make mistakes - to err is human. Procedural errors, accidental file deletions, failure to perform data backups, and other operator errors constitute a risk within our information and communication technology infrastructure. With the expansion of personal computers as an integral part of institutional data stores and processes, the possibilities for operator error have increased. Automation of processes, process design that includes verification steps, documented procedures and central storage of "official" data files may help reduce the risks.

Risk – Knowledge Loss. One of the most challenging risks to manage is personnel turnover. Information and Communication Technology systems often require intervention by individuals with specialized knowledge, and if one or more of those individuals are suddenly unavailable due to a disaster event, a personal situation or departure from the staff, the systems may become inoperable. Documentation of system startup and shutdown procedures, configuration options and administrator passwords, cross training of staff and development of vendor partnerships may be considered as ways to manage this risk.

Consequence – Data Loss. A professor's hard drive crashes. He or she has not made a data backup for over a year, so valuable research data or curriculum development is lost and the time and money invested produces no return. How can we protect ourselves in the new world in which everyone is a computer operator and important data is stored in hundreds of locations? Provision of central data storage with sound backup and archiving processes can help. Relentless exhortation and training of PC users in data backup techniques can help, as can provision of PC backup processes that are easy to use. Some may want to consider enterprise backup software or Internet service that automates server and PC backups. Some data may be volatile enough and critical enough to merit maintaining a frequently or continuously updated parallel copy on another server or off site.

Consequence – Processing Loss. When technology infrastructure services are disrupted, processes are halted and delays in decision making or transaction processes can occur. Encouraging users to request information earlier than the last minute can reduce the impact of an interruption.

Developing standby procedures that allow transactions to be accepted for later completion is another useful strategy.

Consequence – Availability Loss. The data may be all there and the computers all running, but if the network is down or people can't enter their office building for some reason, decisions and transactions will be impacted. Designing systems with alternate methods of access and the same procedure design and operations schedule ideas noted in the previous paragraph may reduce the consequences.

Consequence – Confidentiality Loss. Recent incidents in the news of large quantities of social security numbers being exposed due to laptop theft have highlighted the possibility that a disaster event can have low impact on data, processing or availability but high impact on business due to loss of data confidentiality. Encryption of confidential data, good access security practices and training of PC users can be considered as strategies to minimize these losses.

Business continuation strategies

Once a disruptive event has occurred, even with the best of plans business as usual will not be possible for a period of time. It is important that we think about how business will be conducted during the recovery time, and how long that period can reasonably last. IT departments cannot develop detailed contingency procedures for other functions, but our planning effort can identify at least some portion of critical transactions and suggest approaches our colleagues might utilize. We also want to recognize that some systems are more urgent than others and those systems should be restored first. An inventory of functional systems combined with a thought process that identifies those that are critical can help guide the focus and sequence of our recovery efforts.

Recovery Time Objective. A disaster recovery planning strategy is based on an initial decision regarding how long the business could reasonably operate with significant breakdown to information and communication technology infrastructure. Could we operate for two weeks, or do we need capability to recover in two days? Are there some systems that need rapid recovery while others could wait for several weeks? Once a Recovery Time Objective is agreed upon and essential functional systems identified, backup procedures and recovery plans can be developed that would support the objective.

Functional Systems Inventory. Most classic disaster recovery planning literature recommends a detailed inventory of all functional information and communication systems. Starting with this inventory, we then identify the detailed technical infrastructure upon which each functional system depends. Then we rank the systems by importance and let that drive the risk management and recovery planning for the technical infrastructure components. The difficulty is that we will never get it done if it is that complicated. A simple list of major functional systems is achievable and adequate. Classifying systems as Essential, Important, or Convenient will give us a useful and attainable division to guide our recovery efforts. Accounts Payable might be considered essential because we have to pay our bills. A course management system might be considered important, but it is not essential because professors can continue to conduct classes for a week or two without it. A digital library resource server might be considered convenient because research plans can be rescheduled.

Interim Transaction Processing Plans. Within each major functional system, key high volume transactions can be identified for which interim processing procedures would be necessary during a disaster recovery period. IT analysts along with client department partners can readily identify and list those transactions and suggest a logical approach for interim processing from among the following options. The thought process involved in developing a best effort list will make staff more able to address all needed transactions in a disaster scenario.

Source Document Staging. Accept source documents such as admissions applications or transcript requests and stage them for later processing once the systems are available.

Paper Filing. Set up a temporary filing system so documents can be executed and/or accepted and filed for later retrieval as part of other procedures and ultimately for data entry once systems are available.

Manual Process. Electronic forms can be temporarily replaced with paper forms which can be routed for approval or other action and possibly staged for later data entry.

PC Process. A spreadsheet log may be used to collect transactions or record activity and later used to drive catch-up data entry.

Alternate Process. Sometimes an alternate process is already in existence that may be operational. For example, direct deposit may not be functional, but we could print payroll checks instead. Or our Accounts Payable system may be down, but we could hand write checks.

Alternate Location. Some transactions may become operational if moved to an alternate location. For instance, if the campus phone system is down, calls could possibly be made from home or from a mobile phone.

Preparedness Activities

What can we do to be ready for whatever happens? What would we need to know and to have on hand if we had to rebuild damaged databases or infrastructure? Preparedness activities involve maintaining an appropriate set of recovery resources and training users and IT staff in readiness and recovery procedures.

Recovery Resources – Data Backups. Data backup processes are the cornerstone of any recovery plan. Each functional system or database will have its own logical parameters for backup processing based on data volatility and value. The more volatile data is, the more frequently a backup copy must be made to support acceptable recovery quality. The more necessary data is to organizational functions, the more important it is to verify the validity of backup processes and to protect backup media from loss. Data which does not change, such as a photo archive set, can be copied to DVD or other media once and stored off site. Critical data which changes constantly may need to be maintained in full parallel at an offsite location. Most data will be somewhere in between. Each data backup medium has advantages, disadvantages and special considerations. Tape media ages and must be replaced every few years even if the data has not changed. CD or DVD media may not be readable on all recovery systems. Disk arrays may not be allowed into a commercial hot site or recovery center. Internet backup services may not be verifiable. A good disaster recovery plan will document the backup media types, refreshment frequency and locations for all functional systems.

Recovery Resources – Software Installation. When servers or PC's are lost in a disaster event, software will need to be installed on replacement equipment. Our recovery resource set needs to include original installation media or backups that would allow software configurations to be re-built. Use of server virtualization and hard drive imaging techniques can be a useful and time saving technique for providing software installation recovery resources. A complete list of these resources needs to be a part of the disaster recovery plan document.

Recovery Resources – Information. Rebuilding servers, software, routers, switches, etc. will require many configuration options to be set. We will not be able to rely on our memory for these options. Documentation, whether paper or electronic, of configuration options, passwords, Internet URL's, IP address schemes and other details must be a part of our recovery resource set. In a past technical job, I restored the operating system of an IBM AS/400 only to find that the tape was old enough to include an earlier system administration password which was no longer on record. Since that time, I keep a list of former passwords on file. Another set of information that will be needed is vendor contacts. In the time crunch of responding to a disaster event, a quick reference of vendor partner contact information would be very useful as part of the plan document or as a recovery resource.

Recovery Resources – Auditing. Disaster planning is of no value if we do not do what we plan. Periodic audits can verify that all listed recovery resources are found in their proper places. Results of these checks would be a logical exhibit to show in an annual financial audit which includes a review of IT practices. Testing of risk reduction systems such as uninterruptible power and alarm systems should also be a part of standard operating procedure. The disaster recovery plan documents should include a list of routine testing and audits planned and record the individuals responsible for following up.

Training and Communication. Disaster readiness is everyone's business, so a successful planning initiative will involve reminding everyone of the fact. I recommend that at least once per year, a reminder be sent to all personal computer users reminding them of their part in being sure data is stored in proper locations and is being backed up according to policy. All faculty and staff also need to know how to report a suspected disaster incident and how a response decision will be made. An annual reminder for folks who have specific responsibilities to maintain readiness or as part of a response can encourage them to read the plan and verify that audits, backups or other activities are happening. An occasional workshop or disaster mock-up event might also be helpful. The schedule for routine reminders along with training materials would logically be included in the disaster plan document or recovery resource set.

Recovery Planning

Planning ahead can save significant time and reduce the risk of false starts in a disaster scenario where time is likely to be very precious. Recovery events follow a common life cycle and thinking about the stages of that cycle in advance will help us if we are ever involved in an IT disaster recovery. We can also benefit from defining in advance who would be responsible for various aspects of a recovery sequence and by notifying those individuals and offering training to them.

Finally, we can test our plans, knowledge and recovery resources for adequacy and completeness.

Recovery Life Cycle. The recovery cycle documented in a formal disaster recovery plan cannot be a comprehensive task list or instruction set. It can be a useful guide to the detail planning that must occur to effectively coordinate a recovery effort. It will help participants to remember key areas that may otherwise overlooked in the crunch of a recovery scenario. Each disaster event is unique in its specific impact and recovery requirements, but a common set of considerations can guide the unique detail planning that would be required. Following is one way to look at the sequence of events that must occur in a recovery.

Incident Reported. Our planning needs to define and our communication needs to instruct faculty and staff how a suspected disaster incident should be reported. A practice I have seen used to good effect is to ask site security personnel to be the recipient of reports, and provide them with instructions on how to notify IT decision makers for follow-up.

Disaster Declared. A decision process is needed which evaluates and confirms a reported incident and determines if disaster recovery procedures need to be invoked. Once the decision is made, the recovery team will be notified and a detailed assessment can begin. A central location for recovery team work and meetings will likely be established. This stage will also include communication to faculty, staff, students, executive administration and public relations.

Safety Evaluated. Many disaster scenarios will involve damage to or contamination of a physical space. Before any IT personnel enter such a space to begin damage assessment or to perform recovery activities, safety professionals will need to evaluate the situation and determine whether access restriction is required and whether medical or rescue services need to be invoked.

Damage Assessed. As soon as is possible, a full report of infrastructure damage would be assembled by the Recovery Team and provided to the CIO/IT Director and the institution's executive administration.

Interim Transaction Procedures Invoked. Once damage assessment is complete, operational departments can be notified of the specific areas that have been disrupted. They can then set up and coordinate interim transaction processes.

Task Groups Established. Recovery Team members will assemble task teams to begin recovery of various systems or infrastructure segments, depending on what has been disrupted. Administrative and logistical support for the recovery teams will also need to be set up so they will be able to focus on recovery actions while others take care of placing orders for equipment, obtaining supplies, providing food, etc.

Detail Plans Completed. The Recovery Team and task groups will develop a detailed plan for acquisition of equipment and services, replacement equipment installation and recovery action steps. The plan must be reviewed and approved for necessary funding by the CIO/IT Director or the institution's executive administration, depending on the level of funding required. Communication to faculty, staff and students of the recovery plans and of progress as the recovery continues will be an important part of the plan.

Equipment and Services Procured. Unless a hot site contract is in place which provides access to standby equipment, procurement of replacement equipment will be a critical path activity in the recovery plan. Rapid identification of equipment to be purchased, availability of vendor contact information among the recovery resource information documents, and assignment of administrative support personnel to aggressively follow up on the acquisition process will be important to minimizing the time required. Services may also be required due to technical expertise not being available among local staff or in order to augment staff capacity and accelerate the recovery. Coordinating approval of statements of work and service contracts will be a part of the acquisition activities. Through all this process, it is important that careful records of expenses and copies of source documents are kept to support possible claims against insurance policies.

Restoration Site Determined. As resources are assembled, a decision will need to be made regarding the location for setting up restored essential services. In many scenarios, a repaired or partially repaired original site will be used. If a hot site or cold site contract is in place, the use of those facilities may be preferable. If the original site is unusable, some alternative site plan will be required. If an alternate site is set up, provision must be made to move salvageable equipment to the alternate site as well as to deliver replacement equipment there. A related possibility is that temporary work spaces for personnel may need to be established so they can operate business functions once essential services are available.

Essential Services Restored. Recovery efforts will focus on restoration of those services identified in the plan as essential. Once production operation is restored, data backup procedures will need to be resumed. Backup media utilized for recovery need to be returned to offsite protected storage as soon as possible. Service users can then be informed of system availability and they can resume normal processing procedures and begin any required catch-up transaction processing.

Normal Operations Restored. If alternate processing or work sites have been set up. Activities will be required for completion of repairs to original sites and relocation of equipment and processing to the repaired sites. As non-essential services are restored, further communication and business procedure restarting will be needed. Long range plans may have to be set up for rebuilding some services that are lower priority or that cannot be put in place for some reason before normal operations have resumed. An official decision and announcement will be in order, declaring the end of disaster recovery operations.

Follow-up Activities Completed. Insurance claims and regulatory reporting may need follow-up after normal processing is restored. A review of the disaster recovery plans to make revisions that account for what was learned from the incident will be useful.

Recovery Organization. Preplanning the assignment of responsibilities for aspects of a disaster event response is an investment that can save time during a recovery. Typically the recovery team will be chaired by senior IS leadership and composed of members of IS organization assisted by a few others. Berea College's recovery team includes the CIO, Network Services Coordinator, Director of Administrative Systems, Computer Center Director, Instructional Technology Coordinator, VP of Finance, SGA President, and an Administrative Assistant. [5] Berea's plan also documents the names and phone numbers of individuals currently in each position.[6] Recovery team members would assemble task groups for each of their areas gathering the expertise required by the particular scenario being addressed. The disaster recovery plan will also document the areas of responsibility for each recovery team member. Responsibilities that need to be addressed include actual recovery of various technology areas, communication with the campus community and the public, and logistics of order placement and recovery task group support.

Recovery Testing. Short of experiencing a disaster, the best way to find ways to improve a disaster recovery plan is to test all or a part of it. The simplest way to provide for testing is through a hot site contract which includes blocks of test time using the standby equipment. Most small schools will not be able to afford a hot site contract, though. A minimal approach would include occasional verification that data could be restored from backup media. At Berea, we maintain a log of incidents in which a specific file restore is requested due to accidental deletion or for historical research. The log is presented as evidence of minimal testing of the recovery plan. We'd like to do more, but have not yet found a way we're willing to commit to.

Continuous Improvement. An annual review of the disaster recovery plan can be a sound basis for continuous improvement. Risk reduction strategies that have been considered but not implemented can be documented in the plan and reviewed each year for possible implementation. Testing strategies can be reconsidered. Preparedness actions can be audited and documentation of equipment, contacts and backup procedures can be brought up to date.

Sample Disaster Recovery Plan Outline

I. Executive Summary – Outline the reasons, goals, recovery time objective, and basic approach to the planning.

II. Overview – Discuss more completely the rationale and philosophy behind the plan, report infrastructure components not covered by the plan, list the major systems and services addressed by the plan, and list the kinds of disaster events considered in the plan's development.

III. Prevention Strategies – Document the policies, infrastructure options and procedures that have been put in place to reduce the risk of disruption due to a disaster event. List the strategies that have been considered but have not been implemented. Including the estimated cost of implementation can help a reader understand the decision.

IV. Readiness Procedures – List the ongoing backup, testing, audit, communication and training activities that are expected to happen in support of the plan.

V. Recovery Team – Document the organizational structure and membership of the recovery team, the responsibilities for each position and the name and contact information for each person.

VI. Recovery Process – List the steps of a recovery life cycle and outline the activities or deliverables for each one. List the major functional systems that may need to be addressed and identify which are considered essential for restoration within the recovery time objective. Document the types and storage locations of backup media and the vendor contacts to be utilized for obtaining replacement equipment. Describe the content and location of recovery resources for each major system addressed by the plan.

VII. Business Continuity – Describe the approaches that could be taken for contingency business procedures. List the critical transactions identified as part of the plan and recommend approaches for interim processing during the recovery period.

VIII. Appendices – Variable information such as vendor contacts and information requiring frequent reference during recovery such as the list of recovery resources can be pulled out of the plan body and referenced as an appendix. The appendices then become a quick reference for information required in a recovery scenario, and are the focus for the annual updates that keep the plan current.

Conclusion

Murphy's law states that if something can go wrong, it will go wrong. IT staff are very familiar with that law. A formal Disaster Recovery Plan can build resources that counteract it to some degree. Risks can be avoided and consequences mitigated by considering and implementing risk management strategies. Business impact can be reduced by planning for contingency procedures. Recovery from events that do happen can go smoothly because we have planned ahead and have maintained preparedness. With a modest investment in planning, we can live with less stress and sleep better at night.

Resources that may be of interest:

List of disaster prevention technologies
http://www.epriweb.com/public/000000000001000427.pdf

EDUCAUSE ECAR study of disaster recovery planning practices in Higher Education
http://connect.educause.edu/Library/ECAR/ShelterfromtheStormITandB/39105

Berea College Disaster Recovery Plan document
http://www.berea.edu/iss/documents/ISSDisasterRecoveryPlan.pdf

Abilene Christian University Disaster Recovery Plan document
http://www.acu.edu/technology/is/recovery.html

Oakland University submission to EDUCAUSE Effective Practice library
http://www.educause.edu/Browse/705?ITEM_ID=218

DRI web site
http://www.drii.org/DRII/

Disaster Recovery Journal web site resources page
http://www.drj.com/index.php?option=com_content&task=view&id=751&Itemid=428

Virginia Tech's list of IT disaster possible consequences and prevention strategies
http://www.security.vt.edu/ITrisks.html

Chronicle of Higher Education 2003 article on disaster recovery planning
http://chronicle.com/free/v49/i25/25a03301.htm

References:

1. Ronald Yanosky, ECAR, "Shelter from the Storm: IT and Business Continuity in Higher Education," 2007, pages 112-113

2. Ibid.

3. Ibid.

4. Ibid.

5. "Disaster Recovery, Business Continuity, and Network Redundancy Plan," Berea College, 30 May 2007, page 10 <http://www.berea.edu/iss/documents/ISSDisasterRecoveryPlan.pdf>

6. Ibid., page 16

Achieving Academic Results via Blogging

Gary Rogers
Cheryl Rogers
Joshua Warlick
Macon State College
100 College Station Drive
Macon, GA 31206
478-471-2700
grogers@mail.maconstate.edu

Abstract:

This presentation will address how blogging functions are utilized on a typical residential college campus by faculty as well as students in order to achieve academic goals. The results of numerous interviews with both faculty and students will serve to demonstrate how blogging achieves desired results.

Note: This paper was not available when the proceedings went to print. The author will provide handouts at the conference or via the web or email.

Phishing: A New Tide

Gary Rogers
Macon State College
100 College Station Drive
Macon, GA 31206
478-471-2700
grogers@mail.maconstate.edu

Abstract:

This presentation will address phishing. We will address what it is, current phisinh techniques and possible approaches to mitigate this phenomenon. Several actual phishing examples will be presented as well as the perpetrators and history surrounding these events.

Note: This paper was not available when the proceedings went to print. The author will provide handouts at the conference or via the web or email.

Ghosting your Campus

Gary Rogers
Keith Howell
Macon State College
100 College Station Drive
Macon, GA 31206
478-471-2700
grogers@mail.maconstate.edu

Abstract:

Ghosting is increasingly being pursued in campuses nationwide to address resource and equipment constraints. This presentation will address how we at Macon State College are addressing this issue. Over time, equipment of many varied types, vendors and capabilities must be successfully integrated into the campus network and updated as necessary due to evolving curricula and regulations. This can prove to be a nightmare unless effective procedures and automated processes are followed. Various software can assist in this effort. We will demonstrate these as well.

Note: This paper was not available when the proceedings went to print. The author will provide handouts at the conference or via the web or email.

CyberLaw: Recent Developments

Gary Rogers
School of Information Technology
Jason Ashford
Chief Assistant District Attorney, Georgia
Macon State College
100 College Station Drive
Macon, GA 31206
478-471-2700
grogers@mail.maconstate.edu

Abstract:

This presentation will address recent developments in the CyberLaw/CyberCrime arena to include illicit behavior, increasing complexity of Net attacks and CaseLaw to address these events. International developments in this arena will be addressed as well.

Note: This paper was not available when the proceedings went to print. The author will provide handouts at the conference or via the web or email.

Reviewing Papers for Conference Presentation

Peter Smith
Professor Emeritus of Mathematics
Saint Mary's College
Notre Dame, IN 46556
574-289-2126
psmith@saintmarys.edu

Abstract

ASCUE is currently reviewing a proposal to create a refereed paper track at the annual conference. This paper will discuss this proposal and suggest criteria for reviewing papers and a process for accomplishing this review. It will examine the processes used by similar conferences and make recommendations for consideration at the annual business meeting. The paper will include a discussion of the process used to prepare papers for the ASCUE conference proceedings.

History and Philosophy of Peer Review

Peer review of academic papers was first used at the The Royal Society in England in 1665 by Henry Oldenburg, who was the editor of Philosophical Transactions of the Royal Society. It was and still is intended to assess the quality of an author's work and to find errors in his or her findings. Also termed "refereeing," peer review uses scholars in the author's field to read and critique this work. Traditionally the reviews have been "blind" in that neither the reviewers nor the author know the identity of any of the others. The reviewers typically fill out an evaluation form noting problems and suggesting improvements. Each reviewer is asked to recommend or not the paper for publication. The reviewer comments are usually sent to the author (but not the recommendation).

Recently, a more open process is being tried, where the names of the reviewers are published along with the paper being reviewed. This allows the reviewers to take credit, motivates closer communication between the author and reviewer, and minimizes referee bias. The results of this experiment have been mixed. Most scholars have declined to act as reviewers when asked to use this open process. Authors were similarly reluctant to submit their papers to the process. Change is difficult. Only time will tell if open reviewing has a future.

Another motivation for submitting a paper for review is that colleges and universities often will not pay the expenses of a faculty member to attend a conference if that teacher has not submitted a refereed paper.

Current ASCUE Process

Currently, authors submit abstracts electronically to the website in early January, and these are reviewed and either accepted or rejected by the program chair. The primary criterion is how well the proposed paper corresponds to the conference theme. If an author submits two or more proposals and the number of submissions exceeds the time and space available, it is possible that only one abstract per author will be accepted. Often the program chair will ask authors with multiple submissions if they will be willing to present an additional paper if another presenter cancels.

The author whose abstract(s) have been accepted has until late April to submit the finished paper to the publicity director who is charged with preparing the proceedings. The submitted papers are examined and formatted to fit the proceedings design – currently, Times New Roman 12 point font, one inch margins all around, and footnotes, but no end notes. The publicity director divides the papers into two categories: experiential and theoretical. Often, theoretical papers will discuss a broader concept and cite a number of references to substantiate their claims, while experiential papers describe an experience specific to an institution and describe the context and consequences of the experience. The theoretical papers appear first in the proceedings in alphabetical order by first author name, followed by the experiential papers also alphabetically by author.

Proposed Process for Reviewing ASCUE Papers

Those authors who wish their papers reviewed should indicate this preference when submitting abstracts. Up to fourteen papers will be selected by the program chair for review by an ad hoc committee consisting of members of ASCUE with faculty status. This committee will be selected by the Board of Directors at its fall meeting each year. Each paper will be reviewed and scored by three readers using a process determined by the Board at its fall 2008 meeting. Some sample referee processes will be examined later in the paper. The review committee will strive to achieve a 50% selection rate and the selected papers will be placed in a special section of the proceedings, scheduled for presentation in a special track at the conference, and possibly published in an ASCUE journal.

In order for the review committee to have time to read the papers and decide which should be accepted, authors wishing to have their papers refereed will have to submit them by April 1. If a paper is not selected for the refereed track it will still be scheduled to be presented as a regular paper unless the author declines. Successfully refereed papers will be so indicated in the conference schedule booklet.

Models for Reviewing Papers

There are two models for paper review covered in this paper. The first has been adopted by the Academy of Process Educators for its International Journal of Process Education (IJPE), and is intended to mentor all authors who present papers so they can improve the paper and eventually win journal acceptance. The second is used by the ACM Special Interest Group on Computer Science Education (SIGCSE). This process is much more stringent and accepts only 10% of the papers presented. While the author has access to reviewer comments, he or she is allowed to make only minor modifications and only if the paper has been selected for presentation at the annual SIGCSE meeting as a result of the review process.

IPJE Model

The Academy of Process Educators sponsors a conference and a journal. Papers and workshops intended for the conference are not reviewed except for suggestions for improvement from the program chair, and are published in a proceedings. As such, this organization is much like AS-

CUE as far as the conference goes. However, papers can also go through a review process and be published in the IJPE. ASCUE is investigating taking over a defunct journal in which successfully reviewed papers can be published. There will be more discussion of this option at the business meeting at the 2008 conference.

Appendix 1 contains a copy of the review document for IJPE. The SII format mentioned for reviewer comments stands for Strengths (S), Areas for Improvement (I), and Insights gained from reading the paper (I). The scoring is done on the basis of ten criteria with each criteria given a score from 1 to 10 (1-2 poor, 3-4 below average, 5-6 average, 7-8 good, and 9-10 excellent). To be accepted a paper needs a total of 60 or better. Papers which fail to meet this standard may be modified using the reviewer comments and resubmitted for the current issue of the journal. Papers with scores less than 40 will probably not be successful even with major rewriting. The authors of these papers are encouraged to completely rewrite the paper and submit it for a subsequent issue repeating the complete review process.

There will be at least 3 reviewers in a double blind process. Authors should submit two copies of their paper, one to be published and one with all identifying data stripped out. The complete peer review process takes three months. The reviewers will not be identified, but their comments in the form of SII assessment will be made available to the author of the paper being reviewed. The journal editor or her appointee will mentor authors whose papers receive a score of 40 or above from all three reviewers.

The following paragraphs are taken from the IJPE guide for reviewers:

"Articles are expected to report an original contribution on a significant research topic related to process education as outlined in the aim and scope of the journal."

"Submitted manuscripts must include the following elements:

- Manuscript title
- Authors' name and affiliations
- 100-150 word abstract
- Introduction section following the abstract and preceding the main body of the manuscript
- The main body of the manuscript, divided into appropriate sections
- Figures and tables, if any, embedded at appropriate locations within the manuscript
- A conclusion or summary section following the main body of the manuscript
- List of references
- Manuscripts may include acknowledgments, appendices, a glossary of words and symbols

"The assessment of the manuscripts will be conducted according to the following two sets of criteria and established measures for each.

"The first set of criteria concerns the document's scholarly content and its contribution in one or more of the following ways:

- Addresses issues relevant to Process Education philosophy and implementation
- Employs Process Educational principles and methodologies
- Presents an original contribution to Process Education knowledge map

- Appeals to wide range of Process Educators
- Expands upon relevant Process Education references and bodies of knowledge

"The second set of criteria concerns the quality and presentation of the manuscript:
- Provide a clear, concise, and accurate representation
- Use appropriate and well-defined terminology
- Adhere to journal standards and style
- Be self-contained and well integrated
- Exhibit a high level of quality and attention to details

There are many good ideas we can glean from the IJPE review process, although ASCUE will need to develop its own set of criteria.

SIGCSE Model

Appendix 2 contains a copy of the review form for the SIGCSE conference proceedings. Referees are recruited from the SIGCSE membership and each volunteer is asked to specify the subfields in which they consider themselves to be expert. The conference chair attempts to only assign papers in these subfield to a given reviewer. There are usually enough reviewers that no one needs to read and assess more than four or five papers. Each criterion and the overall paper are scored on a scale of 1-6.Generally, a paper needs to receive a 5 or 6 in all areas from each of three reviewers for it to be accepted.

The author was a SIGCSE reviewer for many years and found its refereeing process to be relatively problem free. All aspects of the process are handled online. Each September, those who were reviewers in the past are asked by email if they wish to repeat, and if so, they are asked to update their profile online. Each reviewer is sent four or five papers in early October and asked to complete the assessment form for each paper online within six weeks, and submit it to the editor. Each paper is reviewed by three referees, and their comments are made available anonymously to both the authors and the other reviewers after the decision is made to accept or reject the paper. Reading the comments of other reviewers helps referees improve their skills.

Conclusions

This paper examined the referee processes of two organizations and compared them to the proposed process for reviewing ASCUE papers. The latter procedure seems workable and should incorporate the best practices of both organizations – i.e., be supportive of authors as in the IJPE model, and do as much online as possible as in the SIGCSE model. A double-blind process in which neither the reviewers nor the authors are aware of the others' identities seems to produce the best results. The next step is for the ASCUE membership to examine this proposal and vote to accept or reject it. If approved at the business meeting, the Board will have to identify a list of criteria and decide how to score the papers. If a cadre of referees can be selected at the Fall Board meeting, we should be able to review papers for the 2009 conference.

References

http://www-jime.open.ac.uk/about.html#lifecycle - Open Peer Review Process http://eprints.ecs.soton.ac.uk/13105/1/399we23.htm - The Origin of the Scientific Journal and the Process of Peer Review

http://db.grinnell.edu/sigcse/sigcse2006/Reviewers/proposalReviewForm.asp – SIGCSE review form

http://www.i-jpe.org/authors.htm – IJPE Author's Guide

http://www.i-jpe.org/review.htm – IJPE Reviewer's Guide

Appendix 1 – IJPE Review Form

INSTRUCTIONS FOR REVEIWERS:

1. I feel my professional experience qualifies me to evaluate this paper:
- Well
- Moderately
- Minimally

2. To the best of your knowledge, has the essence of this paper been previously published?
- Yes
- No

3. Please rate the following with regard to this paper's worthiness for publication based on the following 10 areas (Judgment Basis Score: 8 -10 Excellent, 6-8 Good, 4- 6 Average, 3- 4 Below average, 1-2 Poor)

- Relevance to the journal mission and scope
- Contribution to the current state knowledge
- Is innovative, or constructive
- Validity of approach, i.e., processes, methodologies, techniques
- Quality of information or data
- Has professional integrity: i.e., credits prior work, objective
- Has clear presentation (writing, organization, format, tables, and graphics)
- Depth of discussion
- Soundness of conclusions
- Has long-term archival value

4. Please Rate the Manuscript for Publication:
- **Approved** (all areas are good, 4 areas are average but total score more than 60)
- **Approved, if modified**
- **Disapproved** (total score less than 40, 4 areas below average)

5. If the paper is not approved the reviewer's comments should follow the SII format. An assessment should be provided for each area that did not score 6 and above.

Appendix 2 - Reviewer Report Form for SIGCSE Papers

Note to the Reviewer: All the information in this form will eventually be sent to the Author of the paper with the exception of the reviewer name and the private comments to the Program Committee. These two confidential items are written in red and have the symbol # preceding them.

Additionally, all reviews submitted for a paper will be distributed to all reviewers of that paper. It is hoped that, over time, this feedback will help reviewers improve their reviews as they can compare their responses to those of others.

This form uses Javascript for error checking. If this feature is disabled, the system will work, but error messages may be relatively generic.

Paper Number: [ ]

Title: [ ]

Reviewer Number (Sent to Each Reviewer): [ ]

Reviewer's familiarity with topic of Paper: ○ Low ○ Medium ○ High

---

Focus: In your opinion, at what area(s) is the paper directed? Indicate all that apply.

Course Related

- ☐ Algorithms
- ☐ Architecture
- ☐ Artificial Intelligence
- ☐ Bioinformatics/Computational Science
- ☐ Compilers
- ☐ CS1/2
- ☐ Database
- ☐ Discrete Mathematics
- ☐ Formal Methods
- ☐ Graphics/Visualization
- ☐ High-Performance Computing
- ☐ Human-Computer Interface
- ☐ Networks
- ☐ Numerical Methods
- ☐ Operating Systems
- ☐ Programming Languages
- ☐ Real-Time/Embedded Systems
- ☐ Security
- ☐ Software Engineering
- ☐ Supporting Courses
- ☐ Theory

General Topics

- ☐ Accessibility
- ☐ AP/IB Courses & Curricula
- ☐ Assessment
- ☐ Classroom Management
- ☐ Communication Skills
- ☐ Computers and Society
- ☐ Courseware
- ☐ CS Ed Research
- ☐ Curriculum Issues
- ☐ Distance Education
- ☐ Ethical/Societal Issues
- ☐ Gender and Diversity Issues
- ☐ Information Systems
- ☐ Information Technology
- ☐ Laboratory/Active Learning
- ☐ Multimedia
- ☐ Non-majors
- ☐ Non-traditional Students
- ☐ Object-Oriented Issues
- ☐ Pedagogy
- ☐ Student Research/Capstones/Internships
- ☐ Emerging Instructional Technologies
- ☐ Web-based Techniques/Services
- ☐ **Other**
- ☐ **Not Related To SIGCSE**

Rate the quality of the Paper in each category according to following scale:

6	**Exceptional**	**Top 5%**	**Likely to be among top 10 Papers at conference**
5	**Outstanding**	**Next 15%**	**Above average for symposium papers**
4	**Very Good**	**Next 20%**	**Comparable to many symposium papers**
3	**Average**	**Middle 20%**	**Average symposium papers**
2	**Below Average**	**Lower 30%**	**Correct but not too interesting**
1	**Deficient**	**Bottom 10%**	**Contains serious errors or deficiencies**

While the papers sent to an individual reviewer may be of much higher or lower quality than the norm, the above percentiles may give some guidance about how the ratings are to be used. For example, on average, if you are reviewing 4 papers, you might expect 1-2 papers in the top 2 categories, 1-2 in the middle categories and 1-2 in the bottom 2 categories. Only about 30% of the papers submitted can be accepted, due to time limitations at the Symposium.

Technical quality of the Paper:

○ **6 Exceptional** ○ **5 Outstanding** ○ **4 Very Good** ○ **3 Average** ○ **2 Below Average** ○ **1 Deficient**	Comments (please be constructive and as specific as possible):

Organization and writing style of the paper:
(Please make an explicit note about any paper that exceeds the 5-page limit.)

○ **6 Exceptional** ○ **5 Outstanding** ○ **4 Very Good** ○ **3 Average** ○ **2 Below Average** ○ **1 Deficient**	Comments (please be constructive and as specific as possible):

Originality of the paper:

○ 6 **Exceptional** ○ 5 **Outstanding** ○ 4 **Very Good** ○ 3 **Average** ○ 2 **Below Average** ○ 1 **Deficient**	Comments (please be constructive and as specific as possible):

Significance of the paper:

○ 6 **Exceptional** ○ 5 **Outstanding** ○ 4 **Very Good** ○ 3 **Average** ○ 2 **Below Average** ○ 1 **Deficient**	Comments (please be constructive and as specific as possible):

Overall Recommendation:

○ 6 **Exceptional** ○ 5 **Outstanding** ○ 4 **Very Good** ○ 3 **Good** ○ 2 **Below Average** ○ 1 **Deficient**	Comments (please be constructive and as specific as possible):

Suggestions for presentation at the symposium if the paper is accepted:

 # Write your confidential comments for the Program Committee.
These will NOT be sent to the author

Submit This Form | Reset the Form

Form created 2 June 1999

Form last revised 14 September 2006

Form with data generated by script April 30, 2008

Please report any problems regarding the reviewing process to the SIGCSE 2007 Database Coordinators at sigcse@cs.grinnell.edu.

Developing a Hybrid Course in Information Technology

Dewey A. Swanson
Associate Professor, C&IT
4601 Central Avenue
Columbus, IN 47203
Fax (812) 348-7258

and

Melissa R. Casner
Adjunct Professor, C&IT

Purdue University School of Technology
4601 Central Avenue
Columbus, IN 47203
Fax (812) 348-7258
dswanson@purdue.edu

Introduction

Over the past few years there have been several presentations focused on hybrid courses at the ASCUE conference. Hearing the benefits of hybrid courses I decided to try it on our campus with one of the classes in our curriculum. I enlisted the help of one of our veteran adjuncts who had experience in development and delivery of online courses. In this paper we will discuss what hybrid courses are, our local campus environment that led to development of a hybrid course, the course development, course delivery, and lessons learned from our first effort.

Hybrid Course

We will use a definition from the University of Wisconsin Milwaukee for hybrid class that states in hybrid classes much of the course learning is moved online which in turn makes it possible to reduce the time spent in the classroom. The difference between hybrid class and an online class is that in an online class the face-to-face component is eliminated or is virtually eliminated (some institutions have varying definitions for online classes where face-to-face time is only used with testing for example) and in a hybrid class the face-to-face component is merely reduced and still a significant part of the learning environment. Another popular term for hybrid course is blended course or mixed-mode course. In this paper we will treat these names interchangeably.

Proponents of hybrid courses list many potential benefits. The benefits of hybrid classes include:

- Reach new markets
- Less time for students to commute
- Students can complete degrees sooner
- Ability to accommodate additional students without need for additional classrooms
- Additional ways to interact and hold discussions (to engage) students
- Increased student learning
- New pedagogical approaches

- Blend the best of online and face-to-face instruction

Hybrid courses also present challenges to the instructor since it requires redesigning a traditional face-to-face course. Some of the challenges of a hybrid class include:

- Instructors must rethink the course design to incorporate online activities to meet the needs of the class
- Instructors must make the transition to a more active learning environment
- Instructors need to use technology to facilitate discussions, and group activities
- Instructor must manage a dual environment of online and face-to-face and not overload students
- Instructors must be able to help students understand their role in a hybrid course
- Instructors may need to learn new technologies to deliver the course

Background for Developing a Hybrid Course at Purdue

Computer and Information Technology (C&IT) is part of the College of Technology. Purdue University's College of Technology offers different programs around the state of Indiana including Columbus Indiana. In Columbus we offer an AS and BS in C&IT. A degree in C&IT prepares students for careers in the application of information systems and technology to plan, analyze, design, construct, maintain, and manage software development, systems integration, data management, and computer networks. At each of the statewide locations Purdue partners with a local university to offer the non-technology courses such as English, Business, Communications, etc. In Columbus our partner is Indiana University-Purdue University Columbus (IUPUC). Our partnership provides that we can offer C&IT classes for other departments. In most cases these service courses are used to fulfill degree requirements for a computer/technology class.

Like many Computer Science, Management Information Systems, and Information Technology programs around the country, C&IT has seen declining numbers in enrollment over the past five years. There are many reasons, ranging from students being scared off by offshore outsourcing to increased competition from online degree programs, new competing programs at IUPUC and a push by the state of Indiana to promote community colleges. In the current environment it is important for C&IT to be able to compete for new students and to retain the students that we have. This involves using new and innovative measures to attract and retain students while still maintaining the integrity of a world class program. The C&IT courses we offer in Columbus are the same classes we offer at our main campus in West Lafayette with the same goals and objectives.

Hybrid courses offered several benefits for our campus. As a commuter campus with slightly more than half of the student population non-traditional, we constantly hear from students about the desire not to be on campus three or four nights a week. A hybrid class would reduce the student seat time. Also, evening time presents the most challenges for scheduling. With limited lab space a hybrid would make more classroom space available. Hybrid offers the best of both worlds in providing the benefit of using technology to reduce seat time but also providing a means for students to still have the face-to-face time with instructors which we feel is important in technology courses. Finally, we think if successful in a pilot mode, we can expand the use of hybrid classes in our curriculum and use as an aid in marketing and student retention.

C&IT 107 Computers and Software Packages is an introductory course in the basics of computers. The lecture component discusses basic computer hardware and software components and issues that affect computer users in society along with a lab component that includes an introduction to Microsoft Excel and Microsoft Access. This is a service course for several departments on the IUPUC campus but the majority of students are Business majors who are required to take the class. Typically we offer at least five sections of C&IT 107 each semester.

We chose to develop a hybrid version of C&IT 107 for several reasons. First, the Business Department has been very supportive of offering different forms of this class including condensed and online. Second, since the class is not taken by our majors we had a little more flexibility in delivering it in a hybrid format. Finally, since we offer four other sections of the course students would have the option of enrolling in the traditional face-to-face class.

We offered our first version of C&IT 107 in the Spring 2008 semester. The class had a face-to-face component that met once a week for 100 minutes.

C&IT 107 – Online Components

Following we will look at the development of the C&IT 107 hybrid class. The first consideration was what to put online. Primary communication outside of the classroom was through electronic sources. Each student enrolled in the course was required to have an active e-mail account. Students provided their instructor with a current e-mail address. All students are given a school account to use or they may use their personal e-mail account. All Microsoft Access and Microsoft Excel lab submissions used the Blackboard assignment drop box function. All assignment drop boxes were opened at the beginning of the semester and closed at midnight on the due date. All quizzes, exams and the final exam were taken via Blackboard's online assessment feature. Since the class did not meet face-to-face on Tuesday evenings, the use of online discussions through a whole host of electronic formats was designed. The online discussions were designed to give the students contact with their peers and instructor during the course and experience emerging technology used by local business companies. An Online Discussion is defined as "a conversational exchange; dialogue; or conference." An electronic medium was developed to compliment the course textbook "Discovering Computers 2008" by Gary B. Shelly, Thomas J. Cashman, Misty E. Vermaat ISBN 13: 978-1-4239-1204-0 © 2008. The book provided a current and thorough introduction to computers by integrating lectures of the printed text with the World Wide Web. However, by integrating this portion of the class into an online portion, the students have the opportunity to interact with their peers and instructor around computer hardware and software concerns and/or questions. It also allowed the students the opportunity to demonstrate their emerging knowledge of computer hardware and software. In class, some students will not share their knowledge because of fear of public speaking. The discussions seem to remove the communication barrier for those students.

There were eleven chapters in the textbook and there were eleven corresponding online discussions scheduled for the course. These occurred through the electronic discussion board. Each online discussion spanned for a one-week period and closed on the night the week's discussion was due and was conducted as such:

There were ten questions or definition type topics about the current chapter of the week posted in the Discussions section.

Each student POSTED two journals, blogs and/or discussion topics, so to have all topics covered. The purpose of the online discussion portion of the class was to demonstrate that the students have read the related chapter and to connect with their classmates on discussions relating to the focus for the week. Points were awarded simply for participation, not on the content of responses, as long as they were related and showed some reflection and attempt.

Peer Reviews were used. The purpose of these feedback responses were to demonstrate that you have paid attention to the work of your peers and to provide helpful, constructive feedback.
Then, each student made two replies to another peer's remarks. [They were not limited to only two responses.] The idea behind this aspect of the course was to provide the student a chance to talk about current technology issues they were studying and to speak about their own prior knowledge of the subject.

There was a certain etiquette that was expected of all students in the class in relation to electronic messages. Since they did not physically speak to each other, it was important to remind them that irony and humor do not readily come across as they may be intended. For class purposes, student electronic messages MUST confine themselves to discussion, debate, and even disagreement on the points under discussion. They were not to engage in personal attacks through the online discussion. In that vein, they were encouraged to re-read their responses again before they hit the "send" button. The instructor made it absolutely clear that there was NO toleration for personal attacks.

The instructor made comments to some, but not all of the discussions. The instructor's role was to moderate the discussion, resolve any discrepancies and encourage student feedback.

C&IT 107 – Face-to-Face Components

On Thursday evenings, the class met in a computer lab on campus to learn Microsoft Access and Microsoft Excel. Solid instructional lab design adapted from the textbook Microsoft Office Excel 2007: Complete Concepts and Techniques Shelly Cashman Quasney (ISBN 10: 1-4188-4343-1) and Microsoft Office Access 2007: Complete Concepts and Techniques Shelly Cashman Pratt (ISBN 10: 1-4188-4340-7) meets the instructional goals and objectives for the course.

The instructor has adapted the use of Adobe Connect to record audio and video media of all Microsoft Excel labs in advance of the lab night. There were some students who used these as a review after the in-class lab and others that used it as a base for catching up when they missed an in-class lab. Adobe Connect was used simply because it was available despite the fact that it may not be the best method to serve the needs of the CIT 107 students and meet course goals and objectives, but it compliments the needs of students in the learning process.

Instructor Observations of Class

Some students have grown accustomed to hardcopy material. When they pull up an electronic quiz and submit it, they do not grasp what happens to the captured information. Some students would always print off their quizzes or labs, even though they were asked to submit them electronically. Some students were very eager to participate in the discussion forums, blogs or journals at the beginning of the semester and would post their readings and findings during the first half of the semester. However, they would forget to go back and respond to other student's postings when the chapter was actually due.

All students liked the flexibility with the online portion of the class. Having approximately one week to respond per chapter helped students balance their personal and academic priorities.
All students liked the immediate response to quiz and exam grading. Most students still took advantage of the in-class labs. Most students e-mailed or instant messaged the instructor at least once a week, in lieu of meeting the instructor during office hours on campus. The instructor carried a Blackberry, which enabled quicker responses to troubled or confused students.

Instructor Feelings about Teaching a Hybrid Class

I spent more time prepping than ever, because I moved to the new version of Blackboard, used Adobe Connect and moderated the discussion forums holding all students accountable for posting and replying. Comparing it to a completely online class is difficult. I have taught career exploration and planning class for seniors. Typically, seniors participate without any hesitation. Since this is a beginning level class with mainly freshman, it took some coaching on the first and second week to get students accustomed to taking online quizzes, posting and responding. I met some students early and stayed late to make sure they felt confident. The career class was more student / instructor driven. This class was student to student, student to instructor, instructor to student driven. I typically just moderated discussions, encouraged or commented.

I really liked the class, because I felt like the time the class and I were together was very productive. We focused on the labs and learning about the multiple ways of accomplishing the same task. The lab books usually only show one or the most frequently used method. Also, my class seemed to enjoy my elaborating personal experiences of using different parts of Excel and Access in a real-life environment. I really loved the online portion of the class which was based on overall software and hardware topics. Many of the students would see a more recent article or website than in the book and they could add the link for reference. Those same individuals might be considered geek-like in class by bringing it up without material to back up the topic. This way, the reader can see exactly what the student meant.

Student Feelings about Hybrid Class

The students in the class were surveyed about a variety of things concerning taking a hybrid class. Following in Table 1 are the results of the survey.

1. What student status are you considered?	
FRESHMAN	64%
SOPHOMORE	21%
JUNIOR	7%
SENIOR	7%
2. What is your major classification?	
BUSINESS	86%
GENERAL STUDIES	7%
EDUCATION	7%
3. What format would or do you prefer for class?	
HYBRID	86%
ONLINE	14%
FACE-TOFACE	0%
4. How much content would you prefer online?	
1%-33%	29%
34% - 66%	43%
67%-100%	29%
5. I learn best with this type of learning:	
WRITTEN COURSE CONTENT	21%
VIDEO LECTURES	21%
AUDIO LECTURES	21%
POWERPOINT	7%
OTHER	29%
6. Blackboard has enabled my learning by:	
MAKES NO DIFFERENCE	29%
MAKING IT EASIER	64%
MAKING IT HARDER	7%

7. Adobe Connect for video and audio lab recordings has enabled my learning by:	
MAKES NO DIFFERENCE	43%
MAKING IT EASIER	57%
MAKING IT HARDER	0%
8. I spend approximately _____ hours online for class.	
1-2 hours	57%
3 – 5	21%
6 – 10	14%
MORE THAN 10	7%
9. I have missed ________ class(es) over the semester.	
0	29%
1	29%
2-3	21%
4 OR MORE	21%
10. I have asked the instructor to meet me before class or after class _____ time(s) this semester.	
0	71%
1	21%
2-3 times	7%
11. What electronic tools have you found useful in this class?	
ONCOURSE	86%
BLACKBOARD	86%
E-MAIL	79%
ONLINE GRADEBOOK	71%
DISCUSSION FORUMS	57%
ADOBE CONNECT	43%
ONLINE DROPBOX	36%
ELECTRONIC CALENDAR	29%
INSTANT MESSAGING	14%

Table 1

Lessons Learned from First Hybrid Class

First what worked in the hybrid class? The online discussions were a big success. They were easy to moderate and the students enjoyed bringing in their personal experiences to the chapters. The Adobe Connect recorded meetings were a big success. The instructor only planned to test the recording of the Microsoft Excel labs, but was requested to do so for the Microsoft Access labs. What needs to be reworked? Blackboard has an issue with forwarding e-mails to primary e-mail accounts. The technical team has informed the software company of this issue, but it is a known bug at this time. Therefore, it must be a requirement on the first night of class that the students e-mail the instructor from another e-mail package until this bug is fixed. It would be helpful if the Blackboard test banks need to be purchased, so the professors will have the ability to put multiple copies of the quizzes and exams online. The instructor detected that a few students worked the quizzes together. For now, this could be considered creative teamwork, because they are both reading and learning.

Conclusion

As a department we have been very pleased with the first offering of a hybrid class. It has proven to be successful and popular with the faculty and students who participated. For the students it allowed more flexibility and less driving to campus. We think this type of class is a great way to utilize current technology in the classroom. The class provided the department more flexibility in scheduling available lab space and could be very helpful if we deliver more classes in this format especially in the evening when lab space is extremely tight. We plan to approach our Computer and Information Technology Department to enlist their support in offering additional classes within the next year to develop a plan to increase our hybrid offerings.

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Cisco Wireless Control System

Hollis Townsend
Gannon Stallings
Matthew Manous
Young Harris College
Young Harris , GA 30582
706-376-4311
hollist@yhc.edu

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Migration to Virtual Servers

Gannon Stallings
Matthew Manous
Hollis Townsend
Young Harris College
Young Harris , GA 30582
706-376-4311
hollist@yhc.edu

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Cisco Clean Access Stage Two - Wireless

Matthew Manous
Hollis Townsend
Gannon Stallings
Young Harris College
Young Harris , GA 30582
706-376-4311
hollist@yhc.edu

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The View from the Other Side of the Screen: How Your College's Constituents View the Website

William P. Wilson
Colby College
4000 Mayflower Hill
Waterville, ME 04901-8840
wilson@gettysburg.edu

Abstract:

With your school's web presence becoming the central communication medium, there is growing pressure from many internal audiences to have the website do more things, including (check all that apply): distinguish your College from the rest of the competition; provide more services for more audiences; allow users to find things in a more "logical" manner; customize the user experience; make it more visually appealing to users; attract more applicants; get more alumni to contribute; and, and, and ….

In the not too distant past the process was to get the webmaster, perhaps with the help of a knowledgeable commercial partner, to redesign and restructure the website using their combined experience. With many websites emphasizing more mission-critical services to user groups, it is time to incorporate web usability as one approach to getting your redesign done right. Seeing how your various audiences use the site often provides insights that are often unforeseen by designers or content providers. We will explore the background behind usability, see what technology is available to assist in conducting this kind of work, and look at some real-life examples of what can be uncovered.

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