Teaching with Technology, Volume 2: The Stories Continue
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Introduction

The authors in this volume share a common goal: to create learning environments that facilitate student success. The stories describe how these faculty have used technology in their respective disciplines, including course context, strategies implemented, challenges faced, and lessons learned.

The most effective way I have found to distill a large text is, appropriately for this particular text, using a Web-based tool. Wordle takes a block of text and arranges it into a "cloud" giving prominence to words that occur most often. While teaching and technology are, not surprisingly, fairly large in our Wordle of the top 100 words in this book, the emphasis is, as it should be, on students. The essays in this book focus on what the students do with technologies and the learning that results.
We hope you will enjoy reading these essays and that you will be inspired to reflect on the use of technology in your own classroom. What issues or challenges do you face in your discipline? Is there a tool in this book that may address them? Is there a resource that offers a new strategy to try with your students? Is there a story you would like to share and discuss with colleagues? Perhaps it will be a story from this book, or it may be your own!

About this book

This book presents a collection of peer-reviewed essays by individuals who have integrated technology into actual university courses. Rather than formal empirical research, they represent short case studies from a variety of disciplines. The writing focuses on ways in which technology helped students learn, and the content spans many technologies. The intended audiences for the book are fellow educators and others interested in promoting effective use of technology to enhance learning.

Authors were asked to submit between 1500 and 2500 words and avoid jargon from specific disciplines, as well as “educationese.” The goal was to produce writing that would appeal to colleagues in a variety of subject areas and have staying power. Authors were asked to write in generic terms rather than emphasizing a specific application or website.

After each essay was received, the editors would assign it to two reviewers from other institutions. Among other factors, reviewers looked for practical ideas, useful information, and the answers to a series of questions under four headings:

1. Background – How did the project begin? What were the goals for student learning?
2. Approach – What teaching strategies were used? What technologies were used and in what ways?
3. Results – What were the effects on student learning? Were there any surprises? What challenges were faced?
4. Recommendations – What would be done differently next time? What opportunities do you envision?

The reviewers rated each essay “Needs only minimal changes,” “Could use some editing,” or “Requires major revisions.” Where revision was indicated, the authors had the option to re-submit with changes. After the author approved a final revision, the essay was posted online for immediate distribution at http://ltcessays.wordpress.com (see image below). The essays were posted between March and August of 2011.

The website used a blog format, allowing interested parties to receive email notification as each new essay was released. Over one hundred people followed the blog and thousands of copies of the essays have been downloaded at no charge. The ultimate goal was for the essays to also be published as a single unified book, and that is what you see here.
Acknowledgments

The editors would like to thank all who contributed to the development of this collection, especially the authors and reviewers. Their patience during the process was immeasurable.

Carrie Bishop and Melissa Gay of The University of Georgia Center for Teaching and Learning assisted with desktop publishing on many of the articles as well as with the final production, and we are very grateful for their expertise.

We also must acknowledge the artistic talents of Antonio DiFranco, University of Florida Web Services, for his dynamic cover design.

Finally, we want to thank the members of The Learning Technology Consortium for their support, particularly “Member Emeritus” David Brown for his encouragement and providing the initial impetus for this work.

Thank you, all!
About the Learning Technology Consortium

The Learning Technology Consortium was initiated in 1998 by University of Pittsburgh Vice Provost Robert Pack as a partnership of institutions with similar instructional goals, strong technology and faculty support programs, and an interest in collaboration in the area of teaching and learning with technology.

At the time of this publication, the nine members of the consortium are:

- University of Delaware
- University of Florida
- University of Georgia
- University of Maryland
- University of Notre Dame
- University of Pittsburgh
- University of North Carolina at Chapel Hill
- Virginia Tech
- Wake Forest University

LTC representatives meet semiannually at a member campus. At these meetings and through membership in LTC, members are provided opportunities for:

- Knowledgeable discussion of the selection and use of learning technologies
- Benchmarking with comparable institutions
- Collaboration on research, publications, and presentations
- Immediate access to colleagues throughout the year for input on current issues and interests
- Touring specialized facilities at member campuses
- Learning new and emerging trends and technologies
Foreword

To Dedicated Teaching Innovators

David G. Brown

“More computers equal more learning. This rule is broken by occasional neglect, misuse, or mismatch, but overall, there is a positive relationship between the availability/use of computers and the amount of learning that occurs. Students using computers as one tool in the learning process tend to learn more subject matter and, at the same time, acquire the lifetime skill of information fluency.”

These words were written in a chapter titled “The Jury is In” over a decade ago for a previous compilation of stories published by the Learning Technology Consortium. Today the more stories continue to prove the theme: More computers equal more learning.

A challenge then and now has been story collecting and sharing. During this decade many universities have hired professional course designers who trade stories and then share them with classroom professors in their own institutions. Many of these designers, like specialists in our libraries, are deeply trained in subject matter disciplines. Most are well schooled in educational software alternatives. This group of professionals, from some of our most advanced and successful teaching research universities, has shaped this volume and chosen these stories. They have “refereed” the stories against criteria such as effectiveness (i.e. increase in learning), efficiency (i.e. with limited effort and risk), and applicability (i.e. transferability into other courses and settings).

David G. Brown is Provost Emeritus of Wake Forest University.
To increase communication, most professors now use course web sites (via Blackboard and other programs). Listservs and email groups are standard. Exchanges can be real time or asynchronous. Electronic chatrooms allow communication among learners separated by time and/or geography. Shared hyperlinks make it easy for students to access people and materials. Most of all, by shifting some activities to solo learning settings outside classroom time, classroom time can be freed to discussion and interaction.

To access a breadth of materials in a rich array of formats, these stories cite assigned internet searches by students, powerpoint presentations, YouTube movies, supplemental CD-ROM, electronic text-books, multimedia presentations, translation modules.

To customize, self-paced exercises and quizzes appear in many of the stories. Recorded lectures can be viewed and reviewed when necessary. Hyperlinks are given to example relevant to the interest of each student, rather than one-size-fits all illustrations. For students unable to participate in face-to-face classroom instruction, internet only courses are being created, courses that allow for true interaction among students and between students and professors.

Leave it to the most successful, dedicated teaching professors! This is the group that 20 years ago left behind the security of highly praised, tried-and-true teaching methods to pursue mini-experiments with new (computer based) approaches. Like disciplinary researchers, they shared their methodologies and results with colleagues. Then a new generation of experimenters stood upon the shoulders of early successes and advanced the art of teaching to a still higher level.

We are beginning to know what works and what doesn’t. The future rests with blended courses, a choice of ways to master the material, redundant opportunities, group work, prompt feedback, real world examples, multiple mentors.

Most of the lead characters in these stories are “classroom” professors. Typically, they have innovated in spite of the risk. Teaching in new, yet to be proven, ways means that some experiments will fail. Always developing new approaches takes time that might be devoted to another research paper. The reward, at least for the story generators chronicled in this volume, is more learning for more students.

Unlike in earlier times, teaching has become a Team Sport: lecturer + pedagogist + course designer. Add module author + software specialist + student colleagues + remote adjuncts + librarians + help desks. The professor of chemistry or poetry is, much like a doctor serving health needs, dependent upon an array of specialists, a bank of technology, and a bevy of support groups. It behooves everyone reading this volume to assess the strength of “your” team and to shore up those sectors that are weak.

A team’s course design must accommodate the circumstances: for example, subject matter + geography + computer infrastructure + availability of time + overall cost + individual learning styles. Over-arching these specifics is the learning theory behind the course. Most of the stories in this volume respect four ideas (theories):

Most students learn more when they INTERACT with the material,

Most students learn more when channels of communication are open, between professor and student as well as among students,

Most students learn more when they believe they have full access to multiple learning materials and experts, and

Most students learn more when their learning strategy is customized.

The computer and electronic media increase immensely the ways in which a professor can implement each of these ideas. Here it’s helpful to cite specifics from the stories that follow.

To increase interaction, many computer based simulations are becoming available. Team learning assignments are more feasible when student-to-student communication is supported by Facebook walls, discussion boards, and electronic work rooms. Student-driven web pages, electronic publications, and networking groups enrich interaction opportunities. Professors can connect students directly with other experts, including practitioners in the field, through electronic communication.

To access a breadth of materials in a rich array of formats, these stories cite assigned internet searches by students, powerpoint presentations, YouTube movies, supplemental CD-ROM, electronic text-books, multimedia presentations, translation modules.

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We are beginning to know what works and what doesn’t. The future rests with blended courses, a choice of ways to master the material, redundant opportunities, group work, prompt feedback, real world examples, multiple mentors.

Each of the stories in this volume represents a success. Mine them with discrimination, recognizing that even an approach used in another discipline may be modified for your purpose. Think of them as a stage in an evolving art. Thank the innovators, the story generators and those who collect/share them. Celebrate the learning they are birthing!
In-Class Polling: Less Teaching, More Learning?

Brian R. Levey

Did you ever have the sinking feeling that your class features too much of you and not enough of your students? That you may be engaged, but they’re not? That you’ve learned the material, but they haven’t? (That you’re having fun, but they’re not?) Well, I did and so I went in search of ways to improve the classroom experience for my students and ultimately myself. What I found was an online audience-response system that allows students to answer questions during class via text messaging or over the web. It’s free to students, quick to display results, engaging and fun. The technology also appears to enhance learning and retention.

Brian Levey is an Associate Teaching Professor in the Mendoza College of Business at the University of Notre Dame. He began teaching business law and ethics after a twenty year legal career, most recently focused on building corporate compliance and ethics programs. Levey’s previous jobs include Vice President for Ethics at Fannie Mae and Director of Compliance and Business Ethics with Smiths Group. Among his degrees are an LLM from The George Washington University and a JD from The Catholic University of America.
Teaching with Technology: The Stories Continue, Volume 2

For twenty years, I was a lawyer in the Washington, DC area, working at various times for two law firms and four companies. Although I was grateful for every job along the way and had been successful by some measures, I was not especially happy or fulfilled. One outlet for me was teaching as an adjunct at DC area colleges, which led to the occasional daydream about a second career as a college professor. And so perhaps it did not come as a total surprise to my wife when one evening I came home and asked: “Honey, how would you like to sell everything and move to South Bend, Indiana?” The University of Notre Dame, our alma mater, was looking for someone to teach business law to undergraduate students in its college of business. I applied, interviewed and was offered the position. All of sudden, it was someday.

With my wife’s assistance, I spent much of the summer preparing for class that fall. In addition to staying home for a few years to raise our son, my wife had herself changed careers, from human resources professional to teacher. After earning a masters degree in education, she became the gifted and talented specialist at a local elementary school. As the summer and my efforts progressed, I would boast about the lectures I was planning and she would gently remind me as only a wife can: “Just remember, it’s not about you, it’s about the students. They need to be involved; they need to participate.”

Mindful of my wife’s counsel and recalling the use of the Socratic method in law school, I decided that for each class students would have to brief two cases in writing as part of their homework. Through in-class questioning, I would draw students out, getting them to teach themselves and ultimately the rest of the class.

Over the course of the fall semester at least two challenges emerged. First, my questioning style proved to be more like that of Ben Stein’s Economics teacher in the movie Ferris Bueller’s Day Off – “Anyone? Anyone?” – than John Houseman’s towering Professor Kingsfield in The Paper Chase – “Speak louder, Mr. Hart! Fill the room with your intelligence!” For me, the Socratic method is a learned art to be developed over time. Second, even when an individual student’s case recitation and my subsequent questioning went well, I was primarily engaging only one student at a time. And so I went in search of a way to involve more students more often. What I found was in-class polling.

I first learned of polling at the University of Notre Dame when I attended a workshop on using a student-response system, presented by the Kaneb Center for Teaching and Learning. The system enables an instructor to pose a question to the class and have students respond by using a “clicker” – a hand-held device that looks like a TV remote control. The system tabulates students’ responses and displays the results. Potential benefits when integrated into traditional lectures include:

• higher levels of engagement (i.e., more students actively engaged more often);
• instant feedback, both to the professor and also to the student; and
• the option of anonymity in responding to sensitive issues. (Martin 2007)

Although there are ways to pose a question and solicit answers from the entire class without introducing technology into the classroom – everything from a showing of hands to paper ballots – none of the traditional methods would seem to offer all these benefits so neatly.

I was intrigued, but not convinced, however, as I also learned that the demonstrated system required students to purchase a clicker for roughly $20 and pay a subscription fee of roughly $15 per semester. I was not eager to add to the cost of my class.

Enter Poll Everywhere, a simple text message voting application for live audiences. The presenter creates a poll on the company’s website and the audience casts votes by sending text messages through a cell phone or clicking a Web page on a smartphone or laptop, indicating the option they
wish to select. When the student’s response reaches the company’s Web servers the vote is counted and tallies are updated in real time. The poll and results can be published to PowerPoint or viewed as a Web page.

Unlike with clickers, there is no additional cost for most students at Notre Dame. Either they have a cell phone with a generous texting plan or they own a laptop or smartphone. They also know how to send text messages, which mitigates the risks associated with introducing a new technology. I was sold.

Voting from an iPad

In the fall of my second year, I introduced Poll Everywhere in our sophomore-level business law course, with sections of roughly 35 students each. I envisioned a variety of different uses. Perhaps the most basic was to begin class with a question that reinforced the reading with a key takeaway. (Koegele 2007, Medina 2008) For example, in a class on intellectual property, I began with this question embedded in a PowerPoint slide and asked students to text their answers:

Original, Inc., sells its product under the name “Phido.” Quik Corporation begins to market a similar product under the name “Fido.” This is most likely

a. a theft of trade secrets.
b. copyright infringement.
c. patent infringement.
d. trademark infringement.

While my students are responding to a question, I often emphasize why I am asking it. In this case, they need to be able to tell the difference between the basic types of intellectual property protection. Once the results are tabulated, I reveal how many students ‘voted’ for each answer. I then move to the next slide, which shows the correct answer (d. trademark infringement). Most students get this one right, so I don’t usually provide too much additional explanation at that time, saving it for the more detailed lecture to follow.

Original, Inc., sells its product under the name “Phido.” Quik Corporation begins to market a similar product under the name “Fido.” This is most likely

a. a theft of trade secrets.
b. copyright infringement.
c. patent infringement.
d. trademark infringement.

In other classes, I began with a question that I assumed most students would get wrong. These questions break a pattern and consequently they stick with the students. (Heath & Heath 2007) For example, in a class on contracts, I began with this question:

Mary offers to pay Mike $50 to run naked from the Main Building at the University of Notre Dame to LeMans Hall at St. Mary’s College. Mike can accept the offer only by performance (and not by a promise to perform). If Mike does run naked from the Main Building to LeMans Hall, he and Mary will most likely have formed

a. a bilateral contract.
b. a unilateral contract.
c. a quasi contract.
d. no contract.

Most students think the correct answer is “b” because (like a unilateral contract) the offer seeks performance as the form of acceptance. But I explain that the correct answer is “d. no contract”
At some point the responses start to degenerate – “O’Doyle Rules!” from the movie Billy Madison is a favorite – and I then know it’s time to cut off the text messaging. Sometimes the text messaging fosters additional classroom discussion by those who are willing, even eager, to speak candidly; sometimes it does not. Different classes seem to have different personalities. The exercise typically ends with me explaining how at least some of the responses involve rationalizing and that there is no ethically meaningful difference between shoplifting and illegally downloading music. End of sermon.

Finally, I used online polling simply to break up the class. (Medina 2007) I recognize that not every student shares my enthusiasm for business law. There is a lot to absorb, even when the class is merely reinforcing assigned readings. During a class that covered the statute of frauds, I showed a clip from the movie Jerry Maguire and went on to draw from other Tom Cruise movies and tabloid stories. Late in the class, when eyelids were growing heavy and attention short, I put up this question: “What is your favorite Tom Cruise movie?” I recognize that a visitor to the classroom at that moment might have wondered if this was the highest and best use of time, but my sense is that we need the educational equivalent of an intermission in some class sessions.

Results for Why is it not ok to take a CD from the bookstore without paying for it but ok to download music from the Internet without paying for it?

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<tr>
<td>It's available and easy to download</td>
<td>0</td>
</tr>
<tr>
<td>because I’m helping them out by playing their songs real loud</td>
<td>0</td>
</tr>
<tr>
<td>I'm a man. I'm 40</td>
<td>0</td>
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I think people consider anything they find on the Internet- pictures, songs, information- fair game. Because one is a blatant act of stealing whereas technology has made it so that downloading pirated music is no longer perceived as a crime. It became God and the bookstore are clearly connected where the internet is just magic because you aren't really taking it from anyone in particular. It's just there.

The vast majority of students, sometimes over ninety percent (90%) of the class, answer yes! I then ask: “Why? Why is it not ok to shoplift a CD, but ok to download music without paying for it?” Using the system’s text messaging capability, students have responded in a variety of ways:

- I'm stickin’ it to the man
- It's only one song
- Everyone does it; we grew up in culture where it is considered ok
- It's already been paid for
- It's not tangible (there is no incremental cost or loss)
- I wouldn't buy it; I only copy it because it's free and so there is no lost sale to the artist, the record company
- I won't get caught

Because students’ responses are anonymous, they receive no class credit for answering a question correctly. The results have been positive. Working with the Office of Information Technologies at the close of both Fall and Spring semesters, we surveyed students and learned the following: the great majority of students liked using online polling, thought it enhanced their learning, and found that it made class more engaging. Ninety five percent (95%) of the 173 responding students either strongly (138) or somewhat (27) agreed with the following statement: “I like using texting in this class to...
answer questions." Ninety three percent (93%) either strongly (88) or somewhat (73) agreed with the following statement: "Using texting in this class helps me learn." Ninety eight percent (98%) either strongly (147) or somewhat (23) agreed with the following statement: "Using texting makes the class more engaging." Comments include:

- It makes everyone participate so that class is more engaging and everyone is responsive.
- It is easy and simple, and it really gauges how well I've mastered the material.
- Gives an idea of what test questions will be like. Highlights important key concepts.
- Able to see where I stand in the class.
- I did not have to buy a . . . clicker from the Bookstore - or remember to bring it. My phone is free and I always remember it.
- You don't have to be embarrassed to answer a question wrong.
- Mixes it up. Keeps the class moving.
- It's fun.
- AWESOME.

Of course, while attitudinal survey data is suggestive of efficacy, I recognize that it is not necessarily dispositive. I will leave a more detailed study of in-class polling and improved exam performance to the experts. And as long as we're being honest, I should note that not all the feedback from students has been positive. Some of the complaints from our end-of-semester surveys were technical in nature – some students experienced weak cell phone service and delays in transmission/tabulation. Others cited the cost to those who don't have generous texting plans. (Again, it's not clear to me that this is actually a problem.) Still others found some of the questions too easy and/or not representative of the questions on the exams, and so questioning remains a work in progress. In particular, I am in search of longer questions that require issue spotting and application of the law to a set of facts. Finally, my sense is that at some point enthusiasm for using the system wanes among students, leading response rates to tail off as the semester winds down.

### Recommendations

In the ensuing two semesters I occasionally added the "Think-Pair-Share" strategy to my in-class polling in order to improve the level of engagement, learning and retention. After asking a question, I would tell students to:

- think about the problem and try to answer it in their head;
- pair up with a partner and discuss their proposed answer, and
- respond individually using Poll Everywhere. (Ludlow 2001)

The opportunity to think, pair and share typically yielded discussion between students, and, happily for me, that discussion was often about the problem I posed. I now have a new variation planned:

- present a question that should yield a significant percentage of both right and wrong answers:
- let students respond via online poll;
- ask students to discuss how they answered with someone who answered differently;
- let students respond again via Poll Everywhere, and see if the results improve, i.e., see if students are able to teach each other the right answer. (Mazur Group 2010)

With or without these variations, posing a limited number of questions to a class using an online polling system is engaging, effective and fun. It's a good way to supplement what is primarily an introductory, lecture-based class. And it's so easy, a lawyer can do it!
References and Resources

Chip Heath, Dan Heath, Made to Stick: Why Some Ideas Survive and Others Die 64, 104 (2007)


Margie Martin, “Clickers in the Classroom: An Active Learning Approach”, Educause Quarterly (November 2, 2007)

Mazur Group, “Peer Instruction” (2010)


Web Resources


Digital Video Reflection: Fostering the Development of Future Teachers

Ann C. Cunningham

The Department of Education at Wake Forest University enjoys the advantages of a ubiquitous computing environment with a faculty committed to ensuring all teacher candidates are prepared to use technology to support communication, collaboration, instruction and assessment. This commitment guides not only the use of technology throughout our programs, but our integration choices, as well. Technology integration must have a meaningful place within our curricula, and the tools must be of value to our future teachers. This commitment and focus led to the project described in this essay, the Digital Video Reflection, which is a major part of a capstone course in our graduate programs.

Ann C. Cunningham is an Associate Professor of Instructional Design at Wake Forest University, where she is Director of Elementary Education and Interim Department Chair. Ann teaches courses on Instructional Design, Assessment, and Technology. She has served on the ISTE Executive Board and was president of the SIG for Teacher Educators. Her research interests include factors that influence instructional design choices, as well as technology innovation, professional learning communities, and electronic portfolios.
An additional learning goal is for candidates to develop their comfort level with digital video editing tools so they feel confident integrating these tools into instructional and assessment experiences as secondary classroom teachers. State and national professional standards for education reinforce the value of teachers’ abilities to use technology effectively to improve teaching, learning, and assessment. References on standards relevant to 21st Century teacher education are included at the end of this essay.

**Approach**

The results of the initial pilot helped faculty determine that digital video integration was a superior strategy for achieving the learning goals of EDU 716, and the Digital Video Reflection became a requirement for all candidates the following year. Careful scaffolding throughout the programs was necessary to ensure that all students were able to fulfill the expectations of the video project upon conclusion of their programs. Each candidate needed to be prepared to collect digital evidence over the course of the program. They also needed to be able to articulate a philosophy grounded in theory, pedagogy, standards, and experience. Working collaboratively, faculty developed a year-long plan designed to scaffold candidate success on the new capstone project.

The Technology in Education Course

The primary modifications to this course were associated with developing the candidates’ digital video editing skills. The Digital Video Reflection pilot was conducted with university-owned Macintosh computers and software, and digital video editing techniques were taught “just-in-time” for the small group participating. By year two, however, each graduate candidate had a ThinkPad with MovieMaker2 software. This permitted full-class instruction on Windows-based software in addition to instruction on the use of digital video cameras, microphones, and tripods. Since the capstone project would require every candidate to create his or her own Digital Video Reflection, it made sense to build instruction in this course around a meaningful and relevant classroom use of teacher-created video. To accomplish this, we selected

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**Background**

The Digital Video Reflection project began to evolve ten years ago and is the 21st Century version of the electronic portfolio described in the first volume of *Teaching with Technology*. Inexpensive, simple digital video tools for home use began to appear at that time and low-end, simple to use editing software became an integral part of major computer operating systems. It seemed likely that these tools would one day be ubiquitous in homes and schools and so, with financial support provided through a grant, we decided to pilot digital video creation in EDU 716, the capstone graduate course for our Master Teacher Fellowship and Associate programs. Prior to that point, EDU 716 had required candidates to use PowerPoint to create and share an electronic portfolio of their professional growth over the course of the thirteen-month program. That summer, five of the twenty-eight graduate students were asked to participate in a pilot program where digital video editing tools would be used to support the creation of a professional presentation. The revised electronic portfolio emphasized reflection on teaching growth through a clearly stated teaching philosophy supported with evidence collected throughout the program.

That was ten years ago. Software and hardware have changed, but the core principles of the assignment have remained fundamentally intact because the project is meaningful, relevant, and built on sensible and rational learning goals:

- Articulate your teaching philosophy using the language of a professional educator
- Support your philosophy and values with references to appropriate learning theory, professional standards, pedagogy appropriate for the content area you teach, and reflections on your experiences throughout the program
- Demonstrate proficiency with video-editing techniques and tools

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**Eliminate Barriers, Build Pathways: A Teaching Philosophy**

*By Jennie Biser*

Social Studies MTF

2009
the strategy of anchored instruction. Anchored instruction is built on the theory of situated cognition and can be implemented in a variety of ways (Brown, Collins, & Duguid, 1989). The instructor’s theoretical approach in the classroom was based on social learning theory and candidates worked in collaborative partnerships to create interdisciplinary video “anchors” as tools for engaging students in problems and project-based learning experiences.

Due to the long-term importance of the skill sets the candidates need to develop, instruction on digital video equipment and editing occurs in three phases.

**Phase One –
The Gallery Walk of Digital Video Equipment**

The introduction to digital video equipment is a hands-on experiential learning technique grounded in social learning and constructivist theory. The instructor sets up camcorders, tripods, and microphones at stations in the classroom. Candidates work in small groups or pairs to practice a set of fundamental skills outlined as punch-lists for each piece of digital video equipment. All candidates are given a sheet outlining the tasks to scaffold their practice with the equipment, and each group is expected to practice skills with more than one camcorder model.

After practicing with the digital video equipment (i.e. connecting microphones, locating ports for power and firewire cables, setting up tripods and connecting camcorders to them), the groups are asked to video-tape each member responding to a short set of questions relating to a course topic recently covered in class. Questions are provided prior to the Gallery Walk session allowing candidates the opportunity to formulate their responses in advance. The instructor’s emphasis on the practical nature of this session and the value of this experience for the future is designed to create a more collegial and collaborative learning environment. The goal of this session is practice for the sake of skill development and video recording to obtain footage for use during the video-editing phases of instruction. The embedded challenge is to practice articulation of professional responses to educational issues while being recorded by peers. This method not only provides candidates with an overview of the equipment, but it also helps them develop a sense of awareness of the amount of time it takes to prepare for video-taping and how many “takes” may be necessary to become satisfied with one’s professional articulation. It’s also more engaging to practice editing video of oneself and this approach also gives candidates many opportunities to critique their ability to speak professionally on camera.

**Phase Two –
Importing and Basic Editing of Video**

The class following the Gallery Walk is devoted to a hands-on session about importing video and basic editing. This phase is critical as candidates must be thoughtful about the format they choose for importing their video. Expectations for digital video products during the candidates’ program require familiarity with .avi and .wmv formats and their properties, storage requirements, and time required for moving from camcorder to computer. The session on importing and editing is made more engaging for candidates as they have their own footage to edit, and they have ample time to practice the basic editing skills they will need to create all projects they will complete during their program. Classroom arrangement is important at this stage as the social learning component contributes greatly to awareness of digital video editing features. Candidates are encouraged to play and experiment, and knowing that they are “just playing” with the tools surrounded by their friends creates a learning environment conducive to experimentation. Another positive aspect of careful room arrangement is the ability to see other computer monitors and hear what’s happening.
on other machines. Establishing a peer-tutoring environment increases candidate engagement in the learning process in addition to increasing the learning about the features inherent in the software tools. This arrangement also permits the instructor to facilitate learning for candidates on a one-to-one basis, as needed.

**Phase Three – Adding Audio, Narration, Still Images and Saving Video**

In terms of set-up this phase is quite similar to the second phase, but is important in ways that go beyond use of the software features. Candidates learn to add audio, still images, record and edit their own narration and save the video in a variety of formats, including web-ready. The final phase is important not only because of the editing skills candidates develop, but because they learn fundamentals of digital ethics valuable to this assignment, yet transferable to a variety of educational applications, including their own future classrooms. With easy access to web-based multimedia materials, it is critical that all candidates understand appropriate use and proper citation of resources. Future teachers must be able to model digital citizenship and ethical behavior for their students, and the digital video anchor project is an excellent strategy for emphasizing proper use and citation of digital audio and images as well as reminding candidates what is and isn’t appropriate for web publication.

The modifications to the Technology in Education course may seem time-intensive, but the opportunities embedded in the experience of digital video editing permit instruction to occur that is resonant across the course and the programs. This instructional method and class assignment have also proven to increase team collaboration, develop camaraderie within the cohort, and generate a level of creativity that might not otherwise have been expressed in a graduate course. Upon completion, all projects are shared and celebrated, giving everyone an opportunity to learn more about creative digital video editing techniques while also learning more about the talents and creativity of cohort members. The memories of the experience linger well past graduation, and the assignment is frequently recalled as a favorite.

**The Student Teaching Experience**

The changes to this aspect of the program were not as significant, but were nevertheless vitally important in collecting video evidence needed for the Digital Video Reflection. More cultural than academic, the changes in the student teaching semester focused on capturing video in the local schools. This may seem simple, but it required support networks to be in place in order to ensure that sufficient equipment was on hand and personnel were available to assist with videotaping. Additionally, many teacher candidates have an aversion to being videotaped in front of the class, even though they are aware that it is the only available first-person window into their own teaching development. Support mechanisms provide gentle reminders of the value of frequent taping during student teaching. University supervisors are responsible for informing cooperating teachers of the videotaping needs, reminding candidates to collect video regularly and reinforcing ethical practices associated with videotaping students in a classroom.

**Results**

The Digital Video Reflection project has developed as an integral part of the graduate programs and the scaffolding has become ingrained in the graduate course curriculum. Candidates fearful of the project expectations at the beginning of their programs are capable and confident users of the technology tools upon completion, but more importantly, they are articulate in their expression of their professional beliefs, their theory-based pedagogical practices, and the value of their experiences to their growth as professionals. As most candidates interview for
Digital Video Reflection: Fostering the Development of Educational Leaders

jobs around the same time as this capstone project, their ability to articulate themselves professionally helps improve their communication with potential employers.

Implementation of this project has a significant impact on candidate learning. The technology skills required to complete the project are also important for teachers in 21st Century classrooms. Although the project is the culminating outcome of a thirteen month program, the long-term outcome of developing proficiency with the digital video tools has an impact that reaches into the future classrooms of the program graduates, and it is through the careful and deliberate scaffolding of digital video experiences throughout the program that faculty can ensure candidates develop proficiency and confidence with these ubiquitous tools.

Although the Digital Video Reflection projects have consistently yielded positive results and feedback from candidates, their cooperating teachers, and department faculty, the pleasant surprise is the level of creativity full control of this technology engenders in the teacher candidates. Digital video inspires in ways not previously demonstrated with other multimedia tools, and each year candidates continue to surprise us with their unique approaches to professional reflection.

Recommendations

As a capstone project of this nature is relevant for any professional program and there can be a variety of methods for scaffolding candidate success, it is recommended that learning goals be agreed upon by all faculty responsible for candidates participating in the project creation. Full faculty buy-in is important to the success of such an endeavor.

As proficiency with the tools is a primary learning goal in this integration example, the methods outlined are designed to achieve the dual purposes of thoughtful articulation of teaching values as well as mastery of digital video editing techniques. Other approaches may not require this duality of purpose, but comfort with the technology yields superior final products. It’s worthwhile to ensure all candidates have the technical and content support they need in order to maintain focus on the content of the project.

Consideration of a project like this must be thorough and thoughtful. Access to appropriate and sufficient equipment to address the needs of all candidates is important. Wear and tear on equipment means that budgets must always include replacement funds. Selection of video-editing tools is also a consideration. Our department wanted to prepare candidates to use the tools they might encounter in their future classrooms and schools, but there are a variety of higher-end options that provide a larger range of editing features.

Plan ahead. Digital video editing tools that have remained relatively stable over the last nine years are rapidly changing with the advent of high definition (HD) equipment for mainstream markets. Phones now capture HD video with the capability of instant publication to the web or viewing on an LCD TV. Make sure that the editing software has kept up with the video-capture options of HD, and make sure your video-capture equipment provides a range of options to support candidate creativity.

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References and Resources


Web Resources

Electronic Portfolios (Helen Barrett) http://electronicportfolios.com/


National Educational Technology Standards for Students and Teachers (International Society for Technology in Education) http://www.iste.org/standards.aspx
Vision and Revision: Using Wikis to Produce and Present Undergraduate Research

Christopher Penna

Background

I created the British Literature Wiki in 2007 for students in my British literature survey course at the University of Delaware. Presently, the site averages between 200–400 unique visitors a day from around the world. Over a hundred students have contributed to more than 200 multimedia pages on such topics as the historical context for various periods of British literature and critical analyses of literary works.

Christopher Penna is an Associate Professor in the Department of English at the University of Delaware. His areas of interest include modern poetry and twentieth-century literature, the intersection of literature and composition, and technology-enhanced instruction. He teaches courses in composition, survey courses in British and American literature, and Shakespeare. Penna has received grants to develop hybrid approaches to teaching composition that incorporate technology with traditional face-to-face instruction. He holds a Ph.D. from Delaware along with degrees from West Chester and Syracuse.
There were several technologies that I could have chosen to facilitate more active engagement in the class. Besides a wiki, either a threaded discussion or a blog would have been a useful way to do this. Each of them would have helped teach the students something about writing for a public audience (BibloKat 2009). Nevertheless, in my mind there were subtle and important differences.

While threaded discussions are excellent for carrying on conversations beyond the classroom and for the tentative exchange of ideas, they would ultimately be more of a place for outlining and brainstorming than for extended, careful analysis. The give and take of post and reply could have been energizing, but it would finally be relatively transient.

Blogs feature a sophisticated hierarchy of posts and comments, along with a capacity for tagging and archiving. They would also allow for easy integration of multimedia. But ultimately they seemed to emphasize the transient, the daily accumulation of what's new, with the most recent event always at the top. The blog itself would be a fixed site, but the content isn't meant to be fixed or static. The default of reverse chronological order for posts would emphasize the ephemeral nature of the content. And for that reason I was concerned that students would tend to see their work there as only marginally important – more along the lines of simply talking about rather than engaging with literature.

Wikis, on the other hand, seemed more flexible, allowing for a larger range of teaching goals and for more sophisticated assignments that would, I hoped, achieve more overall student engagement. A wiki is a Web site that can be edited by multiple users; Wikipedia is the best-known example. In a completely open wiki anyone visiting a page can edit. For pedagogical purposes, however, it is desirable to restrict editing to members of a class, although the wiki may still be visible to anyone on the Web. Wiki software keeps track of each change made to a page and records who made the edit. When a new version of the page is saved, older versions are preserved in the wiki’s “history.” The older versions can later be viewed and even restored as the “current version” with a mouse click.

Among my goals was to move students beyond the stage of passive consumption and have them collaboratively research and creatively present their work.
Students were told that they would be evaluated on:

1. Originality in their research into, or interpretation of, a text
2. Page design – every page was to include visual elements
3. Thoroughness and accuracy of information
4. Care in documenting sources

As the project evolved and I began using the site for a more advanced course in undergraduate research, I also formalized my expectations for students and came up with more specific learning goals. By researching and writing collaboratively (both with other students and also with me), these students would gain a deeper understanding of the following:

1. Specific historical and philosophical contexts of British literature from 1660- present
2. Specific authors and works from this period
3. The process of collaborative writing and research
4. Research-related issues of copyright and online media, notions of authorship and intellectual property
5. Issues involved in the editorial process

The expectation for the wiki pages was that students were to produce high-quality materials from which other undergraduates studying this period could benefit. These entries would be more than factual articles and include the students’ research-based interpretative analyses.

As with my larger classes, these students’ pages also required a visual or multimedia element. However, beyond simply finding public domain images on the Web, these students were encouraged to create their own content using programs like iMovie or Photo Story.

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As with my larger classes, these students’ pages also required a visual or multimedia element. However, beyond simply finding public domain images on the Web, these students were encouraged to create their own content using programs like iMovie or Photo Story.
version of the project but that I reserved the right to withhold complete credit from those who didn't contribute fully. The versioning feature of the wiki was a big help in this area since each person's contribution to the page was saved. Nevertheless, the occasional freeloader who makes substandard contributions to a project can create anxiety for other group members. This can be exacerbated when a group is depending on the person's contribution to complete its page. One way to minimize this problem is to require intermediate deadlines for the project so that work appears gradually, rather than at the last minute.

Another potential problem comes from students who work diligently outside of the wiki and keep their work separate from the team until the last minute. Working offline and then copy-pasting a near-final draft undermines the idea of a wiki as a place of vision and revision and subverts the emphasis on writing as a process. Still, some students find it hard to compose in public, being more used to turning in a "final" draft of a paper. The requirement of intermediate deadlines also helps forestall this problem. Moreover, the software I used has a "page includes" widget. This feature allows separate pages to be merged into one main page with a mouse click. As individual pages are edited, the main page is automatically updated to reflect those changes. This gives the student researcher a quasi-private place to compose while allowing the group as a whole to see the progress of the overall project.

What has been gratifying for both my students and for me is the recognition that their work has received. A useful feature of the Wikispaces system is that it generates comprehensive statistics about the site. As noted, the British Literature Wiki receives between 200-400 unique visitors a day from around the world.

The reaction to the wiki project among students in my survey course has been mixed (some students find it a challenge to work in groups or are put off at first by the technology; others enjoy the non-traditional nature of the assignment). On the other hand, the students in the undergraduate research course report a uniformly positive experience. One student noted that working on the wiki pages "has really helped me better understand all of the different literary movements since the 18th century, and the information provided on the pages complements all of the knowledge I gained in . . . class. I think if I had had access to this information during the course, I would have benefited greatly" (Aiken 2008). From my point of view the project has been quite successful.

In the earliest stages, especially when working with my larger survey course, there were some unexpected rough spots. Collaborative projects among students, of course, can always present challenges (Rice, 2009; Fredrick, 2008), among them the decision on assessing an individual's contribution to a team project. I resolved this by making it clear that all members were equally responsible for the final

**Results**

In addition to meeting online through the wiki's "discussion" tab, the students and I met together once a week to report on progress and give feedback. During these workshops, we also discussed editorial issues that arose out of many contributors creating a large collection of documents. This, by the way, led to further avenues of research. Thus, one student who had remarked on discovering the need for "clarity" in editing did research into Web design and formatting and created a useful page of editorial guidelines for other contributors to the wiki.

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**Student Guidelines for Formatting Wiki Pages**

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Vision and Revision: Using Wikis to Produce and Present Undergraduate Research

Recommendations

Were I to advise someone interested in using a wiki for a similar project, I would offer a few general guidelines:

- Present students with fewer, more specifically delineated choices for projects as opposed to a large number of general, open-ended ones. This is especially true for a large survey course. Students tend to spend a lot of time “deciding” what to work on rather than getting down to work. Having too many broad choices also tends to lead to overlapping among projects.
- Make a strict set of intermediate expectations for the drafting of the page. For example, give deadlines for when the first outlining should appear on the page and for when a reasonably complete rough draft should be posted. In addition give feedback to the students at each of the intermediate stages.
- Develop a carefully designed tool for assessing. Make clear whether projects will be assessed by individual contribution or as a whole. State explicitly what components will be evaluated. (See a sample rubric under Web Resources below.)
- Plan to spend time teaching and re-enforcing rules of copyright and fair use, especially as they pertain to the Web.

Despite the rather structured nature of these recommendations, there has to also be a certain amount of willingness to accept trial and error, or rather vision and revision. After all, it’s that very recursiveness that wikis were designed to accommodate. That is also the nature of much academic research, making the wiki a particularly appropriate tool for demonstrating this to our students.

Admittedly, students who select a course in undergraduate research or who get involved in a project like this through the Summer Scholars Program at the University of Delaware may not represent the typical undergraduate, but the work they have been able to produce has inspired them and has been well received. More important, they have come away with tangible learning artifacts and have met the learning goals envisioned for them – goals that depended on and were mediated by the wiki.

Beyond this recognition is the gratification students have reported in seeing their work on the wiki as a publication. When I asked students to reflect on the experience, one commented on the feeling that her work was a legacy left for others. Another commented on how bringing multimedia content to the pages allowed her to give a voice to her work and a new dimension that might not have been possible with a more traditional assignment.

A Student-Produced Video on the Wiki

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References and Resources


Web Resources

The British Literature Wiki – http://britlitwiki.wikispaces.com/
Student YouTube video – http://www.youtube.com/watch?v=LSOGXGRZa1g


How Open or Closed Should Your Wiki Be? (Stewart Mader) – http://www.wikiorg/2008/02/28/day-17-how-open-or-closed-should-your-wiki-be/


Wikis in Higher Education (University of Delaware) – http://www.udel.edu/sakai/training/printable/wiki/Wikis_in_Higher_Education_UD.pdf
There is a lot of buzz these days about electronic books (e-books) and the devices that support them. Within academe, print digitization is revolutionizing the way we interact with scholarly journals and other periodicals; the same trend is emerging with textbooks. This essay provides a brief background on the higher education market for electronic textbooks (e-textbooks), findings of a study conducted at the University of North Carolina at Chapel Hill on faculty roles in e-textbook adoption, a case study on some early experimentation with the electronic textbook as an instructional improvement tool, and the authors’ perspective on the future instructional role of the medium.

Jean DeSaix, is a Senior Lecturer in the Biology Department at the University of North Carolina at Chapel Hill. She has won of a number of teaching awards, locally and nationally. Her teaching has included introductory zoology and biology courses as well as working with graduate students who are seeking to develop their own teaching skills. DeSaix’s interests are in curriculum development, instructional strategies and educational technology. She received her MS and PhD from UNC and her AB from Catawba College.

(Continues on page 25)
Student adoption rates serve as a broad indicator for the viability of the e-textbook market, but much of that demand is pre-determined by instructors. Not surprisingly, instructors have a great deal of influence over student textbook purchasing decisions. Of students who participated in the UNC pilot, 90% said information the instructor provided on the importance of the textbook was a key factor in their decision to purchase or not. Given many students’ unfamiliarity with e-textbooks, instructor endorsement of this format is likely to be a significant factor in their purchasing decisions. Several students who purchased an e-textbook commented on the importance of hearing about them from their instructors:

“The big thing was that it was teacher-endorsed… like if the teacher never said anything I wouldn’t have looked at or gotten the e-book”

“If the teacher hadn’t said anything, you just wouldn’t have known if it was okay”

The timing of faculty endorsement of an e-textbook also appears to be important. 53% of students in the pilot were notified about the availability of the e-textbook via email before the semester began, while 47% did not find out about the e-textbook option until the first day of class or later. Students who were notified by their instructors before the semester began were nearly seven times more likely to purchase an e-textbook. They were also more likely to seek additional information about the e-book before making their purchasing decisions.

The method the instructor used to tell students about the e-textbook was an important factor in student awareness. Instructors reported notifying students through one or more of these channels: an email before the semester began, an in-class announcement, or in the course syllabus. Students informed via all three methods were most likely to be aware of the e-textbook option. Students who said they were unaware of the e-textbook were most likely to have been notified only through an in-class announcement. The study did not account for late enrollment in the class, a factor that was likely responsible for some percentage of student unawareness.

At UNC-Chapel Hill, the instructor must approve the use of the electronic version of a text before it can be made available to students enrolled in the course. For the fall 2008 semester, e-book titles were available for 139 UNC courses and 15 instructors approved this option for students. In spring 2009, 132 courses used textbooks which had an electronic version, but only 15 instructors included the e-book in the approved list for

Many faculty members and students do not know enough about electronic textbooks to make informed decisions about their adoption and use.

The electronic textbook market is perhaps best described as being in the early stages of an inevitable transition. Devices like the Amazon Kindle have spurred growing interest in e-books, but adoption of electronic textbooks has lagged in higher education (Kolowich, 2010). Why are we not seeing a mass transition to e-textbooks? Many students are not comfortable using a laptop display for the kind of deep reading often required with a textbook, but few of them appear interested in purchasing a separate device dedicated to reading text.

A laptop is still the main productivity tool for most students. However, some industry observers point to Apple’s iPad as an early example of a device that could marry the portability and sharp screen of an e-reader with the computing power of a laptop (Young, 2010).

Market inconsistency is also an issue. Some publishers simply digitize their print books, while others enhance them with embedded media; many textbooks are not even available in electronic format. Finally, many faculty members and students do not know enough about electronic textbooks to make informed decisions about their adoption and use.

E-textbooks and instructor roles

During the fall 2008 semester, twelve instructors and more than 1,200 students participated in an e-textbook pilot study at the University of North Carolina at Chapel Hill. The goals of the project were to identify steps needed to help instructors and students become more informed consumers in the emerging e-book market, and to explore the potential impact of e-books on teaching and learning at the University, especially in light of concern about rising costs of textbooks.
their use. The percentage of instructors approving e-textbooks has increased over the past two years, but many faculty members continue to have reservations about using them. Our bookstore does not formally collect information from instructors about the rationale behind their decisions, but anecdotal feedback suggests that many instructors either do not know enough about e-textbooks to make an informed decision or are concerned that e-textbooks will encourage the use of laptops in the classroom. Laptops as distractions have become an issue for some instructors, although it is not clear that prohibiting laptops in the classroom should preclude student use of an e-textbook outside of it.

**Approach**

I began using an electronic textbook as an option in my honors course during the spring 2009 semester. In support of this pilot application, Pearson Education provided e-books at no cost for the title *Biology 8e* by Campbell and Reece with the online product “Mastering Biology”. E-reader software allowed me to highlight text, incorporate notes, and then share both with students through the online version of the text. Students logging into their e-textbooks could see my notes within each chapter. I used this feature to insert annotations within the online text that my students referenced during their readings. Notations included pointing out particularly important facts, emphasizing certain figures, and indicating parts of chapters that could be omitted. In the system that I used, a push-pin icon alerts students to a note. When they click on the pin, they see a window as indicated in Figure 1. In this case, I have used the highlight function to indicate particular parts of the module that they should focus on.

![Figure 1](image)

In summary, instructors who are interested in providing students with a choice of textbook formats should openly communicate this option as early as possible, before students begin making purchase decisions.

**E-textbooks as instructional tools**

Many comparisons between print textbooks and electronic textbooks have focused on the personal preferences of the end-user, but there are also clear differences in functionality. Full-text searching, copying and pasting are among the features that distinguish e-books from their print-based counterparts. Instructors at UNC and other institutions are also beginning to explore some of the pedagogical opportunities unique to digital formats.

One of the authors of this essay is Jean DeSaix, a biology professor who participated in the 2008 pilot. She has continued to gather data from her students about their textbook purchasing habits and has begun actively exploring the potential instructional benefits of emerging e-textbook products. The remainder of this essay is written from her perspective.

**Reading on an iPad with “iBooks”**

In my honors course during the spring 2010 semester, I made the electronic version of the textbook and the associated on-line learning system a requirement for students; the print version was optional. In this case, Mastering Biology was used not only as a rich source of additional learning through animations and tutorials, but also as a site for daily homework that was completed before each class. This decision was driven by my conviction that students benefit from access to instructor annotations as well as having continuous formative evaluation with all their learning materials available through one portal. Students using e-text-
books could access an animation about the process or structure they just read about through one click of the mouse. They could test their understanding of course concepts through formative assessment activities that were part of the publisher-developed on-line learning system. The book enhanced the homework and the homework enhanced the book. My colleagues and I hope the auto-graded, twice weekly homework will help students with time management and promote better in-class interactions among students who are now well-versed in the basic content.

In the Spring 2009 honors course, embedded annotations helped students to choose concepts on which to focus in preparation for in-class discussions. This process also allowed me to reference relevant sources including such timely events as a lecture by a campus researcher working on the mechanisms covered in the chapter. I realized my goals to help students – especially first-year students – manage the large volume of content, to help them make more efficient use of time spent on assigned readings, and to allow face-to-face class time to be used more effectively.

During class, students often use the e-book search function to find additional examples or explanations from the book that they might add to the class discussion. This not only made them look good by having pertinent facts at their finger-tips, it made the class discussion richer and deeper and added new material through a voice other than my own.

I noted that during class students were quickly able to check their facts and understanding with the e-textbook. In a sense, I was at their side when they were reading the textbook, and the textbook was at their side when they were engaged in class discussion. This tool isn’t going to revolutionize the way I teach the course, but I found myself having higher expectations for my students as far as the level of class discussion. Building on this simple example, it not hard to imagine how such a tool could also be used to support peer learning and formative assessment techniques. (Rayner, 2008).

In the 2010 honors course, students reported that they understood concepts better because of the illustrations and animations – enhancements that digital delivery made possible. Having automatically-graded homework before each class seemed to make the students better prepared for class material. Data should be available to support this impression within the year.

A similar Pearson e-textbook and homework package is now being piloted in the multi-section general biology course at UNC-Chapel Hill. A homework product combined with the e-textbook will be a requirement for Biology 101 students next year.
Major factors driving interest in electronic textbooks are improved quality of homework assignments, rich feedback for formative assessment, simulations, study plans, and other online learning activities made available by publishers and through open source initiatives. These packages, often referred to as courseware, are commonly viewed as supplements to the print textbook. Their full integration with electronic textbooks, however, allows for a more seamless and potentially powerful package of learning tools (Warren, 2009).

Within the next 5-10 years, we believe that these tools will become part of a unified suite of content and academic services providing students with personalized learning experiences across a variety of disciplines. The readability enhancements mentioned earlier will likely go hand-in-hand with learning management systems, personal diagnostics, data visualization tools, artificial intelligence-based tutoring services, and easy access to online communities of interest as well as other external learning resources. Drawing on available libraries of perspectives and materials, instructors will also have more options for producing their own custom courseware products.

By 2020 we may see lectures integrated into online courseware along with the textbook and common companion products such as problem books, solutions manuals, and study guides. A potentially significant cultural transition for higher education institutions will be helping instructors to re-envision their roles in courses where technology-mediated learning is a key component. Even today, courseware includes the option to link formative evaluation to learning goals, to choose questions using Bloom's taxonomy as a criterion, and to diagnose major misconceptions. This courseware can enhance instructor awareness of important pedagogical issues as it helps them understand how to develop learning goals, how to implement Bloom's taxonomy in expectations of their students, and how to recognize common misconceptions. Not only are these products educational for students, but they represent professional development for instructors.

One promising recent development is the growth of the Open Educational Resources (OER) movement. OERs are materials offered freely and openly for educators and learners to use and reuse. Among other initiatives, nonprofit foundations and governmental agencies are beginning to fund the creation of high quality electronic textbooks.

The number of students opting for electronic textbooks will certainly increase as the market matures and more suitable devices proliferate. Meanwhile, it appears that some faculty members will drive adoption by recommending or requiring electronic texts based on the added instructional value they provide. We believe that these new learning products will continue to yield effective instructional activities that simply cannot be replicated with a print textbook.

This tool isn’t going to revolutionize the way I teach the course, but I found myself having higher expectations for my students as far as the level of class discussion

Reading an electronic textbook online

(Author bios, continued from page 21)

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References and Resources


Image credits


Figures 1, 2, and 3 are taken from

Web Resources

7 Things You Should Know About E-Readers (Educause) http://www.educause.edu/Resources/7ThingsYouShouldKnowAboutERead/200539


The Future of the Book (video by IDEO) http://vimeo.com/15142335

OER Commons (Open Educational Resources) http://www.oercommons.org/
Incorporating Online Education with Service-Learning Courses

Paul H. Matthews

Academic service-learning is an approach to education which combines community-based service experiences with academic learning goals and course content.

In a service-learning experience, students learn not only about social issues, but also how to apply the new knowledge to action that addresses real problems in their own communities… Students receive academic credit for demonstrated knowledge in connecting their service experience with course content. (Torres & Sinton, 2000, cited in Campus Compact, 2003)

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Service-learning programs generally include structured opportunities for student reflection (the “intentional consideration of an experience in light of particular learning objectives”; Hatcher & Bringle, 1997, p. 153) and analysis as the means for linking course content with the field experiences. Such courses are increasing in availability and popularity across the country; for instance, at the University of Georgia (UGA), an Office of Service-Learning (http://www.servicelearning.uga.edu) was created in 2005 to support faculty and students in implementing this model of engaged learning.

Encouraging students to take part in course-based service-learning provided an opportunity for the tutors to become better trained and more confident and effective in their tutoring.

However, scheduling this supporting course, “ESOL Service-Learning,” was increasingly challenging. Because the community-based service (the tutoring) took place primarily in the afternoon, students could not attend this class at the same time; yet, during the morning, the tutors were taking all their other coursework, making it impossible to find a time that worked for all schedules. While the course was housed in the College of Education, the majority of participating students were from other Colleges and Schools within the university, and found it difficult to traverse to “south campus” for a single class in their schedule. To be able to deliver the support course most effectively to a greater percentage of the tutors and remove barriers to their ability to participate, a technological solution presented itself. I decided to implement an online version of this course, keeping the same student learning goals as for the face-to-face version: gaining hands-on experience and theoretical knowledge for working effectively with English-learning K-12 students; understanding issues relating to the education of English learners and Latinos in Georgia; and linking service and learning via structured reflection.

As it turns out, there is a growing interest in the field of service-learning related to how online instruction dovetails with service-learning, resulting in what some have called “service-eLearning” (Dailey-Hebert, Donnelli-Sallee, & DiPadova-Stocks, 2008). Indeed, as I describe below, my experiences support the assertion by Dailey-Hebert and her colleagues that “eLearning is not only compatible with but enhances and extends the aims of service-learning” (p. 1).

Approach

Converting to online service-learning was a multi-semester process. I began using the university’s online teaching platform (initially WebCT, since converted to “eLearning Commons”/Blackboard Learning System Vista Enterprise Edition) to host readings and content, and to structure and archive tutor assignments and reflections. In Spring 2008, I created and taught a fully online version, then continued to use and update much of the content to support a blended delivery in Fall 2008. In Spring 2009 I taught two versions of the course (one online, one face-to-face) to provide different options for students, then in Fall 2009 and Spring 2010 taught fully online versions.

Students were able to select from a variety of community- and school-based venues for their tutoring experiences, which were all done face-to-face with
individual or small groups of children. The course, offered for variable credit, required 20-60 hours of tutoring for the semester, at the venue(s) of their choosing. Students selected their tutoring venue based on accessibility, day(s) and timing of the program, and preferred age group or grade level. Each school or community center provided the facility, recruited the children being tutored, and provided administrative and on-site supervision and oversight. Some venues were also staffed by a College of Education undergraduate or graduate student assistant.

An initial face-to-face meeting with the tutors in a computer lab at the start of the semester provided opportunities to overview the course, ensure familiarity with the online learning platform, answer questions, and begin building community. An email listserv was created for each class, as a way to help remind students of upcoming assignments due and to share announcements. The discipline-based service-learning course itself included weekly content modules for asynchronous access. Modules included readings both from the web and from embedded .pdfs, as well as pre-recorded video lectures (using the videoconferencing program Adobe Connect, which allows for recorded online archives of presentations). Each content module also had an affiliated quiz, with access parameters set for a three-week period to encourage timely involvement. Each student provided a "presentation" on tutoring activities or cultural topics; this could be arranged as an in-person presentation at a tutoring venue, or could be posted as a detailed PowerPoint presentation, in some cases with voice-over narration. Finally, students submitted biweekly to a labeled discussion folder, online reflective journals and a summative reflection paper, each responding to particular but open-ended prompts relating the course concepts and readings to students’ service experiences.

Results

This sort of critical reflection—a key component of successful service-learning (Bringle & Hatcher, 1999; Stoecker, Hilgendorf, & Tryon, 2008)—fosters stronger connections between theory and practice, creates a space for considering how specific experiences and broader ideas relate, and is essential for deeper understanding and learning. In these courses, I also used reflection as an evaluation and feedback tool, asking about their perceptions of what the course was doing effectively and recommendations for improving it. Specific prompts in the summative course-final reflection were, “What kinds of support did the online course provide for you?” and “What suggestions do you have for improving the course?”

I undertook constant comparative analysis and open coding of the emergent themes in students’ responses to these open-ended prompts (Spring 2009, Fall 2009, n=23). Three primary affirmative or positive themes, and two areas for improvement, emerged from these responses.

First, while not necessarily unique to the online course, almost all participants (19/23) affirmed that the course readings and online content modules were helpful for their service-learning community tutoring experiences. For instance, one participant noted: “I could not have made it through a semester of tutoring without the help and support of this class. The weekly readings taught me how to tutor these kids effectively and how to understand and handle their behavior.” Additionally, many students (5/23) specifically singled out the AdobeConnect-based video presentations by the instructor as especially helpful, as in the comment: “Also, I enjoyed the weeks when there was a video powerpoint [sic] to go along with the lecture. I would suggest more videos!”

A third of respondents noted that the flexibility of scheduling provided by the online course was particularly helpful for them. For instance, “The online setup was nice while I’ve been working full-time and going to school, because the schedule was very flexible.” This finding affirmed the usefulness of offering the course in an online, asynchronous format.

Participants also appreciated receiving regular feedback from the instructor (6/23) and interaction with their peers (4/23). For example, one student commented, “The online course has provided constant support with regular email reminders about the weekly content and feedback on our journal entries and questions or concerns”; “The online course allowed me to see what other students were going through with their tutees.
This helped to encourage me that I was not alone in some of my struggles.” This feedback from each other and from the instructor was mentioned specifically in the context of the reflective journaling by several (3/23), as with this comment: “I liked the format of the class especially having to do submit the reflective journals. It was always great to reflect on what I was and had been doing; it helped to refocus me and put things into perspective. I loved having the feedback from what I would submit to make me think deeper and give new perspective.”

In response to the prompt requesting suggestions for improving the course, two main recommendations emerged. A number of students (5/23) commented that keeping up with the online assignments and activities due was challenging: “I had never before done that [taken an online course], and found it to be a bit difficult to ensure I was staying on task and getting my work done.” Interestingly, almost half (10/23) of participants recommended incorporating face-to-face meetings during the semester, as with the following comment: “I wish I could have met with the people in the class at least once, or maybe having live interactive discussions on line sometimes might have been helpful.”

Online learning tools are viable for organizing, archiving, delivering and reusing the course content, allowing students to access relevant information that helps support the work they are doing in their community-based service at the time they need it.

Recommendations

Service-learning, to be effective, must include relevant and meaningful service activities that respond to community needs; provide opportunities for enhanced academic and civic learning; and engage students in “continuous, connected, challenging and contextualized” reflection (Howard, 2001, p. 20). At the same time, as awareness and practice of service-eLearning continue to grow (Post, 2008), this “integrative pedagogy… [can become] a powerful and value-laden approach to learning” (Dailey-Hebert et al., 2008, p. 1) in synergistic ways. In considering lessons learned from this case study of the development and implementation of online service-learning tutoring, several recommendations seem especially appropriate for bolstering service-learning courses in any field.

Service-learning and online instruction both allow for and help develop different kinds of relationships between faculty and students (Howard, 2001; Lewis & Abdul-Hamid, 2006). This is not necessarily positive; personally, I found it more difficult to get to know the students through the online-only interaction in these courses. Feedback and interaction may happen in different ways than the traditional large-group lecture. Likewise, both kinds of instruction also place more responsibility for active learning on the student. For those students who find it difficult to keep up with course content and assignments without face-to-face prompting, engaging students with emails and discussion postings, as well as communicating attentively and in a timely way not only with the students but also with the supervisory partners for the community-based experiences, become critically important (Bailey & Card, 2009). Of course, technology can also help the community partners with expediently reporting student community work back to the instructor. One of the tutoring sites I worked with, for instance, used a fingerprint scanner to log tutors in and out, which generated an Excel spreadsheet that was sent monthly to the instructors!

Reflection, that sine qua non of service-learning, can be fostered particularly well by online teaching tools (Stoecker et al., 2008). As Post (2008) suggests, the asynchronous nature of online reflections can allow greater time for “critical thinking and problem solving to emerge” (p. 24) in greater depth. Online archiving of discussion and reflections also allows students to reference and develop strands of ideas. Online submission can logistically streamline the process of responding to reflections (no handwriting to decipher, or notebooks to collect), and for faculty members interested in analyzing the students’ learning outcomes, having their contributions already typed and organized into folders is quite helpful. As mentioned, I found the online reflections as useful for course evaluation purposes (during the course and post-hoc) as for monitoring student learning and activities.

Online learning tools are viable for organizing, archiving, delivering and reusing the course content, allowing students to access relevant information that helps support the work they are doing in their community-based service at the time they need it. In service-learning courses, the sequencing of content may need to be more student-driven—so
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that, for instance, they can seek out at any point in the semester suggestions for responding to tutee behavior, developing strategies for teaching vocabulary, etc. However, as some students seem to find the reading/writing-intensive modality of typical online courses taxing, chats and video presentations can help minimize this strain. A principled rationale for incorporating multimedia reinforces the suggestion that online learning tools should serve to minimize perceived online disadvantages, not be used “just because they exist” (Elbaum, McIntyre, & Smith, 2002, p. 40). Such support can also come from the responses of the instructor and class peers. Blending courses to provide at least occasional face-to-face support meetings (even if not mandatory for all students) can also help students who prefer higher levels of non-computer interaction. Interestingly, in the semester following the feedback described above, I intentionally structured in two optional face-to-face sessions throughout the semester to provide this opportunity; however, no more than two students showed up for these sessions!

Clearly, much of the learning in service-learning courses also happens at the community service venue. Online content can help with preparing students for the community experiences. This certainly includes students’ general support, learning, and preparation (e.g., strategies to tutor reading or math). However, online coursework can also help prepare students for the community experience by linking to relevant websites about the venue (Dailey-Hebert et al., 2008), as well as through archiving and sharing reflections or tips from previous semesters’ student experiences at those same venues. For instance, one tutoring venue some of my students worked with had its entire orientation and background check process on its website, along with a Facebook page for sharing information with and among the tutors. The community component of service-learning can likewise be an effective counterpoint to some of the disadvantages (e.g., lack of face-to-face interaction) of an all-online course (Bennett & Green, 2001). That is, the interpersonal activities with other students and community partners can mitigate some of the sense of isolation that students might otherwise experience online. For my students, at least, this was very much the case.

Finally, the online instructional format can allow increased potential distance of service venues (Dailey-Hebert et al., 2008) and more flexibility in timing of placements, such that students who otherwise would not be able to take part in the learning component of the service activity are able to do so. In fact, in Spring 2009 I had one student in my course who was physically located and did her service-learning at UGA’s Griffin campus, several hours south of our main campus.

In sum, as my case study of online service-learning tutoring courses demonstrates, integrating technology into university service-learning coursework can help enhance the teaching and learning experience substantially, benefiting the university students, faculty members, and collaborating community agencies. Not only does the online course format reduce conflicts with the timing and location of service experiences, it also directly supports many of the key elements of effective service-learning course design.

Bennett, G., & Green, F.P. (2001). Promoting service learning via online instruction. *College Student Journal*, available online at [http://findarticles.com/p/articles/mi_m0FCR/is_4_35/ai_84017184/](http://findarticles.com/p/articles/mi_m0FCR/is_4_35/ai_84017184/)


Clickers in a Classroom: Learning Outcomes and Student Reactions

Evan Golub

Background

My department at the University of Maryland offers a technology literacy course for non-majors. This course presented two concerns that motivated me to explore the use of classroom response devices (clickers). First was a desire to improve student performance, specifically regarding retention of certain types of facts. Each year a surprising number of students gave incorrect answers to certain exam questions that had been discussed specifically in class, sometimes in several ways. Previous work (Duncan, 2006) indicated that student attention could be focused on specific material via clickers, which implied that the students would later perform better when tested on this material.

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The second concern was how to make a large lecture course more interactive and engaging in order to improve the overall course experience and address attendance issues. During previous semesters, when I wanted to bring voices besides my own into a discussion I would pause to ask students to raise their hands to vote on a question, or ask “would anyone like to share a thought on this” at various points. Very few students would raise their hands or offer personal opinions. Additionally, attendance would be fairly high at the start of the term, but I found that later in the semester it would drop noticeably. A small group of students would raise their hands or offer ideas, and that group did not suffer from an attendance drop. This led me to believe that an increased level of overall engagement might encourage better attendance.

Previous work (Cue, 1998; Duncan, 2006; Draper & Brown, 2004) and local discussions indicated that attendance could be improved through daily or near-daily clicker use. In one attempt to use clickers in a course, I simply asked those who already had the devices to voluntarily bring them; this produced less than a 5% response, even though data indicated that approximately one third of our students had them. It was suggested that basing 5% of the semester grade on responding to clicker polls would be significant to students. I also read (Jackson & Trees, 2003) that students who might not have come to class without this requirement could be inattentive or even disruptive in class, so there were some risks associated with this change.

Approach

While there are other ways to have students in a large lecture provide feedback during a class period (a show of hands, pointing to answers with individual laser pointers) the clicker system used here provides a way to collect student answers, display the results, and assign points for participation or correct answers.

Clicker-based polling can be used for taking attendance, assessing prior knowledge, administering quizzes, reinforcing key facts, asking general opinion polls, or presenting anonymous opinion polls.

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students about what happened next. One of my polling slide sequences presented these questions, along with appropriate answer options:

1. Around how many web sites do you think there were in 1995?
2. Around how many web sites do you think there were in 2001?
3. Around how many web pages do you think there were in 2001?
4. Around how many web pages do you think Google currently indexes?

Discussing certain topics openly can be a challenge, especially topics that touch upon controversial, embarrassing, or even illegal activities. Polling can be a useful tool in situations where students may not want to identify themselves with an answer. Clickers allow you to ask students to be honest about these topics without revealing themselves to their peers. The summary data can be used as a discussion point as well as allowing students to consider their reply in the context of the class-wide response. As an example, when discussing copyright, I presented a scenario where a student needs to obtain and read a book during the coming month. Each of the methods in the sequence below was presented on a separate slide and students were asked to indicate whether it was acceptable for someone (not specifically them) to acquire the book in this way:

- Buy the book new.
- Buy the book at a used bookstore.
- Borrow the book from the library.
- Borrow the book from a friend.
- Borrow the book from a stranger who is offering to lend it out on Craigslist.
- Sneak a copy of the book out of a used bookstore and then return it a week later.
- Steal the book from a new bookstore.
- Download a copy of the book off the Internet via a file sharing system.

After polling closed the results were displayed. I followed with questions to the class where the percentages indicated something “interesting” but not too controversial. I was surprised that a very low number of students felt the Craigslist option was acceptable, so I asked students to volunteer why they felt this way. Several quickly raised their hands to share their reasons.

One can also use polling to demonstrate a concept that requires group involvement along with rapid data collection and analysis. After discussing the concept of research and randomness in one class session, I asked students to click a random button number between 1 and 9. The number 7 received a disproportionately high number of votes and the number 4 not many at all. I commented that when accusations are made about election corruption, officials sometimes study the distribution of the last digit of the tallies in districts. I suggested we try again, hoping to avoid the imbalance of the first poll. In the re-poll, 7 had a disproportionately low number but there were many 4s. I used this as an example of how results can be influenced by subtle changes in wording when choices are presented.

Figure 2: A question that involves a rating scale.

I think it is irresponsible for bloggers to repeat statistics they find online if they have not looked into how the data was collected.

<table>
<thead>
<tr>
<th>Percent</th>
<th>Answer</th>
</tr>
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<tr>
<td>20%</td>
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<tr>
<td>37%</td>
<td>2. Agree</td>
</tr>
<tr>
<td>28%</td>
<td>3. Neutral</td>
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<tr>
<td>13%</td>
<td>4. Disagree</td>
</tr>
<tr>
<td>2%</td>
<td>5. Strongly Disagree</td>
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</table>

I connected two class topics – Internet journalism and statistics – in a pair of slides with agree/disagree polls on these statements:

- I think journalists should be required to have a background in statistics if they use them in a story they are reporting.
- I think it is irresponsible for bloggers to repeat statistics they find online if they have not looked into how the data was collected.

A discussion ensued among several students – with the context that everyone in the room knew the poll had shown opinions very much split on these issues. Soon after it was announced that web addresses would be able to contain non-English characters, I presented a slide displaying five web URLs and asked the students to indicate which they felt was a “safe” link. There was no direct lesson in the example, but it served as a way to show how there could be adversarial “cons” created by reasonable and honest decisions made by the organizations in charge of the Internet and to encourage the class to think broadly about the “world” part of the world wide web.

One should have specific goals and an initial plan for how to use response devices across the entire semester, but leave room to be creative and spontaneous in some polling. Your plan should be flexible, with contingencies for technical glitches. A student’s device can break, a classroom receiver can malfunction, or a session of data can be lost. Also remember the cost to your students; we replaced a required book with free online readings in order to reduce the financial impact of purchasing the device.
more students than when I simply asked for a show of hands. This inspired me to generate more interesting and thought-provoking polling questions throughout the semester, even after I had moved past the set of polling slides mapped out in advance. Several of the examples mentioned in this essay were the result of such inspiration.

Regarding the score percentage of the final grade, in our first semester of use clicker polling was worth 5% of the course grade and almost every student had a clicker registered. In the second semester it was increased to 7% with no overall differences in the observed outcomes.

While attendance did stay higher throughout the semester (70 - 90%) there was not a strong correlation between participation in polling and performance on the corresponding exam questions on that material. There was an exam question about secure clients and servers that I would ask each semester and many students answered incorrectly. When I began using clickers, I presented a total of four polling slides that asked about this topic in different ways. As expected, many students gave incorrect answers during polling and I revisited the topic to review and expand upon the correct answer. Nevertheless, a large number of students still gave incorrect answers to exam questions that topic.

At the time of the first exam students had seen perhaps a dozen multiple-choice questions with “right answers” on polling slides and a half-dozen opinion-based questions. The objective items became an interesting (if potentially skewed) initial “test” of the clickers themselves, as I simply incorporated those questions onto the exam verbatim to see how students responded. The class average on those questions ended up being lower (63.24%) than the average on the rest of the exam questions (70.63%). In fairness, many of the questions were chosen for polling because they represented difficult concepts. It was also possible that the average was brought down by students who did not attend to participate in the polls.

For the 69 students who took the final exam in Fall 2008, I ran Pearson correlation tests between individual clicker participation points and clicker exam question scores. Correlations and scattergrams of student data did not show a significant relationship. The Pearson correlation was only 0.51. I used the same question-writing approach on the second exam with a similar number of items. The class average on those questions ended up being slightly higher (71.20%) than the average on the rest of the questions (70.63%). In fairness, many of the questions were chosen for polling because they represented difficult concepts. It was also possible that the average was brought down by students who did not attend to participate in the polls.

As the instructor, I enjoyed class more and felt more in touch with the “pulse” of the students as a result of the higher level of interaction created by using clickers. I was able to engage far
Recommendations

I decided to continue using clickers with this course because of their positive classroom benefits and the fact that they appeared to lead to an increase in attendance. An increase in class participation as well as the potential to rejuvenate my view of a course significantly influenced that decision. Being aware of the strengths and potential weaknesses in advance should temper expectations and shape the use of polling.

The potentially disruptive students that Jackson and Trees mentioned did not show themselves. Whenever I did polling at the start of class I did not poll at the end. After students learned this, there would typically be a small number who would get up and leave after I ended the polling session and closed the slides. They generally sat in the back of the room and were able to leave without disrupting the class as a whole.

Future plans include exploring whether it is possible to take advantage of the positive observations via occasional use in other courses, without having any portion of the class grade assigned to participation. A more controlled study might be designed in which two sections of the course taught by the same person would differ only in whether they used clickers during class. The facts from the clicker questions would be presented in both classes, but polling would only be done before revealing the facts in one class. Additionally, some facts would be presented but not polled on in both classes. Student performance on the exam questions would be recorded item by item for comparison.

For the final exam I used the same approach to generate new questions, and all previous clicker-based questions were asked once more. The class average on those questions ended up being much higher (78.54%) than the average on the rest of the questions (63.06%). However, once again analysis showed no significant correlation. The Pearson correlation was only 0.40. For Spring 2009, the first exam was designed in the same manner as Fall 2008, and once again no strong Pearson correlation was seen. No further correlation tests were conducted.

An interesting pattern related to clicker participation re-affirms the adage that "showing up is half the battle". Students with high course grades had high rates of clicker participation. This is not a measure of the effectiveness of clickers, but it is an interesting data point in terms of class attendance and overall performance.

<table>
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<tr>
<td>B</td>
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<tr>
<td>C</td>
<td>76.2%</td>
</tr>
<tr>
<td>D - F</td>
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Students were asked about their attitudes towards clickers at the beginning and end of the term. At the beginning, after three practice days of clicker use they were asked to provide Likert-style answers (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree) to statements such as "I think the use of clickers will lead me to come to class more often." At the end of the semester reworded statements were presented, such as "I think the use of clickers lead me to come to class more often."

When asked whether clicker use would/did lead them to come to class more often or make class more interactive, they generally agreed that it would, although some shifted to neutral on these statements at the end of the semester. The last polling slide asked whether they thought clicker use would make the class more interesting. Feelings varied on this initially, but moved towards mostly agreeing by the end of the semester. Detailed results of this polling can be found at [http://www.cs.umd.edu/~egolub/ClickerResearch/ClickerPerceptions.shtml](http://www.cs.umd.edu/~egolub/ClickerResearch/ClickerPerceptions.shtml)

### Turning Statistics Report

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References and Resources


Web Resources


Shifting the Gaze: Creating a Space to Play (and Learn) with Digital Technologies

Sara Kajder and David Hicks

Background

With the proliferation of new forms of representation (i.e., podcasts, digital stories, RSS feeds, manga, wikis) comes new pressures and potentials within the range of content and literacies that are present, or even possible in classroom teaching. This chapter discusses the development and implementation of a jointly-designed, interdisciplinary teacher education course (EDCI 5784: Teaching and Inquiry in...

Sara Kajder is an assistant professor of English Education at Virginia Tech. Her research examines the nature of teaching English in standards based contexts, the integration of new literacies and emerging technologies to support the teaching and learning of English, and the nature and development of adolescents' literacy identities.

David Hicks is an associate professor of history and social science education in the School of Education. His teaching and research interests include examining teachers' understandings of the teaching of history in standards based settings, and how integrating technology can support the teaching and learning of history and social science.
Course design was informed by current literature on digital youth practices with new media, what we know about learning, the importance of communities of practice, and the culture of schools and schooling.

Course objectives directed that students:

1. Critically evaluate emerging technologies for instructional uses, literacies they evoke (and, potentially, supplant), openings for content exploration, etc.
2. Discuss the impact of the grammar of schooling (and the deep seated regularities of schooling) on one's own actions and decisions with regard to the use of digital technologies.
3. Create multiple artifacts and exemplars for use in classroom instruction.
4. Explore methods of producing evidence of student understanding of the curriculum.
5. Negotiate assessment requirements within the current standards based 21st century classroom.
6. Investigate, research and analyze classroom practice and student learning for impact of web 2.0 tools and learning 2.0 pedagogies on student learning.

**Approach**

An initial consideration during course design was where the course fell in our students’ sequence of programmatic coursework. This course replaced two existing 3-credit courses. The first was a single-semester “teaching with technology” course offered to all pre-service, licensure students in all programs, and the second was a “teacher as researcher” course required for completion of the Masters degree. As such, our goal was to integrate the research, technology and methods courses to foster connections and aid in developing an interdisciplinary learning community amongst course participants. At the macro level, the idea of fostering learning communities of practice is at the core of our School’s conceptual framework.

All students were in the final two semesters of their graduate preservice Masters of Curriculum and Instruction/post-graduate professional licensure programs, concurrently enrolled in methods courses emphasizing curricular development, pedagogy, and the realization (and practice) of their skills within assigned field placements. Our intentional placement of this new course in dialogue with the methods and field experience courses was meant to leverage this period of identity and skill development as teachers began to see anew what it means to teach and learn in diverse, 21st century public classrooms. In contrast to the typical one semester “teaching with technology course,” this course spanned the entire academic year, requiring students to apply their fall learning experiences into their pedagogy during the spring student.
teaching. This overcame the lines of demarcation between the methods, field, student teaching and other programmatic coursework thus changing the culture of the programs and learning experience of the students. As stated in the course syllabus:

This class is ... designed as a room to play and prepare you for 21st century classrooms. We do not want you to succumb to cultural inertia and just recreate and blend with what you see in the classroom, but have you become change agents in terms of how you and your students interact and use digital technologies to support the teaching of humanities.

… Learning to teach is a time when one's past, present, and future are set in dynamic tension. With this in mind, the ability to reflect on action, in action, and for action is key, and that means you need to be willing to play and take risks. This course is designed to provide you space to begin to develop a critical yet entrepreneurial eye with regard to self, school, digital technologies, and context.

Using the very tools available to students both in and outside of the classroom, students blogged and vlogged, collaborated within wikis, tagged, tweeted, posted and annotated work within flickr, created and shared digital stories and podcasts – all the while critically exploring the potential instructional value-added of pairing their content and future pupils with specific tasks and tools.

We utilized a studio learning approach, affording students the opportunity to choose specific sessions that met their interests and learning needs, challenged their hands-on skill development, and provided an authentic community learning experience. Short in duration, each mini-studio followed a structured (and therefore predictable) framework beginning with a mini-lesson modeling a classroom use of the tool or digital learning space, hands-on application within interdisciplinary small groups, and active debriefing and discussion of potential instructional uses and pedagogical value-added. This approach was supported/anchored by a class wiki that all students accessed to house materials, map our journeys (“we”), connect to student reflective blogs (“me”), and share examples of our students’ developing work (“see”) (figure one).

Students were required to attend a minimum of four studio sessions along with multiple full-class, required meetings. Choices were made given both the capacities of the tools themselves (i.e., Jing is a screencasting tool) and the larger categories of use developed by course instructors. In developing these categories (outlined in the third column of table one), we paid specific attention to how our disciplines and standards come together to support learning.

Within this pedagogical design, the goal was to help students to develop an “entrepreneurial eye,” providing a macro-level view of schooling in the 21st century in terms of their disciplinary area, current and emerging technologies and educating for literacy. Instead of focusing on teaching specific tools or practices, our focus was on reading, navigating, and using the continually shifting landscape of technology tools as readers, writers, thinkers, teachers, creators, and participants. Further, instead of succumbing to cultural inertia and recreating the classrooms they knew as students, we looked for participants to become change agents, reflecting upon their actions, exploring visions of the possible for their classrooms and critically examining digitally supported instructional strategies and their impact upon student learning. To that end, as the culminating course assignment, students developed and implemented action research projects, investigating their pedagogy with web 2.0 tools and closely studying the impact on their students’ learning.

The action research project is designed and implemented during the second semester of the course, specifically tasking students with pairing their instructional needs and goals with at least one of the tools that we’ve explored in the fall studios. As shared in the assignment guidelines:

Our “play” means something very different this semester. We will no longer be exploring new tools in the relative safety of our collective classroom. Instead, you’ll be deploying your own activities in your own teaching contexts – alongside the very real adolescents in your classrooms. The experiences, opportunities, and challenges that this semester brings in your student teaching placement will “imprint” on you in significant ways – and be something you carry forth into your practice for years to come.
Following the continued blurring of the lines between methods course, this digital humanities course, and students’ work in the field, this assignment happens apart from any formal meeting of the full group. Instead, instructions are disseminated through methods faculty as is the assessment of the three segmented parts executed in the process of (1) designing the study, (2) collecting and analyzing pupil data, and (3) using those findings to inform subsequent practice. This final part looks different across students, sometimes due to disciplinary lenses and standards, but also as our goal is the critical evaluation of instructional value-added in both the functioning of the tool and the pedagogies used in the classroom. Students come together as a learning community at the close of the program where these papers and findings are disseminated as a part of a well-established electronic portfolio defense.

The portfolio is a standards-based reflective compilation that maps their journey from student to teacher across their graduate programs of studies and work in the field. While students choose portfolio artifacts that provide evidentiary warrant for their growth as teachers, the action research project is one of several required assignments. The action research project is examined alongside other artifacts as students demonstrate their standards-based learnings but is also as one assessment of their state mandated (and defined) technological literacies.

### Results

The year-long design of the course paired with students’ reflective work in the eportfolio tasks creates an opportunity for them to trace for us their learning over time. Where earlier cohorts of students might have met the state-required “standards checklist” for technological literacy, there was limited (if any) transfer from the methods classroom into their work alongside pupils in k-12 contexts. Here, the course as a whole and the culminating action research process provides tangible evidence of classroom technology use but also illustrates their abilities to critically examine and reflect upon their practice—in action, on action and for action (Schon, 1987).

A large area of discovery for us as faculty was made immediately from the first day of class as students demonstrated their unease with their own abilities as users of digital media and tools. Our assumptions were built from the existing literature on their “digital nativeness” (Prensky, 2005) and were found to be completely false. Given the course focus on building a supportive learning community, students were able to develop efficacy, skill knowledge, and pedagogical authority which nudged them into a more confident space where they were more ready, willing and able to simply play and explore what digital media brought into their classrooms. Their journey and their honest struggles were captured throughout both semesters as they vlogged and blogged about their experiences in the field and in working alongside cooperating/mentor teachers who shared their hesitation. Our student teachers were placed in very traditional public classrooms with a broad range of access to the kinds of tools that we explored and modeled in the course. Further, they went through the same learning process as any preservice teacher, reverting first to creating the kinds of classrooms that they had experienced as learners rather than those we were leading them to envision in their coursework (Valencia et al., 2009; Clift & Brady, 2005). The transparent process of reflecting across multiple venues and modes allowed for students to publicly (and safely) share their concerns and make inroads into their further learning and development as individuals and members of the learning community.

In the second half of the course (concurrent with student teaching), technology use represented a broad spectrum of pedagogical approaches and tools. In some cases, these were found to amplify pupil learning and/or engagement. In others, the opposite occurred, providing student teachers with the opportunity to examine why, explain why, and re-envision their sense of pedagogical authority with the use of digital technology. As the course defines learning in a broad sense, students acknowledged the importance of using digital technologies as a motivational or engagement tool which opened up new opportunities for continued study. Within the first cohort of students conducting this work, students’ uses of technology ranged from conducting anonymous polls using polleverywhere.com, to pedagogies using SMART boards to support visual discovery, to uses of blogs, podcasts and wikis to support student writing across content areas, and to uses of screencasting tools like Jing to model or scaffold

<table>
<thead>
<tr>
<th>Studio One</th>
<th>Content/Schedule</th>
<th>Big Idea</th>
</tr>
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<tbody>
<tr>
<td>Group One</td>
<td>9-10:15: VoiceThread</td>
<td>Perspectives/Visual Representation</td>
</tr>
<tr>
<td>Group Two</td>
<td>10:15 – 11:30: GoogleEarth</td>
<td>Perspectives/Visual Representation</td>
</tr>
<tr>
<td>Group Two</td>
<td>10:15 – 11:30: Flowgram/Jing</td>
<td>Perspective/Visual Representation and Multimodal Composing</td>
</tr>
<tr>
<td>Studio Two</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group One</td>
<td>9-10:15: Flicker</td>
<td>Information Fluency and Management</td>
</tr>
<tr>
<td>Group Two</td>
<td>10:15-11:30: Podcasing with Audacity/iPadio</td>
<td>Inquiry-Driven Learning</td>
</tr>
<tr>
<td>Studio Three</td>
<td>Group One</td>
<td>GoogleEarth</td>
</tr>
<tr>
<td>Group Two</td>
<td>10:15 – 11:30: Skype/Global Schoolhouse/Social Networks for the Classroom</td>
<td>Inquiry-Driven Learning/Perspective Taking</td>
</tr>
<tr>
<td>Studio Five</td>
<td>Group One</td>
<td>Multimodal Presentations</td>
</tr>
<tr>
<td>Group Two</td>
<td>10:15 – 11:30: Using the SmartBoard</td>
<td>Visual Representation</td>
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</tbody>
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<th>Table 2</th>
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<tr>
<td>Studio Schedule</td>
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The goal was to help students to develop an entrepreneurial eye,” providing a macro-level view of schooling in the 21st century in terms of their disciplinary area, current and emerging technologies and educating for literacy.
instruction. Again, in all cases, no matter the tool or pedagogy used, students were responsible for making the case for the pedagogical value added (or lack of) demonstrated in the selected episode of instruction. Final reports synthesizing their classroom findings were shared both face-to-face in a brief, conference-style, 10 minute presentation, and through a written research report. Both of these products are used as electronic portfolio artifacts as evidence of both their ability to use and manage technology and to evaluate and monitor their pupil's growth.

Within their findings, we largely saw that critical evaluation of the technologies used during the action research project was both contextually aware and critical. As one student teacher wrote of Edmodo use in supporting her students' response to current events, "students did not find it easy to navigate, three-fourths of them did not like using the website to respond… saying 'it still felt like work.'" What we found to be particularly noteworthy was the student teachers' moves from evaluating the impact of the use of the tool to reflections on their own practice and ideas for future implementation. To that end, the same student teacher wrote about the relative merits of differentiating tool use to meet particular student needs, establishing a balance between students who needed explicit strategies for managing the information load present and those who needed to add to the corpus presented within the Edmodo environment. In other words, she found that teachers working within digital contexts need to recognize the needs of digital learners to both create and consume information, and provide appropriate environments, supports, and models for making those practices work. As faculty, we believe that the action research assignment was an opportunity-maker, positioned within and through the realities of schools, and cooperating teachers who may not recognize or integrate digital technologies in their practice. Thus, this task creates an opening, however small, for student teachers to initiate a trajectory towards critical use, mindful play, and learning alongside their pupils.

**Recommendations**

Our experiences across the design and implementation of this course lead us to further realize the role and importance of "core values" in our approach rather than recommendations per se. As we plan for the next cohort of students to move through this course, we continue our commitment to the roles that choice, play, and community have in developing the "entrepreneurial eye" preservice teachers need to navigate an ever-changing landscape of digital media, tools, and texts. Where the design of the course facilitates face-to-face meetings during the first semester, we are also now shifting towards a hybrid model that brings together online studio-formatted modules, an extended community of practice that invites participants from other institutions, participation in online educational technology conferences (i.e., k-12 online conference and NCTE Virtual Conference), and the face-to-face meetings needed to build a cohesive community of learners within our own students. As the toolset of software and tools (cloud-based or other) continues to expand, so will the technologies explored within the studios. We also envision growing that out to include mobile learning devices including but not limited to iPod Touches, iPads, and Kindles. Again, the goal here is to remain rooted in the pedagogical affordances of the tools and the literacies they make possible, not centering our thinking in what is necessarily "new."

Our interdisciplinary approach has fostered a diversity of perspective within the learning community, a necessary element of developing our students into 21st century digital pedagogues. This is a course that goes beyond the semester, and we also see a continuation of that into our graduates' induction years as they continue to integrate technology into their teaching while maintaining the critical, analytical perspectives fostered within and through the course. Where the traditional “teaching with technology” course might bring together students across disciplines, we see a critical distinction between a collection of bodies in a room and an intentionally facilitated and truly emergent, authentic community of practice that moves outside the faculty-constructed experiences within the course.
References and Resources


Image Credit


Selected Web Resources

Waving: Enhancing Online Discussion

Larissa Horn

Introductory Note

This essay describes how I used Google Wave in a mathematics seminar. Many readers will be aware that Google abandoned development of this product in August 2010. You may not know that in December 2010 Apache announced that it had taken Google Wave under its open source project umbrella. Before completely letting go of Wave, Google will release “Wave in a Box,” giving developers access to Wave’s functionality and allowing power users to run their own Wave server. Google Wave is dead; long live Apache Wave!

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In order to foster more productive conversations, I decided to create a setting in which students felt comfortable enough to express their thoughts to the whole class. Many people have anxieties about math, so it was important to find a resource that would provide each student an opportunity to contribute in his or her own way—including asking questions about the readings, looking up information, and compiling data for the class.

Additionally, one of the goals of this class was to foster understanding of multiple sides of an issue. I needed a way to keep the classroom atmosphere welcoming to all students, no matter how their beliefs might differ. Since many of our topics were controversial, it was important for students to treat each other with respect. It is rare for everyone to agree, but I wanted students to learn to understand someone else’s viewpoint while still disagreeing.

Throughout each topic in the course, I wanted students to learn to find their own answers to the questions that arose. They would need to amass a great amount of information and sort through it together.

### Movie Title | Year | Gross
---|---|---
1 Avatar | 2009 | $760,507,625
2 Titanic | 1997 | $600,788,188
3 The Dark Knight | 2008 | $533,345,358
4 Star Wars | 1977 | $460,998,007

### Adjusted

| Movie Title | Year | Gross |
---|---|---|
1 Gone with the Wind | 1939 | $1,588,070,800
2 Star Wars | 1977 | $1,400,020,000
3 The Sound of Music | 1965 | $1,119,384,900
4 E.T. | 1982 | $1,114,975,100

Source: boxofficemojo.com

I wanted the students to recognize that numbers can give an argument a false sense of legitimacy. Classroom discussions and debates seemed the perfect setting to explore this issue.
For each topic in my seminar we created a separate wave to serve as an online chat room. Students were given full permission to edit, and asked to post questions or other information they found while researching the material outside of class. During class sessions, we used the wave to guide our conversation. As a discussion facilitator, this helped me early on to know where the students’ interests lay.

Not only was Wave an impressive chat room, but it was also part of the whole Google package. Once a person was logged in, other applications were only a click away. Wave seamlessly integrated with Google docs, for example. When we needed to jointly enter data into spreadsheets, we could embed the document right in the conversation. It remains to be seen how this integration will play out in the future.

Approach

Essentially, Wave is an interactive version of email. Participants communicate in “waves”, which are threaded conversations. Any person involved with a wave can change any portion at any time, including comments they did not author. A wave records all these edits in its history. In addition, programmers have created hundreds of free extensions called “gadgets” and “robots” that allow waves to serve as much more than chat rooms or collaborative documents. There are gadgets that allow users to insert tables, maps, or virtual chalkboards. Robots can translate text into different languages, look up information and post it in the wave, or turn code into proper math equations with symbols.

Several educational applications of Wave have been documented on the Web. Shelly Blake-Plock (2010) had her students use it to write an epic poem in Latin. Richard MacManus (2009) describes how a group of grad students explored collaborative note taking.

Many people have found Wave difficult to “get” until they have participated in a wave. A few guides are available to help as you begin to learn the system; perhaps the most thorough is Trapani and Pash's Complete Guide to Google Wave (2010).
The students saw many benefits to this particular style of discussion. It allowed them to consider and reconsider their thoughts before presenting them in the classroom. Rather than having a glaring mistake permanently posted, students were free to edit their posts. If replies convinced them to change their mind, they simply rewrote their posts. If they found new information to add, instead of cluttering the page with another reply, they added it to the original post.

With less pressure to be perfect, some of the shyer students found it easy to contribute to the discussion. Wave allowed students with a fear of talking in front of others to gradually improve their contributions. Writing down their thoughts was much easier for them than having to come up with answers on the spot during class. Eventually, the positive feedback from the responses on the wave gave them confidence to speak up during class also. One student in particular came to me at the beginning of the semester and explained his fear of talking in class. I suggested he post more often if he was afraid to contribute more verbally. By the end of the semester, he was one of the more outspoken students in the class.

Perhaps more importantly, Wave kept the students engaged in the discussion outside of class. Our chat room was as accessible as any other social networking website. Rather than having to log in to an official university site, it was natural for the students to flip from Gmail to Wave several times a day to see if anyone had posted anything new. Even more appealing to this generation of students, Wave updates in real time. This means you never have to reload a page and you can respond as someone is typing thoughts. Occasionally, I would come across remnants of these live discussions where students sorted out their thoughts with one another.

When teaching this class the previous semester, we had used a more basic chat room. The students were able to post, but could not reply to specific comments or questions previously posted. Using Wave, they produced much more lengthy and thoughtful comments. I believe that the unique format of Wave encouraged the students to develop their responses into more than just snippets of text.

Also surprising, the students showed an unexpected level of respect for one another even through a few pointed debates. Despite differing opinions, they approached the conversation with a considerate tone, open to hearing about other viewpoints. Being able to view the thoughts in writing first allowed the students to reflect on them without the additional emotion coming from a face to face conversation.

Though this technology clearly had a positive effect on the course, its use was not seamless. Google had only released the product months before the class began, and it had its share of glitches.
After completing the course, it became clear that adding robots and gadgets can turn a wave into much more than an online discussion. However, even without extensions, Wave can keep track of assignments and allow students to turn them in using a private reply. I can grade assignments and give feedback by simply editing their assignment myself. By using private replies, I can see everyone's completed assignments, but each student will only see his or her own.

Wave can help professors organize group projects. It was originally designed to replace email with a more collaborative medium, and it's perfect for group work. By placing myself as a silent observer on the group wave, I am able to track students' progress throughout an assignment. Replaying the history of the wave at the end lets me see to what extent each person participated.

At the end of the semester, my students had their own recommendations. Many of them enjoyed the option of posting in the Wave for participation points. One student mentioned that they though it could be useful in other courses. Another sent invitations to her entire sorority, hoping to get them to switch to Wave for all communication.

Implemented throughout an entire university, Wave could replace many of the functions of email and other organizational courseware. In theory, just about anything from a blog to a webpage to a question and answer forum can be created with Wave. The uses are limited only by one's creativity.

The next step: Wave in a Box

In theory, just about anything from a blog to a webpage to a question and answer forum can be created with Wave. The uses are limited only by one's creativity.


**Web Resources**

7 Things You Should Know About Google Wave (Educause)  
http://www.educause.edu/Resources/7ThingsYouShouldKnowAboutGoogle/188963

Apache Wave incubator  
http://incubator.apache.org/wave/

Google Wave Overview (video)  
http://www.youtube.com/watch?v=p6pgxLaDdQw

Wave in a Box  
http://waveinabox.net/
Active Scholarship: Information Literacy and Research-Intensive Instruction with <emma>

Ron Balthazor, Sara Steger and Robin Wharton

Background

Perhaps the greatest challenge we face as instructors in the academy today is the same one we have always confronted: namely, how do we inspire and empower our students to be responsible for their own learning. Moreover, the proliferation of digital media has created a need for college instructors to cultivate in students the skills required to navigate and participate effectively within an information- and communication-rich environment. Much of what we teach today may become obsolete or at least incomplete in short order. Thus, we should show students how to collaborate with knowledge experts and with their peers, teach students to be

Ron Balthazor is an academic professional at the University of Georgia. He teaches composition and Environmental Literature and is the lead developer of the <emma> project. His continuing interests include PHP, Symfony, SQL, JQuery, Thoreau, E.O. Wilson, and gardening.

(Continues on page 55)
constant learning about new digital tools, and discover with them how best to evaluate the authority of texts of all kinds. Our goal in this project was to use digital technology to facilitate research-intensive instruction that foregrounded scholarly collaboration, problem solving, and information literacy as key components of the curriculum. We were inspired in our pedagogy by the ongoing work of the Bernard L. Schwartz Communication Institute at Baruch College, City University of New York, and the Mellon Library/Faculty Fellowship for Undergraduate Research at the University of California Berkeley. Both of these institution-wide efforts aim to enrich undergraduate learning by engaging students in authentic research, writing, and communication projects. We thus designed a pedagogical pilot in which we created a technology-enhanced classroom that integrated a number of institutional resources—including technological, instructional, and support systems—in a manner that sought to develop fundamental scholarly communication skills in order to emphasize students’ involvement in their own learning.

In the pilot, we particularly wanted to model within the class a scholarly community, comprising not just the students themselves, but also the instructor and instructional support personnel who collaborated with her and with them to accomplish the work of the course.

The pilot began as an initiative of the <emma> project (http://www.calliopeinitiative.org), and the <emma> project team provided the organizational and technological infrastructure. <emma>, an online learning management system developed at the University of Georgia as an extension of the writing- and research-intensive classroom, provided the collaborative space where students and the other members of the team (the instructor, a reference and instruction librarian, and a composition specialist from the writing center) could exchange texts, share information, and build knowledge resources. Using careful course design and strategic implementation of digital technology that was custom-built to facilitate process-oriented composition pedagogy, we coupled a virtual research and writing lab with face-to-face and digital workshops designed to support projects that not only encouraged, but required, scholarly engagement from students enrolled in the course.

**Approach**

The course for the pilot was an upper-level Native American literature course, and we began by meeting with the instructor to hear her input regarding the specific desired learning outcomes and to craft the projects that she would incorporate in her syllabus. We wanted to include both collaborative and individual writing projects and both low- and high-stakes writing assignments. To that end, students contributed twice weekly to an online discussion forum in <emma>. To encourage students to engage in dialog about readings outside of the classroom, at least one posting per week was to be in response to another posting. Students also posted two annotated bibliographic entries providing historical or cultural context for an aspect of a reading to a research forum to create a collaborative annotated bibliography for the course. Students could then use this shared resource in their final research paper for the term. Finally, students participated in a series of forum discussions targeted at developing writing skills and workshopping ideas for their final essay.

Having designed assignments around the idea of active scholarship, we used <emma> to draw together and expand the existing structural and support systems at our university to meet our pedagogical imperatives. In particular, we wished to emphasize research and incorporate information literacy, and to that end we called upon our busy library instruction program. One of our reference and instruction librarians joined the pilot team and the class. She prepared a short, targeted research sources orientation to give students an

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**Image One:** The <emma> homepage

![Image](https://via.placeholder.com/150)
idea of what materials they could consult on Native American literature, led a more intensive hands-on research workshop after students were further along in the writing process, and participated in two research forums with the students. As students began to formulate their research topics, they posted their thoughts and ideas to the online forum. The librarian then joined the online classroom and posted responses that pointed students to particular journals, books and indexes that would help them refine their topics. After the hands-on workshop, students participated in another forum in which they were invited to post more specific research questions, and the instructional librarian again was able to help them locate and evaluate their sources.

This approach to research support maximized the investment of the reference librarian by giving her a digital window into the research agenda of the class and encouraged the students to see the reference librarian as a partner in scholarly activity. We wanted students to understand that librarians do far more than look after books, facilities, and equipment. In a research setting, particularly when one is new to a subject area in which the librarian is expert, librarians can offer invaluable guidance about where to begin, how to determine which sources are reliable, and how to use library resources most effectively. As students gained experience and expertise, they transitioned into the role of developing subject matter experts in their own right through their sharing of tips and information alongside the librarian in the research forum and their collaboration on the course annotated bibliography.

Finally, we wanted to focus on writing and find a way to enable students to talk about their writing and receive feedback during the writing process. Students engaged in face-to-face and online writing workshops both in peer teams and through specialized instruction led by a composition expert from the Writing Center who, like the librarian, participated in the classroom as an embedded, rather than an auxiliary resource. The composition expert first visited the class to run a thesis workshop, then participated in an online thesis workshop to assist students in refining their claims. In addition to this forum, we capitalized on the fact that <emma> was designed to facilitate peer review in order to enable students to use each other as a resource as their drafts progressed. Students shared and commented on each others drafts, marking up various aspects of each other’s work. For example, in one assignment, peer partners used a template in <emma> to mark up their paragraphs in progress, highlighting their partner’s argument, use of evidence, and the interpretation of the evidence. This peer review enabled the writers to visualize whether their paragraphs relied overmuch on evidence without interpretation or vice versa.

No doubt, the exercise highlighted the value of research as well, as it pointed to how students could and should use the information gathered in their research as evidence for the essay’s argument. It also emphasized clear organization and logical development by highlighting how claims built from evidence and connected to a thesis. Thus, our two pedagogical goals, i.e., greater emphasis on the writing process and richer inclusion of information literacy, overlapped and supported each other.

We capitalized on the fact that <emma> was designed to facilitate peer review in order to enable students to use each other as a resource as their drafts progressed.

Results

While many of the strategies deployed to foster greater student engagement over the course of the pilot (consultation, peer review, process-oriented composition) are not particularly novel, the use of technology greatly facilitated their use in a larger enrollment class (35 students) for a number of reasons. First, because the <emma> project team, the librarian, and the composition expert could participate asynchronously in the digital learning space, they understood the problems with which the students were engaged, how they were using information and technology, and what their needs were at particular stages of the process. Second, by collecting documents and information in a single virtual environment designed around the
composition process, the technology cut away the usual inefficiencies associated with managing document and knowledge exchange in a writing- and research-intensive classroom. Much of the work could be completed asynchronously, outside of class time, and then reinforced with targeted, face-to-face instruction. Finally, and perhaps most significantly, everyone, including the students, could observe the collaboration at work in the digital environment.

<emma> provided the connective tissue knitting together the work everyone was doing in and outside of the classroom. The <emma> project team could see how the assignments they had designed with the instructor were taking advantage of, or running up against, the affordances of the technology. The librarian could observe how the peer review and composition workshops were reinforcing her instruction in information literacy. By the end of the term, the <emma> course site provided students with a rich and multi-layered digital record of how they had transformed information into knowledge in the form of an extensive annotated bibliography and their individual final papers, through reading, discussion, research, collaboration, and writing.

The instructor, her students, and the other team members all viewed the pilot as a success. With the additional technological and personnel support she received, the instructor was able to integrate research and writing into the curriculum to an extent that simply would not have been feasible without it. Her students reported in reflections about their work and the course that they valued the additional feedback they received from their peers and, to a somewhat lesser extent, the Writing Center expert. Though good writing instruction is fundamental to improvement, good technology helped nudge the students to more drafting and revision and provided them more feedback from peers through asynchronous peer-review.

By participating as an embedded resource within this collaborative classroom, the librarian worked closely with students, both virtually and in class, allowing her to teach new skills and make an impact on students’ work far beyond the one-shot workshop. She felt that the asynchronous instruction really enhanced the in-person workshop since she already was very familiar with the students’ projects. She also reported that the pilot project, somewhat predictably, took a large amount of her time—from compiling a list of the most promising resources in Native American studies to responding to multiple postings from the students. Nonetheless, the “big commitment” equated to “big rewards,” and her experience as a part of the course community enabled her to achieve a level of authentic participation she wouldn’t have achieved in other workshops. The extra assistance students received from a librarian familiar with both the course’s subject matter and desired learning outcomes encouraged them to develop new research habits and to make use of a broader range of primary and secondary reference materials than they were accustomed to using.

Likewise, the <emma> project members felt they successfully implemented technology to enable a new collaborative pedagogical model that effectively transformed the relationship among the instructor, her students, and the variety of personnel who support instruction across campus.
Recommendations

We found that the incorporation of a Writing Center expert was somewhat less useful to the students than we had anticipated. While the students really valued the specific input given them by their peers in online writing workshops, the Writing Center expert was not as familiar with the readings, and thus provided more general feedback on the principles of thesis development. Since this was an upper-level course, some of the students felt that their writing skills were more developed than the basic instruction that the expert provided. In short, the writing support was not as effective as the research support: the writing expert had not invested in the course content as the reference librarian had, and thus was not as well equipped to enter into a conversation about the writing that the students really needed. More sophisticated writing and research projects quite simply require greater investment by support members. Earlier and more regular involvement of the writing expert would indeed improve the benefit to the students.

Our project confirmed that collaboration in course development and instruction is fundamentally beneficial to the instructors and the students involved and should be encouraged, even though it takes a deeper commitment of resources from all involved. We learned that technology can indeed increase the efficiency of such collaborations by creating an easily accessible repository of shared information (e.g., class generated annotated bibliographies and shared research support questions) and by making the participation of all of the collaborators a regular, albeit asynchronous, part of the class. This collaborative model centered around student work contrasts starkly with the “celebrity” paradigm in which technology is used primarily to push content from a relatively small number of teachers as content creators to an ever-expanding crowd of students as content consumers. We dubbed the pilot “active scholarship,” reflecting our attempt to use technology to move away from the sage-on-the-stage approach and change the fundamental nature of student engagement from passive to active learning. We also continue to learn that technology can encourage and support good pedagogy simply by making it easier to do particular tasks both in and out of the classroom (particularly here, with multiple drafts and complex peer-review). We are at our best in the profession when we create an atmosphere in the classroom where students discover they can be active scholars.

(Author bios, continued from page 51)

Sara Steger is a Postdoctoral Fellow in Digital Humanities at the University of Texas at Dallas who will begin teaching at the University of Georgia this fall. She is also a researcher and developer for the <emma> project and co-founder of the Calliope Initiative.

Robin Wharton is a Marion L. Brittain Postdoctoral Fellow at the Georgia Institute of Technology, a researcher and developer for the <emma> project, and co-founder of the Calliope Initiative. In addition to the PhD, she holds a JD from the University of Georgia School of Law.
References and Resources


Selected Web Resources


The Calliope Initiative http://www.calliopeinitiative.org

Mellon Library/Faculty Fellowship for Undergraduate Research at the University of California Berkeley. http://www.lib.berkeley.edu/mellon/
Developing a Student-Centered, Discussion-Based Online Course

Amanda Haertling Thein and Tim Oldakowski

The purpose of this case-study essay is to share our experiences developing a discussion-based online course in a burgeoning online program. The first author, Amanda, was the instructor and co-content designer for the course. The second author, Tim, was a graduate student assistant who helped design content and format for the course in question.

Amanda Haertling Thein is an associate professor in the Language, Literacy and Culture Program at the University of Iowa where she teaches courses on literature instruction and response. She is a former high school English teacher and former Program Coordinator for the University of Pittsburgh’s online M.Ed. program in English Education.

Tim Oldakowski is a doctoral candidate in English Education at the University of Pittsburgh where he researches multimodal instruction in the classroom. He has been instrumental in the development of the Pitt Online M.Ed. Programs in English Education and Elementary Education and works with both the School of Education and the Center for Instructional Design and Distance Education in the implementation and operation of these programs. Tim will be teaching English and English Education courses at Slippery Rock University beginning in the fall of 2011.
When our School of Education decided to launch an entirely online M.Ed. program in English Education, we were excited but skeptical. M.Ed. programs are designed to engage practicing teachers in dialogue about key theoretical perspectives and empirical research that have real impact on classroom practice. Such programs rarely include courses centered on lecture; instead these programs require student-centered discussion and opportunities for designing and sharing classroom instructional tools and strategies. We knew that an online program would provide far more teachers in our region with the flexibility of taking courses (many of whom would otherwise have to drive quite some distance to attend classes), but we wondered how we could authentically capture the dialogic nature of our constructivist-oriented program in online courses.

Research on asynchronous discussions in online forums put some of our fears to rest. Studies have found that online forums can be quite productive spaces for dialogue. For instance, studies suggest that online discussions are characterized by greater student-to-student interaction with more elaboration and engagement than face-to-face courses, which are more often marked by teacher-to-student interaction (Heckman & Annabi, 2005). Additionally, online forums can allow for equitability in student participation that is sometimes lacking in face-to-face discussions (Peterson & Slotta, 2009), perhaps because they provide productive distance that allows for a less-threatening environment for sharing personal ideas and experiences (Mabrito, 1991; Larson 2008). Finally, asynchronous online discussions allow students more time for careful reflection on readings and on others’ responses (Baker & Lund, 1997; Larson, 2008).

With this research in mind, we set out to design the first course in our program - Theory and Practice in Teaching Multicultural Literature.

**Background**

*Theory and Practice in Teaching Multicultural Literature* is a course that aims to teach 7-12 English teachers best practices for teaching multicultural literature. A face-to-face version of this course had been successfully taught through a discussion-based seminar format a number of times in prior years. Therefore, a high priority in designing the online version of the course was maintaining the integrity of the course both by retaining the content and by using technologies that enhanced delivery of the content. In other words, we did not want to design a course that used technology for the sake of using technology. We wanted to design a course that would allow students to engage in discussion that was authentic, dialogic and substantively engaging (Nystrand & Gamoran, 1991) as well as interpretive.

Approximately a year before the launch of the course we began working with the University’s Center for Instructional Design and Distance Education (CIDDE) to discuss online pedagogy, technology and systems of delivery. We had both utilized Blackboard (the course management system that served as the delivery system for the online course) in our prior teaching, so we were familiar with its design and function. As we considered the affordances of Blackboard, we determined that wikis – collaborative work spaces where all invited individuals can contribute to content, would provide a useful means of hosting discussions that would mimic face-to-face discussions.

Once we determined that wikis would serve as a primary instructional tool, we returned to the original goals of the course to begin the design process. The goals were outlined in the form of the following three overarching questions:

1. How can teachers successfully and critically engage students in multicultural literature? How can teachers incorporate new texts and rethink old texts? What pedagogical practices can teachers learn to more effectively teach these texts?

2. What can we learn from students’ responses to multicultural literature? What does it mean when students resist engagement with multicultural literature? In what ways do students’ cultural and social stances and assumptions affect their readings of multicultural literature?

3. How might differences and/or similarities between the cultures of teachers and of students come into play during the instruction of diverse types of literature? In what ways might classroom, school, and community contexts affect how teachers approach the teaching multicultural literature?
In face-to-face iterations, *Theory and Practice in Teaching Multicultural Literature* included four requirements of equal value: (1) participation in classroom discussion about the multicultural literature and scholarly readings, (2) student presentation and facilitation of a student-designed lesson plan incorporating multicultural literature, (3) a weekly dialogue journal in which pairs of students shared reflections of course readings, and (4) a final paper in which students reflect upon their learning for the semester. With the majority of the student grade based upon authentic discussion and writing about the course readings, our large goal was to seek a method for allowing students to engage in dialogue in an online format.

The first course was taught as a 12-week course in the summer semester, with one module to be completed each week. While the course was asynchronous, each module began on a Monday and ended the following Sunday so that the course, while not self-paced, did enable students to participate on a somewhat flexible weekly schedule.

The whole class discussions took place in a wiki, a collaborative space where all students could contribute postings in the form of a printed text. Each student was assigned one week to facilitate class discussion by posting five interpretive questions on the readings by the Sunday evening prior to their assigned module and checking in each day to ask follow-up questions and synthesize emergent ideas. Amanda modeled facilitation for the first two modules. When students were not facilitating, they were instructed to participate by providing substantial, paragraph length responses to at least three of the questions and by responding thoughtfully to the postings of their peers. Students were asked to post responses throughout the week rather than all at once, so that an authentic dialogue could build.

During the same module in which a student acted as facilitator, she was also asked to post a lesson plan appropriate for K-12 students, which incorporated the ideas and theories about the teaching of multicultural literature found in the course readings for that module. Amanda modeled this practice by posting her own lesson plan that incorporated the readings from module 2. The remainder of the students provided feedback on the lesson plan in the wiki page in which the lesson was posted; again students were asked to read and respond to feedback provided by other members of the class.

While the whole class discussions enabled students to see others’ perspectives, the dialogue journal in the discussion board provided a space where students could reflect on their personal responses to the readings and make connections to their own teaching in dialogue with just one other person.

In the dialogue journal assignment each student was asked to post a weekly response of about 500 words in a discussion board forum and to respond to his partner in about 250 words.

Class participation was easy to track because all postings in the wiki and discussion board remained online and were date and time stamped. While the richness of the postings was most important, having all dialogue saved was helpful in tracking how a student participated in the discussions and partnerships.

The final assessment, a reflective paper, was uploaded directly to the instructor and was not utilized in whole class discussion.
As we've reflected on these findings we want to suggest that the online format of this class encouraged substantive uptake of ideas for several reasons. First, students were specifically required to respond not only to the initial questions posed by the facilitator, but also to their peers. In other words, uptake was a required feature of the course. However, the requirement of uptake certainly doesn’t equate to substantive discussion. We argue that the substance of the uptake in these discussions can be attributed, at least in part, to the fact that these discussions were written rather than oral, and therefore, transparent. Surface-level uptake used as a springboard for changing the subject would be only too obvious in writing. Finally, we posit that the substantive uptake that characterized these discussions was fostered by the asynchronous nature of the discussions. Students were afforded time to carefully consider their peers’ comments before crafting their own responses.

We also noticed that students’ responses were more scholarly and less focused on personal anecdotes or experiences in individual classrooms. We believe that the transparency of the written format was again at play in this trend; personal responses may be viewed as digressions when seen in permanent written form.

In thinking about why authentic questions were often posed but sometimes ignored, we again considered the scholarly norms for discussion that were established in the course. Although students came to expect substantive academic responses and questions from one another, the asynchronous and nonlinear nature of the class – which gave students the freedom to respond when they chose, to whichever comments or questions they chose – also allowed students to leave certain challenging questions unanswered.

In determining the success of our approach in this course we focused on closely examining the weekly, student-facilitated wiki board discussions, which we saw as the central feature of the course. In examining these discussions we coded each response for uptake and authenticity of questioning, two factors that Nystrand and Gamoran (1991) found to be indicators of dialogic, substantively engaged talk. Following Nystrand and Gamoran, we defined uptake as the clear integration of interpretations and ideas voiced in the preceding discussion within a response. Each response containing uptake was then coded for uptake type: surface-level agreement/sympathy, supporting/encouraging, questioning/challenging, asking for elaboration/clarification, or developing an original idea. In coding for authenticity of questioning we examined the kinds of questions that students posed to one another. Authentic questions had an indeterminate number of correct answers, while inauthentic questions had only one possible correct answer.

Through our coding we found that discussions in this course were frequently characterized by multiple instances of uptake across lengthy “dialogic spells” (Langer, 1995), or extended stretches of student interaction related to one question. Uptake often started as surface-level and moved into developing of original ideas and/or challenges. The questions that students posed within dialogic spells were often authentic, but were not always taken up by others in the class.

Results

In thinking about why authentic questions were often posed but sometimes ignored, we again considered the scholarly norms for discussion that were established in the course. Although students came to expect substantive academic responses and questions from one another, the asynchronous and nonlinear nature of the class – which gave students the freedom to respond when they chose, to whichever comments or questions they chose – also allowed students to leave certain challenging questions unanswered.

Interpretive Questions: Examples of Interpretive questions
Recommendations

Our work on this course suggests that online courses have the potential to engage students in substantive, dialogic discussion. Moreover, asynchronous online forums can provide time and space for students to develop well-conceived scholarly responses and can encourage consideration and uptake of other students’ ideas. Therefore, we would certainly recommend that teachers consider online courses not only for lecture-based instruction, but also for student-centered, dialogic discussion.

In future iterations of this course we plan to implement instructional mechanisms for ensuring that high quality interpretive questions don’t go unanswered. For instance we might consider compiling a list of unanswered questions at the end of each module and using these as dialogue journal prompts for the following week. We would also recommend that even in discussions that are student-facilitated, there is a place for the instructor – in the case of this course, that place might be in pushing students to answer those challenging questions that are left unanswered.

We limited our scope in this essay to a discussion of the usefulness of student-facilitated discussion forums. In looking further into the success of this course, we plan to conduct similar analyses of students’ dialogue journals and responses to their peers’ lesson plans. Additionally, we plan to conduct analyses of the content of students’ discussions, dialogue journals, lesson plans, and final projects to determine the extent to which students acquired proficiency with the major tenets of multicultural literature instruction.
References and Resources


Virtual Crime Scenes in a Forensic Science Course

Donald Lehman and Debra Jeffers

Today’s students have grown up in a rapidly evolving technology filled world, where video games have become immensely popular. Students use and expect digital technology in education. A recent study of 217 medical students found that they had highly favorable views of using video games, social networks, virtual reality environments, web sites, podcasts, etc. in medical education (Kron et al., 2010). Despite the fact that males were more likely than females to play video games, there was no difference between the two groups when asked if they liked the idea of using technology to enhance healthcare education. Digital learning tools can increase student interest and have the potential to enhance learning.

Donald Lehman is an associate professor in the Department of Medical Technology at the University of Delaware. Besides teaching a forensic science course, he teaches courses in medical microbiology, immunology/virology, and statistics. He has an Ed.D in Education Leadership with a concentration in education technology from the University of Delaware.

(Continues on page 67)
In my Introduction to Forensic Science course, we discuss the history of forensic science, the collection and transportation of crime scene evidence, and the role of forensic scientists. I also present the principles of forensic testing in the areas of immunologic assays, DNA analysis, fingerprinting, toxicology, arson, and bioterror. The learning goals for this course are to (1) develop the student’s understanding of the principles and methodologies of forensic science and (2) to apply this knowledge to the interpretation of forensic test data. By attaining these goals, students will gain appreciation for the relevance and impact of forensic science, as well as being able to interpret test results.

In view of the course goals and students’ clear interest in everything high-tech, I decided to craft a collaborative assignment using technology that would require the students to combine the different types of information they had learned in this course. Medical schools and nursing programs have been using computer simulations for some time, so I explored the available options and tools.

Computer simulations provide students the opportunity to apply knowledge learned in a classroom setting, prepare for a laboratory exercise, work in collaboration, and to make decisions. Moreno-Ger et al. (2010) developed a simulation to measure the hemacrit (percentage of red blood cells) of a sample in an undergraduate physiology course. An experimental group of students utilized the simulation one week before the laboratory session, while a control group attended the laboratory session without participating in the simulation. After the laboratory session, there was no statistical difference between students in the two groups for the perceived difficulty in using the laboratory equipment. However, those in the experimental group exhibited higher reliability in determining hematocrit values, and a majority of those students reported that the experience was favorable or very favorable.

Computer simulations reduce the need for building training facilities to administer simulated labs with medical dummies and real equipment. The scarcity and cost of required equipment and supplies also cease to be a source of concern. A computer simulation allows students to repeat an activity as many times as necessary to master required skills. Another advantage is that simulations can be created for learning situations that cannot be duplicated in real life, due to safety concerns and other factors.

Three-dimensional simulations have an advantage over earlier simulations, in that they are more interactive, allow greater collaboration, and have more potential outcomes. An instructor can insert himself or herself into the simulation as a patient, physician, or any other role, to interact or just to observe the students. When a simulation takes place online it allows for interactions among individuals from around the world.

Abid, et al. (2010) used a 3-D interactive computer program to help students learn about peritoneal embryogenesis. Medical students were taught the subject by traditional “chalk talk” or via a 3-D interaction on a DVD-ROM. The instructor presented the interactive software and did not let students use the DVD by themselves. Despite the fact that students could not observe the simulation on their own, the overall scores on test questions were higher in the group seeing the 3-D simulation compared to the chalk talk group (65.12% vs. 49.33%, p < 0.001).

3-D virtual models of operating rooms, emergency departments, and physicians’ examination rooms are used extensively for teaching and training. Students use a computer-generated persona, called an avatar, to participate in a medical simulation. They can ask patients questions, use medical equipment, and interact with other students playing different roles. When clicking on a piece of equipment, students can be provided additional information about the situation, allowing them to make additional decisions. The Imperial College of London has developed a virtual operating room to help educate nursing students. Royal Sussex County Hospital uses a virtual simulation to obtain informed consent from patients preparing for surgery.
Instead of using preprogrammed software I decided to use an online virtual 3-D environment to provide students the kind of active learning activity I envisioned. The immensely successful product “World of Warcraft” is a virtual world that exists only for game-play, and the software creates all of the content. A number of open-ended environments are available where users can create content and interact socially. Two examples are “Active Worlds”, a commercial product, and “Open Simulator”, an open source tool that is gaining popularity.

The most widely adopted open-ended virtual world is Second Life, a commercial product where basic accounts are free. A number of educators at the University of Delaware have been exploring Second Life. In addition to the forensic science class, The University’s virtual islands host courses in areas such as Art, English, History, Woman Studies, Material Culture, and Communication. There are also outreach projects presented by the Delaware Design Institute, the Center for Political Communication, and the University Library.

Approach

We used Second Life to provide students a capstone-like experience in the introductory forensic science course. We created two virtual crime scenes which students were to visit together in pairs. They would work collaboratively to complete a series of tasks in real time.

Our development team was made up of an information technology professional and, for a short time, a student worker. Both team members had extensive skills in virtual world building and image editing. All of the props for the crime scenes had to be created and scripted with tools available in the virtual world. Photoshop was used to create textures that could be uploaded and applied to the corpse and the crime scene evidence. These textures included special body markings, such as decomposition on skin, clothing, and the various pieces of evidence.

We created two virtual crime scenes which students were to visit together in pairs. They would work collaboratively to complete a series of tasks in real time.

We began by giving the students a demonstration of the virtual environment. The students were then provided with printed directions on how to log in and create their avatar. After allowing the students a few weeks to practice on their own, we held an “in-world” training session. At this time, the students received more detailed instructions on how to teleport between locations in the virtual world, move their avatar, and take pictures of what they encountered.

The crime scene contained a murder victim and physical evidence, such as a blood stained identification card. The students were then required to document and collect evidence. The assess-
Results

The biggest challenges we faced were creating crime scenes and administering questions in Second Life. The objects at the crime scene needed to be scripted to interact with each other and the avatars when the students clicked on them. This was a challenge because no one on the team had much scripting experience. After some extensive in-world searching, we found a number of free quizzing scripts; however, none of them could do what we needed. We eventually found a free quiz game that met our needs, but it required some adaptation to work in our simulation. The creator of the game modified the scripts for our use. Professional scripters are available to build more elaborate props, but we were operating with a limited budget.

In addition to creating the crime scenes, there was a bit of a learning curve for the students in the virtual world; some students were more comfortable with the technology than others. Students like the idea of using this technology and might become engaged in an activity, but does that mean they are learning? Few studies have been conducted that assess student learning in virtual worlds. A pilot study by Wiecha et al. (2010) found that physicians’ confidence in their ability to select, initiate, and adjust insulin for patients with type 2 diabetes had a statistically significant increase following an Second Life simulation. In addition, the percent of participants providing a correct insulin initiation plan and correct initiation of mealtime insulin increased between pre- and post-tests. All twelve participants agreed that this virtual world experience was an effective method of medical education. Additional studies are needed to assess student learning in virtual world environments.

Student evaluations (n = 14) of our project have been mixed. For the item, “The crime scene assignment in Second Life contributed to my understanding of the material in this course,” the responses were 50% agreed and 14% strongly agreed, while 29% strongly disagreed. The responses to the item, “Rate the effectiveness of the crime scene assignment in Second Life in achieving course goals,” were 14% excellent and 43% very good, but 21% responded unsatisfactory. Some of the open-ended evaluation comments indicated the students did not find the assignment very useful.

There was a bit of a learning curve for the students in the virtual world; some students were more comfortable with the technology than others.

Physical evidence: a blood stained identification card from one of the crime scenes

At the conclusion of the exercise, the students received DNA results of blood stained material submitted to the forensic laboratory. Each pair of students submitted a written report that included photographs, a description of the crime scene and their findings, and an analysis of the DNA data. This simulation overcame many of the challenges of staging a realistic mock crime scene.
Virtual Crime Scenes in a Forensic Science Course

**Recommendations**

Virtual crime scenes can be an excellent digital teaching tool. It is possible to create several different scenarios incorporating many principles: DNA analysis, fingerprinting, toxicology, etc. A single crime scene could be programmed with different test results offering a number of different learning opportunities. Virtual worlds offer the flexibility and complexity to provide a “capstone” experience in this type of course.

Overall, we have been pleased with the project; we currently have developed two different crime scenes. In future courses, we would like to expand the physical evidence the students collect such as including fingerprints and toxicology results. In addition, we would like to include some laboratory testing. The students would enter a laboratory in the virtual world and perform DNA testing as well as toxicology analyses. They would then be able to write more detailed reports concerning the crime scene. These additions should address the student comments about the project not being useful and not meeting the course goals.

We also plan to enhance the question scoring. Currently, the answers the students provide to the questions are only formative. We are considering collecting their question scores and using the scores in the calculation of the report grade.

*An avatar looks at the blood stained identification card has clicked the item, displaying a multiple choice question.*

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*Author bios, continued from page 63*

**Debbie Jeffers** has worked for the University of Delaware in IT for 21 years. Debbie is the campus Virtual Worlds evangelist, supporting educators and students using Second Life at the University of Delaware. As part of that support, she builds class projects for course work and manages the UD Second Life islands. She also manages a 40 seat Macintosh computer site located in the Art Department and supports technology in teaching and learning, and occasionally teaches Photoshop classes.
References and Resources


Web Resources


University of Delaware virtual crime scenes - available for a few weeks at a time while students are collecting evidence. http://slurl.com/secondlife/University%20of%20Delaware/56/152/27
Using Wikis to Promote Active Inquiry in First Semester Calculus

Louis F. Rossi

Students who major in mathematics, science or engineering love to solve problems, yet many struggle with application problems in their first semester of calculus. While mathematics is the common language for describing problems in science and engineering, it is difficult for most students to translate what they have learned about mathematics into other domains.

The reform efforts of the 90’s emphasized making mathematics more relevant (Ferrini-Mundy & Graham 1991, Wu 1996, Wu 1997) and using technology to free students from the burden of mechanical manipulation so they could explore “real world” problems. Technology can certainly improve the presentation of mathematics. It is less clear that enhanced presentations have improved learning or that students are more motivated when freed from mechanical manipulations.

Louis Rossi is a Professor of Mathematics at the University of Delaware. He received his PhD from the University of Arizona. His interests include vorticity dynamics, vortex methods, smoothed particle hydrodynamics, high performance computation, biologically-inspired algorithms and mathematical modeling. He enjoys teaching modeling, analysis and numerical methods at all levels. He maintains BlobFlow, an open source, high precision, parallel vortex method for viscous flow simulations. Dr. Rossi is Education Section Editor for SIAM Review.
Background

Two experienced instructors recently wrote a brief piece highlighting what many instructors already know: active learning requires participation from both individual learners and groups (Hoffman & McGuire 2010). The purpose of my project was to use technology to enable greater participation and learning in first-semester, university-level calculus by providing the experience of discovering mathematics in a variety of unexpected settings. The project employs two distinct strategies:

1. **Collaborative writing** to motivate and inspire students to explore mathematical problems in compelling settings.

2. **Peer assessment** to provide meaningful feedback several times during the semester, continually reinforcing the exploration.

While this two-pronged teaching method is useful for all science and engineering majors, it was developed for a special biology (bio) section of our calculus course in response to an initiative on campus to make our life sciences programs more quantitative (Usher 2010). The activity was designed for large lectures of one hundred or more students and makes use of the Sakai wiki tool.

There is considerable qualitative evidence of the benefits of wikis and blogs in promoting active learning in different settings (Minocha 2008, Parker 2007). However, using collaborative writing to learn mathematics requires special consideration:

- The language of mathematics is not properly expressed using ordinary text and
- Students need feedback on their mathematics as well as their writing.

When investing time and energy into instructional technology, it is always necessary to consider the trade-offs. The basic scientific question is whether the benefit is worth the investment. Is instructor time better spent marking homework or setting up interactive web pages? Is it better to devote class time to clicker-based activities or work a few more examples for the students? Can the technology build connections between the students and the instructor? Will it help connect students with course content?

In any course, students learn best when they make a strong connection with the instructor. When the connection is strong we say students are engaged, and engaged students succeed. Concepts, skills, questions and answers flow easily. These connections extend beyond the classroom. Office hours provide another opportunity to reinforce connections. When students complete problems and receive prompt feedback on their work, the connections grow stronger. Exams and other types of student work provide similar opportunities for learning. The effective use of technology can build new connections and enhance existing ones.

Instructors are at a distinct disadvantage when teaching a large course. There is a physical distance between the students and the lecturer that often leads to a cognitive distance. Twenty-five to thirty-five students in a classroom feels like a community, but a hundred or more students in a lecture hall is a crowd. Students do not know one another and are more self-conscious about asking questions. Problem sets are marked by anonymous graduate students. The volume of problem sets means that students might not receive feedback on all their work, and the logistics of collecting and returning problem sets mean that extended periods of time will elapse between handing in problems and having them marked. Often, students do not look at scored homework because the class has moved on to a new topic, although automated homework and quizzing products address this issue with some success.

Nevertheless, teaching calculus in large lectures is a reality at research intensive universities and, given this reality, there is considerable merit in devising new ways to engage students. Faculty have considerable resources at their disposal for enhancing intra-student connectivity and faculty-student connectivity. A wiki for collaborative writing is one such tool.

Approach

The method described in this essay is powered by two hypotheses: that students are motivated by compelling problems of their own choosing, and that they have been exposed to a significant amount of mathematics prior to entering the university. This activity was developed for the bio section of our most rigorous calculus course. This course is taught in large lectures to students majoring in mathematics, engineering and the physical sciences. Beginning in the Fall of 2007, the course was required for all biology majors as part of a broader effort to bring more quantitative methods and techniques into our life sciences curriculum. The bio section covers the same curriculum as all other sections, and all sections take the same common final exam.
The first semester of calculus ought to be exciting for students. After covering differentiation, students are ready to learn about applications, and calculus opens the door to vast fields of problems that could not be addressed in earlier courses. In lecture, our freshmen science and engineering majors lean forward a bit as we present rigorous procedures for determining optimal geometries or pricing strategies or network configurations. The language of calculus explains why Snell's Law is no law at all but a mathematical fact derived from simple assumptions about the natural world.

Spending time with students in office hours is more sobering and grading exams can be quite disappointing. Many of those who were engaged in lecture have difficulty transferring mathematical knowledge from one situation to the next, even if the underlying mathematics is identical. Significantly, portions of the course dedicated to applications do not introduce any new mathematics. Most students have mastered the deep connections between functions and their derivatives. Almost without exception, they can mechanically differentiate just about any function you give them. Most can connect information about first and second derivatives with the shape of a function's graph. The problem is not that students cannot differentiate functions or determine where the derivative is zero. The problem is that students have difficulty quantifying problems, and they need practice.

To begin preparing for the activity, I download interesting images. Since calculus is the mathematics of change, the images should involve a dynamic process. The images need not involve physical motion, a distinction that is especially important to those interested in the life sciences. From the very first day, students learn that calculus is the mathematics of change and change occurs in many ways. Processes such as the corrosion of pipes or the cooling of a cup of tea must be elevated to the same level as the traditional motion of a particle. For the bio section, I use many images from the life sciences as well as more traditional scenes exhibiting change.

I place the images on a wiki page (Figure 1). Students then sign up for an image and form teams of up to three students. Each team creates a wiki page for the project, and the image will be the centerpiece of their activities throughout the semester. It is important to note that students are not choosing to learn some topics and not others. By choosing the image, students are choosing an application area, and most students enjoy this process. However, everyone learns the same topics.
In order to think critically about one another, students must understand that merit is not infinite, so I limit the total number of points that can be allocated among team members. On a three-person team I might allow 40 points to be distributed. This forces students to reflect upon the distinct roles different members play on the team. Most importantly, students must provide a written statement of why they have assigned specific scores. If the narrative is not complete, the assessment is returned for revision.

At each stage, I score the project on its quality. Individual students receive a project score scaled by their peer assessment score. Peer assessments are always confidential, but the project score is known to the entire group, so everyone on the team knows roughly how well their work is regarded.

Every team faces challenges. Often a challenge is technical, but sometimes it is interpersonal. When a team member is unhappy with a score, their first instinct may be to take the problem to me. However, students need to first work out the issue with their teammates. I strive to provide a rubric that can effectively shape student expectations, performance, and (hopefully) learning.

Peer assessment is used to provide valuable feedback at each stage. This makes the workload more manageable for the instructor, especially in a large lecture situation. However, peer assessment does require active instructor participation. In my class, each student on each team submits a confidential peer assessment at each stage. The students assess every member of the team—including themselves—according to the following four categories:

1. **How my teammate (myself) thinks.**
   0 (no original ideas) to 10 (has brilliant ideas, takes others’ ideas and makes them better).

2. **How my teammate (myself) writes.**
   0 (has written nothing) to 10 (has contributed great material, edits others’ work and provides feedback on everything).

3. **How my teammate (myself) responds.**
   0 (has not interacted) to 5 (comes to every meeting, answers every phone call, responds to each email).

4. **How my teammate (myself) leads.**
   0 (provides no leadership) to 5 (brings the team together, makes others better, smooths out difficulties).

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**ANGLES AND DISTANCE OF THE BRACT**

The equation \( x = \tan(\theta) \) can be used to find the distance a bract would fall.

- \( x \): the distance from dandelion to falling place
- \( h \): the height of the dandelion head
- \( \theta \): the angle at which the bract flew from the dandelion head

On the other hand, if the distance and the height are known, the function

\[ x = \frac{h}{\tan(\theta)} \]

---

**STAGE 3:**

**Problem 1: Growth Problem**

As the number of bracts that come off the dandelion increase, the number of bracts accumulating on the ground increases. The equation \( P(t) = C e^{rt} \) can be used to solve.

Suppose the population (accumulation) of dandelions there were 300 pieces on the ground by 140 mi
Recommendations

While this collaborative writing activity helped students see mathematics all around them, there was still room for improvement. Technology was the great enabler of this project, but there was still considerable overhead for the instructor in managing peer evaluations.

Learning management systems like Sakai should incorporate peer assessment tools. A successful tool would be flexible enough to allow instructors to place students in groups or allow students to form their own groups. Instructors could configure evaluation forms to allow students to enter scores and comments confidentially. Peer evaluation would be approved by the instructor or returned to the student for further explanation and reflection. Finally, peer assessment needs to be linked to the grade book by mathematically combining peer information and the instructor’s assessment of the work product. This kind of tool would be fairly sophisticated, so it is no wonder that such a thing is not generally available, although some institutions have implemented specialized tools for their own purposes.

This was a successful project that helped students apply mathematics in different settings. The activity used collaborative writing facilitated by a wiki to encourage students to actively use their knowledge in a variety of settings. The development of this project did not come from a particular educational theory, but rather from an observations that many instructors have made over the years: students need to actively practice what they learn, and they need feedback on their work. The availability of a solid wiki platform capable of setting mathematical equations properly made this particular project a reality and, in this case, there was a substantial benefit in terms of student learning.
References and Resources


Web Resources

7 Things You Should Know About Wikis (Educause) - [http://www.educause.edu/ELI/7ThingsYouShouldKnowAboutWikis/156807](http://www.educause.edu/ELI/7ThingsYouShouldKnowAboutWikis/156807)

Peer evaluation for student group projects (UC Davis) - [http://cetl.ucdavis.edu/peer-eval/](http://cetl.ucdavis.edu/peer-eval/)

Sakai - [http://sakaiproject.org/](http://sakaiproject.org/)

Understanding Rubrics (Heidi Goodrich Andrade) - [http://learnweb.harvard.edu/alps/thinking/docs/rubricar.htm](http://learnweb.harvard.edu/alps/thinking/docs/rubricar.htm)
Teaching the Principles of Web 2.0 to Computer Science Students

Manuel A. Pérez-Quiñones

Background

This case study describes how I modified the CS5774 User Interface Software course in the Computer Science department at Virginia Tech to teach students the principles of Web 2.0. One goal of the course is to teach students how to build interactive applications. The course only prerequisite of this graduate course is knowledge of an object oriented programming language. Students often take the course in their first year of graduate studies. A class typically has 25-30 students. The biggest challenge in this course is deciding which types of interactive applications to cover. Interactive software today is pervasive. We find interactive applications in car radios, phones, music players, game consoles, traditional window-based desktop/laptop applications, and on web-based...
services. Each of these uses a different technology for implementation. Sometimes, they even require a particular programming language (e.g. Objective-C is required for iPhone programming). Yet many of the basic design principles used to build these applications are common across technologies. This is something most students are not aware of or would not see in a similar course if it only focused on just one technology.

I teach three technologies in the semester-long course, a daunting task by any measure. It is my experience that students appreciate the design principles that span particular technological implementations if they are exposed to more than two of these technologies in a semester. I focus on desktop, web-enabled and phone applications. To make the course cohesive, I ask the students to build what amounts to a single software for a corporation, one that will have a desktop component, a web application, and some form of phone interface. As such, design decisions on one of the technologies often carry over to the others. This forces students to think beyond the simple implementation of “this homework” and makes them consider more strategic decisions that span the whole semester. As examples, I use many of today’s web-based applications. Facebook, for example, has a web interface and an iPhone application. Twitter has a web interface, several smartphone (e.g. iPhone) clients, a desktop client, and SMS interfaces.

**Student Learning Objectives**

The common element tying the three technologies together is Web 2.0. Web-based, interactive applications, including Web 2.0 and social networking have become incredibly popular in the last few years. They are changing the way we exchange information and how we collaborate.

**Web 2.0 Principles**

Social software refers to software that “enables people to rendezvous, connect or collaborate through computer-mediated communication” (Social Software). This type of software has existed for years in the form of bulletin board systems, listservs, forums, and newsgroups. Recently, however, blogs (Tepper 2003), RSS feeds, tagging systems, and collaborative filters have made social software very popular, particularly among young computer users. In 2006, over half (55%) of all American youth (ages 12-17) used some form of social networking site (Lenhart, 2007). By 2010, almost three quarters (73%) of teens used social networking sites (Lenhart, 2010).

Some of the most popular websites today are excellent examples of social software systems. Some examples include social networking sites with a broad user base like Facebook (www.facebook.com), and those created for special purposes like Ning (www.ning.com); communication-based sites like Twitter (www.twitter.com); multimedia content-sharing systems like YouTube (www.youtube.com) and Flickr (www.flickr.com); product recommendation systems like reviews on Amazon (www.amazon.com) and Netflix (www.netflix.com); and content recommendation tools like Digg (www.digg.com), Del.icio.us (del.icio.us), and last.fm (www.last.fm).

What is common to all of these sites is a series of principles (or features) that characterize Web 2.0 applications. The first is user provided/generated content. In some cases this is as simple as product reviews (e.g. Amazon) or as sophisticated as video productions (e.g. YouTube). Second are individual incentives for participation. These can be organizational or social. Third, Web 2.0 applications typically make a connection between users by establishing some kind of ties (friends, followers, etc.), and exploiting weak ties for added functionality and benefits. Fourth, sites also typically have some commenting or discussion feature to allow users to communicate with each other within the system.

Finally, most content is syndicated in the form of RSS feeds or embedded HTML.

**Approach**

In class, I introduced the notion of Web 2.0 using the popular YouTube video: “Web 2.0: The Machine is Us/ing Us” by Professor Michael Wesch (2007). We discussed the importance of what the video depicts in the day-to-day activities of users and how each of the technologies highlighted plays a particular role in the ecosystem of web applications. I used a number of technologies to conduct the course. I added videos shown throughout the semester to our course management system using the HTML embedding features of most sites. I used RSS feeds for course podcasts, calendar feeds for course content, and a Twitter account for course communication. Twitter is called a micro-blogging platform that allows users to communicate in 140 characters or less. People use it to post personal status information, communicate with colleagues, and to broadcast messages and news they see elsewhere. Researchers have suggested that micro-blogging may “indeed be one mecha-
Teaching the Principles of Web 2.0 to Computer Science Students

Student Feedback

A Master's student had this to say about the course:

“By the time we started with the development of our team projects, we not only understood what several of the Web 2.0 technologies were, but having used them as part of the course, we had also seen how they can be effectively used. At this stage, he [the professor] asked us to conceptualize and develop real-world applications which used these technologies. Since he forced us to be creative about our projects, we treated these projects not as homework, but as something that we produced and owned - a mission of sorts. We weren't just coding to specifications, we were thinking deeply and having conversations about these technologies and how they apply to different use cases. The process was so exhilarating, that in the case of my team, we decided to make our project open source and to continue development on it even after the course got over.”

The collective benefit of using these supporting Web 2.0 tools in the classroom is best captured by a comment from a graduate student who is a professional in town. He said:

“I found the incorporation of easy to use software like Moodle, Twitter, email list serve and video podcasts invaluable in providing appropriate context and information to me outside of the class.

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Results

In this section I show some results from one of the offerings of the course. The data presented below show that students enjoyed the Web 2.0 focus, embraced the use of Twitter, and learned the value of including Web 2.0 principles in their projects. I finish this section showing one sample application that demonstrates how Web 2.0 principles were included in student’s work.

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Student interaction afforded by Twitter

Several authors, including Ferenstein, have commented on how Twitter enables conversations to continue outside the classroom. My experience was not different.

Figure 1. Plot showing density of Tweets, x-axis is time of day starting at midnight on the left, and y-axis is day of week starting with Sunday at the top. The professor shows almost no activity from midnight till 5am. The student plot has activity at almost all times of the night.

Above is an example of the type of exchange that occurred within Twitter and outside of class. One of my students wrote a Twitter message on his personal account about the different work hours that professors and students kept, as evidenced by the time of the day when we posted messages on Twitter. I couldn’t resist the opportunity to bring it to class and discuss the two images. We discussed the differences and how the different responsibilities in family life affect our work hours. It also shows that faculty get more hours of sleep than graduate students, an extra motivation for students to graduate.

Sample Project: Colloki

One of the sample projects from the course, shown here (later renamed to Colloki), lead to several publications (e.g., Ahuja 2009). Colloki was a local discussion tool that merged concepts from forums, news aggregators, tagging systems and several other Web 2.0 ideas. The goal was to foster local deliberation by members of a small community. The project used a number of features from the Web 2.0 world, including sharing a user picture from an external service (Gravatar, http://www.gravatar.com), providing a voting system for people to determine the most popular story of the day, use of tag clouds for navigation, use of RSS feeds for remote access to content in the application (content syndication), and using an iPhone application to provide mobile access and encourage participation in the online community.
Recommendations

I feel that the use of Web 2.0 technologies in my class was a success. For me the students’ projects are evidence of the success using an impressive array of Web 2.0 technologies. In addition, several students commented in their student evaluations about how much they liked the use of social networking in the class. I feel strongly that using Web 2.0 tools to manage the course gave students the exposure necessary to make them feel comfortable with the technological pieces of Web 2.0 applications. This in turn allowed them to build these principles into their projects.

Below I present some general observations from my experience using Web 2.0 in this course.

Email is broken. Fewer and fewer students are actively using email. They have grown up using text messages and social networking sites. Email has become the tool of communication for professional work environments. Twitter allows quick and direct communication with students. More and more students receive their messages from Twitter and status updates from Facebook instantaneously, therefore faculty should use these mechanisms to communicate with students.

Use Twitter (or a similar technology) to draw their attention. Twitter can be used when material for your course is updated. Students will be notified right away that something has changed, and then they can decide when to check that information. The short Twitter message can include a link to the material that has changed, such as a link to the course management system. This makes it easy for students to get to the new material right away.

Create a Twitter account just for the class. Create a Twitter account just for that course you are teaching and ask your students to follow your class account. This allows you to keep class announcements separate from your personal account.

Make use of other web resources. Videos on YouTube, entries on technical blogs, and even news stories are excellent resource materials for classes. Many of these sites have an option of embedding HTML, so you can include your YouTube videos right inside your course management system.


Towards the
Paperless Class

Corey Angst and Jon Crutchfield

I have been transitioning from paper-based teaching to digital teaching for years, incorporating not only increasing amounts of electronic documents, web pages and web videos, but also requiring that students take exams (all of mine are essay-exams) on a computer. The last remaining obstacle was the textbook. While my primary textbook has been available digitally through the web browser, the student experience was not adequate (Hannon 2008).

Note: although co-authored by Mr. Crutchfield, this essay was written from Professor Angst’s perspective.

Corey Angst is an Assistant Professor in the Department of Management at the University of Notre Dame. His research interests include the transformational effect of IT, technology usage, and IT value. In recent papers, he has investigated the diffusion of disruptive healthcare innovations and the relationship to financial value and quality of care. Prior to pursuing his academic career, Professor Angst worked as a consultant with the DuPont Company. He received a Ph.D. from University of Maryland and an MBA from the University of Delaware.

Jon Crutchfield is an Academic Technologies Consultant with the Office of Information Technologies at the University of Notre Dame. He collaborates with faculty, students and IT staff to identify and implement emerging technologies for pedagogical needs. Mr. Crutchfield holds an MBA from Notre Dame and previously developed innovative, customer facing web sites for Ford Motor Company.
Background

In March of 2010 the Office of Information Technologies (OIT) formed an ePublishing Working Group and invited me to participate, along with a variety of other people at Notre Dame. Each of us had a distinct interest in the transition from print materials to digital. The purpose of the group was to examine the ePublishing ‘ecosystem’ on campus. Several meetings were spent discussing a pilot study, but the tipping point came with the introduction of the Apple iPad tablet computer and its support for the ePub standard. During the summer of 2010, OIT issued a call for action: did any faculty members in the group want to initiate a pilot to more deeply examine ePublishing? I recognized this as a chance to both achieve my paperless class and also gather data for my research on how people adopt and adapt to technology.

I volunteered my Project Management course as an opportunity to, 1) evaluate the effectiveness of a multi-function eReader in and out of the classroom, 2) see how the introduction of the eReader impacted the University (i.e. impact on IT support, infrastructure, etc.) and 3) establish an entirely digital course. OIT offered to fund 50% of the cost for the 16 GB Wi-Fi tablets and cases if we could convince other groups to fund the remaining 50%. Four groups stepped up and OIT committed to lead the technical implementation of at least one course pilot for each of the funding partners during the 2010-2011 academic year.

Approach

Students in my Project Management course take on “real world” projects sponsored by Notre Dame and other organizations (for profit and not-for-profit) in our region. These consulting projects give students an opportunity to apply the project management principles they learn the class. As part of the course, I help students become aware of advances in technology that can aid in the successful management of their projects. Introducing iPads was a natural extension of that learning goal.

As part of the course, I help students become aware of advances in technology that can aid in the successful management of their projects. Introducing iPads was a natural extension of that learning goal.

weeks. When I finally asked why, the students said they loved the idea of the tool but that it was far too bulky and inefficient. I had strongly encouraged them to use this specific tool, but they chose a different one. It allowed them to experience working online in a collaborative environment, which was the intended goal. With the iPad experiment, I wanted students to actively engage with me on how the device could be used to collaborate beyond the obvious ways, such as email.

OIT and the Hesburgh Libraries conducted extensive research to help me determine the best way for students to access out textbook on the tablet. In the end, the only apps that worked were 1) CourseSmart, where the textbook was only accessible when connected to Wi-Fi, and 2) VitalSource, which let students store the book on their device. I ultimately chose CourseSmart; it provided the best highlighting and annotation features … and VitalSource was not available at the beginning of the course.

I contacted all students before the semester started and told them they would have the opportunity to participate in an iPad pilot, but were free to decline. The content of the eBook was identical to the physical book and students were given the option to return the tablet at any point in exchange for a printed book. The student response was unanimous and enthusiastic in support of participation. We were concerned about possible accessibility issues for students with disabilities, but no one indicated a need for accommodations. Therefore, while the iPad has some accessibility features, we did not test them.

I gathered data from the students at multiple points during the semester and employed the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh, et al. 2003) and other scales to assess various perceptions held by the students. The UTAUT model holds that there are indirect factors which moderate most of the direct determinants of the intention to use technology, and some which moderate the direct determinants of technology use behavior.

Students completed four surveys over the course of seven weeks: before picking up the iPads, two weeks
Towards the Paperless Class

Students immediately recognized collaboration benefits when using tablets to support their consulting projects. Many took their iPads to meetings with clients. Students also discovered “found time” with the tablet.

Other professors participating in the pilot used the tablets in a variety of ways. In a freshman level course on contemplation students used them for journaling, sketching, and recording audio reflections outside of class. A professor in the law school used an online polling service to gain instant, honest feedback from students on their feelings regarding moral and ethical issues during in-class discussions.

I found a way to use the iPad that improved how I graded student presentations as well. I used iAnnotate PDF to open the student presentations and used a stylus to write questions to ask the group and comments about the content and the presentation. Finally, I would put a grade on the presentation and use Dropbox to distribute the marked up, graded presentation to the group – often before they made it back to their seats. I am convinced that the immediacy and directness of the feedback improved the quality of the feedback I gave the students.

With new technology implementations, it is not uncommon for expectations to be high initially, fall dramatically as users realize all the limitations, then gradually rise again as they learn how to work around or accept the limitations. Through the surveys and focus groups we learned students did have very high expectations initially, but there was very little decrease throughout the time students used the tablets – this was true even though students reported high levels of dissatisfaction with some functionality.
Students also reported that they were much more likely to use the tablet to gather additional information about a topic being discussed during class or take notes because it was less obtrusive than a laptop and created less of a barrier between me and them.

Here is a sample of student quotes from the surveys and focus groups.

Everything [is] on one device [that is] smaller than many books.

It is obviously helping avoid unnecessary paper waste, but it also opens up a lot of possible collaboration that didn’t exist with the normal textbook set up.

I am more organized and my backpack is certainly lighter since I don’t need to carry my laptop and cord everywhere.

I also LOVE the long battery life.

Instant information at your fingertips.

Takeaways from the data summarized above:

1. Expectations were high due to the incredible hype surrounding the release of the iPad, but performance appeared to live up to the hype.

2. Usefulness (performance expectancy) was very consistent throughout the entire study and did not wear off even after the iPads were returned, suggesting this was not a transient effect that went away when students went back to the traditional way of working.

The textbook markup experience and the method of handling files were the primary sources of student dissatisfaction. Highlighting and annotating the book through the CourseSmart app was much more cumbersome than with a printed book. Students also reported that flipping back and forth between locations in the digital book was difficult. Unlike other computers the students use, the iPad does not expose the file system. Students were unable
Towards the Paperless Class

• Encourage students to explore the tablet and share their discoveries with the class – new apps, pros & cons, and tips & tricks.

In hindsight, I wish I had required specific apps beyond the one required for the textbook; most of them are very inexpensive. Several issues came up when students did not have a good PDF reader, for example. Finally, now that I am more comfortable with the capabilities and limitations of the device, I would create assignments and quizzes that required students to use the tablets. Overall, the initial pilot was a huge success. Subsequent use of iPads in other classes has also gone better than expected. In late 2011 we will release a report detailing the findings from five other courses that used the device. In addition, the ePublishing Working Group continues to evaluate multi-function eReader tablets. Here are some questions we hope to address in the near future:

• Which specific teaching, learning and research activities do tablets facilitate?
• What accessibility issues do tablets raise and how can they best be addressed?
• How does the sustainability of multi-function eReaders compare with that of books?
• Does using a different type of tablet or newer apps affect technology acceptance?
• Are there differences between courses in student perceptions of the iPad (behavioral, perceived value, usage)?

The textbook markup experience and the method of handling files were the primary sources of student dissatisfaction. Highlighting and annotating the textbook on the tablet was much more cumbersome than with a printed book.

Recommendations

This experiment afforded me a wealth of knowledge about introducing technology into the classroom that would not have been possible without the pilot. As a result, I have several recommendations.

• Begin searching for digital course materials well before the class starts. Not all books are available electronically and some of the publishers have proprietary reading software.
• The library is an invaluable resource in helping identify digital content and understanding copyright issues.
• You and your students will reap huge benefits if you spend time up front with the digital course materials and the apps used to access them. Give students active guidance on how to use the device in support of the learning goals for the course. Not all students can use digital materials and tools to take notes, complete assignments, or study.
• Involve your information technology group early in the planning process. They can help with setup and provide valuable technical support, freeing you to focus on teaching.
• If the course demands specific apps or accessories (e.g., stylus), then require students to purchase the items and provide them with training.
• Transferring content to and from a tablet can be more difficult than it is on a laptop or desktop. Identify a file storage solution – on campus or cloud hosted – that works well on the tablet and show students how to use it.
• Set clear expectations for ways students should use the tablet - or not use it - during class time.

The textbook markup experience and the method of handling files were the primary sources of student dissatisfaction. Highlighting and annotating the textbook on the tablet was much more cumbersome than with a printed book.
References and Resources


Web resources


iPad Enterprise Deployment, including iPhone Configuration Utility (Apple) http://www.apple.com/support/ipad/enterprise/

Notre Dame eReader study (YouTube) http://www.youtube.com/watch?v=-knt89NLAY0

Image credits


Several years ago, my institution (the University of Maryland College Park) installed wireless Internet access in all of the classrooms. At first, I didn’t notice much difference in the level of student engagement. Possibly one or two students would bring a laptop and in a class of 35 students, I reasoned, there would always be a few who weren’t paying attention anyway. Further, they could be using their computers to take notes, a practice for which I had great sympathy as my own fingers can no longer continually form letters for long periods of time. I am not held back from handwriting by disability; I’m just out of practice.

Then two or three laptops became three or four; three or four become ten or twelve. If I paced the aisles, sometimes I saw note-taking, but sometimes I saw Facebook, email, or, more than once, funny kitten videos. Attention clearly started to wander; probing questions that had for years provoked engaged responses stopped provoking altogether.

Laura J. Rosenthal is a Professor of English at the University of Maryland, College Park, where she specializes in seventeenth- and eighteenth-century British literature and culture. Her most recent books include Nightwalkers: Prostitute Narratives from the Eighteenth Century and Literary Study, Measurement, and the Sublime: Disciplinary Assessment (see web resource list), a collection of essays co-edited with Donna Heiland. She is currently writing about eighteenth-century cosmopolitanism in theater and print culture.
After all, in my Restoration drama class I was teaching some of the funniest plays in the English language. For years students had appreciated the antics of Sir Fopling Flutter, come “piping hot” from France and frisking through the pages of George Etherege’s *Man of Mode*, stopping to explain the splendors of his new lace cuffs to anyone who would listen, claiming expertise in the latest dance styles but declining, even when pressed, to execute a caper. Isn’t that funnier than a kitten falling into a bowl of cereal? Something, in other words, was not entirely working for my networked students even when temporarily closed out of cyberspace.

**Approach**

Taking the general advice to “go where the students are,” I decided to remake my classes in a way that might (re)capture their attention. I took a brief summer seminar on “Teaching with Technology,” lead by Spencer Benson at the Center for Teaching Excellence at the University of Maryland. Reinforced by my then-4th-grade daughter, I learned how to make PowerPoint presentations in which, with the help of “Google images” and some great websites devoted to historical clothing, I could show students examples of the kinds of accessories that Sir Fopling Flutter loves to show off to his friends. Then I learned how to incorporate video clips and manipulate digital versions of performances, although I still haven’t found as many good examples of performances of Restoration plays as I would like. I went to local performances, took pictures when permitted, and incorporated those into my classroom as well. I experimented with assigning performances to my students, although that can get very complicated. I played recordings of “Mack the Knife” and showed trailers from Broadway productions of *Threepenny Opera* available on YouTube when teaching *The Beggar’s Opera*. I was also able to find various interviews with directors and actors on YouTube on the particular challenges and pleasures of producing Restoration and eighteenth-century British drama.

All of this helped quite a bit. New built-in technology and, yes, the wireless Internet piped into the class has made all of this much easier. I had used audio/visual supplements before, but the necessity of dragging around the giant A/V cart had limited my motivation. I started to feel that while the use of enhanced classroom displays had improved attention in my classes, it still wasn’t using the available technology to its full potential, nor was it fully reaching my rewired students. They were still listening to...
After what seemed to be some improvements in the way I taught students to write papers, I started to look at the quizzes. I always liked quizzes because they made sure that the students had done the reading. While this in itself made a big difference, it didn't necessarily guarantee an engagement with the text. In the "Teaching with Technology" seminar we had discussed blogging as a way to promote engagement, but I was reluctant to require my students to write posts that would be exposed not just to the class but to public view. The Blackboard site, however, had recently added a blogging function, so I decided to give it a try (Blackboard is our course management system). I know others have had success with discussion boards, but I wanted more sustained responses from my students than I think discussion boards promote. Yet this raised other problems: to make their blogging valuable, I would really need to grade it—or at least respond to it. Was I really willing to read 35 blog posts before each class? I solved this by putting them in groups, and rotating when the groups would blog. Since I was teaching a course in Restoration and eighteenth-century drama, I named the groups after historical coffee houses, in which many discussions of theater and other issues of the day took place. This involved a little additional organization at the beginning of the semester, but once I establish the different coffee houses I can use them for not just blog rotation, class discussion and turning in a completed paper that bore little resemblance to most of the fluid text that comes into their world. I was painstakingly grading them and could only hope that they would learn something from my comments.

Then one day I was staring around the coffee machine with a colleague, complaining about grading. The colleague said something like, "It's really not that hard to give the grade itself. What I hate is the way you have to justify the grade in all the comments." Of course we all sometimes find grading tedious, especially when there is lot of it to finish in a short amount of time and we also have an article to finish and a book manuscript to evaluate and a committee to attend that day. But what had not occurred to me before was the dual function of grading implicit in his comment: one the on hand, you are evaluating; on the other hand, you are justifying this evaluation. I had also been heavily involved in my college's learning outcomes assessment process (the committee to attend that day), and in that moment wondered how justifying a grade helps students learning anything. In theory, they should learn a lesson from one graded paper to use of the next one, but over the years I have found those improvements difficult to detect. Further, if they really understood what the paper was supposed to look like, why should there be any justification of the grade?

So I decided to separate the evaluating and the learning function of grading, with the help of technology. I started having students email me a first draft of each paper, which I return to them electronically with copious interventions and comments using the markup function in Microsoft Word. Writing these comments has proven considerably less tedious than justifying the grade of a single draft that will be not changed. In my comments, I try to push them to think further about particular issues, challenge certain assumptions, point out unjustified sweeping generalization, and show them, very specifically, where they need more support. I find this activity—dare I say?—interesting. By the time they turn in the final draft, they have a reasonably good sense of what they need to do to improve the paper. There is no reason, then, for me to justify the grade, and I don't do it. Since I have been evaluating papers this way, I have not had a single student challenge a grade (although it has not eliminated the need to finish way too many of them while simultaneously writing an article, reviewing a book manuscript, and attending a committee meeting).
but for quickly putting them into small groups for
discussion or for working out a particular scene in
the play. Not every student has blogged before each
class; nevertheless, by the time we get to class the
conversation has already started. Through their blog
responses, they often bring up many of the issues
that I was hoping to cover. Part of their blogging ru-
bric includes responding to other posts in their own,
which moves their thinking forward and helps build
community. Class discussion, then, begins at a more
advanced level that it would without the blogging.

Next I turned to the final exam. Would there be a
way to use some of the new resources to improve
my final exam and make it a more interactive
learning experience? Near the end of the semester
students always want some kind of review sheet,
so over the years I had developed a list of terms
("Whig"; "Tory"; "Fop") that would help them
study for the final. Then one year I thought, why I
am withholding this important information until
one week before the final exam? Suppose I told
them on the first day what they needed to know for
the exam. So one year I gave them the sheet on the
first day, and they used it to take notes throughout
the semester. At the end, though, I realized that
there were many terms that I had not fully covered;
further, giving out the sheet like that made them
engaged in the kind of close reading of the play texts that
I wanted them to engage in. So I turned this aspect
of the course over them.

In addition to posting brief discussions of the as-
signed reading on the Blackboard blog function, I
now had them research two terms on the list and
post their definition, with links, in the Blackboard
wiki tool. They are permitted to use Wikipedia here,
but must have at least two other sources. I grade
these posts, but obviously they can't see each other's
grades. Part of the learning outcome of this assign-
ment, then, is their own process of sorting through
information on the web and figuring out, by tracing
origins, the reliability of various posts. Later, I added
two more wiki post assignments summarizing critical
articles on individual plays. Any of the research and
writing they do for the blog posts and wiki posts can
be recycled in their papers, so by the time they get
there they have laid some of the groundwork. Like
the blog posts, the wiki entries are not all entered at
once but rotated according to the coffee houses.

Most recently, I wanted to take advance of some
of the wonderful primary-text databases that my
university has purchased: The Eighteenth-Century
Collections Online; British Periodicals; and The
Burney Collection of seventeenth and eighteenth-
century newspapers. These have all become invalu-
able research tools for me. I had previously experi-
ted with asking student to incorporate primary
research from these databases into their final papers,
but with uneven results. Incorporating primary
sources into any argument about a literary work is
a very advanced skill, and I'm not sure that I would
be able regularly to get a class full of undergraduates
there by the end of the semester. Many need to focus
more precisely on their own readings of the plays.

So instead, I developed a separate research project in
which they need to find a review or some kind of dis-
cussion about the text we are reading and give a brief
report on this to the class. This way, they get briefly to
be experts on the play, explaining to their classmates
how audiences were entertained or scandalized.
So do my students still watch funny kitten videos while I am trying to initiate them into the profoundly superficial mysteries of Sir Fopling Flutter? Well, I’m sure they do. But while they might be glancing at Facebook updates during class, at the same time work for my course has infiltrated their “screen time” at home. Maybe after watching the latest Lady Gaga video they will hop over to Blackboard and see what their classmates have written about the greatest fop ever. Maybe before they come to class they will have Googled some images of the four-inch high heels or the two-foot high hair Sir Fopling might their worn, or read a review discussing his pallid make-up or the actor’s unfortunate ad-libbing or some outrageous gender-bending antics. After all, Sir Fopling Flutter, like the class in which I teach him, is still a work in progress.

**Recommendations**

Reaching students outside of class through technology has boosted engagement, but I have returned to banning laptops in class. I hope someday there will be a way to turn off the wi-fi in the classroom so students can use their laptops for taking notes. Right now, though, the wireless network is too distracting. Trying to figure out who is using their laptops for what directs too much energy into policing, leaving less for engaging with the material.

A great way to make sure that students understand all the technology they need to use for the class is to give a graded “tech exercise” after the second week, in which student demonstrate that they can use the appropriate databases, have found the class blog, have set up their Dropbox account, etc. This will help prevent confusion and distress later.

Sometimes less is more. I started out asking them for multiple informational wiki posts, but now usually have each student complete just one, keyed to one day’s discussion. I have added an oral report to go with it, which encourages ownership of the material.

Finally, assume that the technological aspects of your course, like its content, will constantly be changing.
Etherege, George Etherege (1676). *The Man of Mode, or, Sir Fopling Flutter.*
http://www.bibliomania.com/0/6/88/1881/

**Web Resources**

http://www.teaglefoundation.org/disciplinaryassessment/

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Page 5: “John Wilmot” painted by Jacob Huysmans, circa 1675
Rich Media Capture Technology Facilitates Timely Feedback for Students’ Oral Presentations

Karen A. Curto and Nicholas C. Laudato

Abstract

A rich media technology was introduced into a “Communication in Biological Science” class to provide timely feedback for senior biology students’ oral scientific presentations. Individual oral presentations with PowerPoint slides were captured with a rich media technology that permitted instructors to provide critical commentary by typing into a textbox associated with and synchronized to the recorded presentation.

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(Continues on page 99)
Similar to editorial comments in the margin of a written draft, this technology is like “real-time” feedback on the organization, delivery and scientific content of the digitally recorded presentations. The textbox comments were personalized and, along with the recording provided by a private URL, permitted students to easily access their original oral presentations for revision into an improved final talk.

**Background**

During their senior year, students majoring in biology at the University of Pittsburgh fulfill a writing requirement in a course "Writing in the Biological Sciences," wherein they produce a persuasive paper on a controversial biological topic researched largely from the primary literature. For example, in past versions of the course students evaluated whether autophagy promotes or inhibits cancerous cell growth, selected a “best” mechanism for aging retardation through caloric restriction or evaluated the perceived problems associated with urban gas well drilling. The overall goal for the course is to facilitate our biology students’ communication of their science knowledge for a role in society by using an assignment on the resolution of the biology controversy. The course aims for students to 1) utilize the primary (peer reviewed) literature as the major credible source of science information, 2) tailor a presentation for an audience with consideration toward their science background, 3) create a thesis supported by main points and evidence from the primary literature, 4) consider the logical order of information presentation and 5) recognize the value of feedback and necessity of the revision process to generate a final polished communication product.

In post-course surveys, students explained that talking about their biological topic in one-on-one conferences with the biology instructor facilitated comprehension and organization in their written document. In response to this finding, a single six-minute oral presentation was introduced to provide additional opportunities for students to talk about and receive feedback on their topics. During the first year with the oral assignment, the biology instructor provided a lecture about organizing a presentation and a grade rubric as a guide for these one-time presentations. However, instead of being viewed as a formative assessment tool to benefit the final written document, the oral presentation became a dreaded, anxiety-provoking summative assessment challenge for which students were ill prepared. The biology instructor sought help from two University services: 1) a Communication-across-the-Disciplines program to provide specific oral communication instruction and 2) the University’s instructional technical services group to record students’ initial presentations. This essay focuses on how the course evolved in its use of technology in an effort to provide meaningful instructor feedback to students in a timely manner. As enrollment numbers increased it was a means to maintain detailed and personalized advice on these critical first talks.
Rich Media Capture Technology Facilitates Timely Feedback for Students’ Oral Presentations

**Approach**

The writing course is divided in half, with the first part dedicated to the first and second drafts of the written document and the last half focused on the oral presentation, while the final written draft is being revised for submission. Thus, initially students learn about searching the primary literature and the necessary review/background information on their controversy. The first drafts show attention to the background section and a tentative resolution. One-on-one conferences between student and instructor and peer review of the first drafts provide feedback for the second drafts. Instruction now focuses more on the logical flow of an argument. However, it is the oral communication instruction that is a valuable critical exercise toward refining the argument.

Two communication workshops based on students’ self-identified concerns from pre-course surveys about their abilities to prepare and deliver an oral presentation constitute the formal oral communication instruction. The students identified 1) organizing a talk and 2) delivering a talk as highly desirable topics. Initially, the workshops were conducted in the communication department, but as enrollment climbed, the communication lab director recorded the workshops and each biology instructor used these DVDs to guide the oral communication section of their course (Bayer et al. 2005).

The workshop on organizing a talk guides students through steps from identifying their topic and purpose to stating a thesis supported by evidence. Thus, for example, microalgae as a fuel alternative source is a topic, wherein the purpose might be to evaluate this organism as a source for biodiesel fuel, with the thesis being to support continued funding to develop microalgae as a source of fuel supported by strong lines of evidence from the primary literature. Although students come into this workshop after at least one and sometimes two written drafts behind them, they still struggle with maneuvering the information from their written document into this format. It is an active classroom, with both instructor and peers providing feedback as each student articulates what will become the parts to their six-minute talk. It is not merely plugging sections from the written drafts into a template, but a critical thinking exercise to identify and express the most important information from the written argument (Curto and Bayer, 2009).

After the second communication workshop that focuses on delivery and speaking anxiety, students prepare a PowerPoint presentation to support their initial six-minute talk. The biology instructor, with technical assistance to record the talks, makes novel use of a technology called “rich media capture” or “lecture capture.” These technologies are hardware/software solutions optimized to capture real-time presentations in the classroom or lecture hall. They typically capture audio and video synchronized with screen images from the presentation, usually PowerPoint (Figure 1). The resultant capture is stored on a streaming server for later review. The viewer sees a bundled multi-windowed synchronized presentation (Figure 2) with video and audio of the presenter, a full-resolution image of the PowerPoint presentation, and navigation tools including thumbnails, indexes, scroll bars, and search.
The normal academic application for this technology is to capture an instructor’s presentation for subsequent student review and study. In contrast to this typical use, the instructors are not recorded, but rather, students’ presentations are recorded to enable the instructor to provide contextual feedback to the students on their presentations. The instructor uses features of the rich media capture solution to provide feedback on specific aspects of a student presentation and publishes this annotated recording to the individual student. Subsequently, when the student views this individualized session, the feedback is delivered in the notes area of the viewer within the specific context of the presentation.

The specific rich media capture technology employed in this initiative changed over time and each used a very different technique to create and share the instructor’s feedback to students. The initial solution used Sonic Foundry’s Mediasite and the current solution uses Panopto’s Focus. The nature of this approach should work with any rich media capture application that supports either captioning or notes.

In the original implementation of this approach, a student talk was captured via the Mediasite rich media capture appliance. In preparation for the recording, the student e-mailed PowerPoint slides to the biology instructor who loaded them onto a laptop. During the presentation, this laptop was connected to the Mediasite recorder appliance which automatically synchronized the PowerPoint slides to the digitally-recorded student presentation. The videographer subsequently uploaded the presentation to the Mediasite server and named it appropriately. The videographer then extracted the audio/video components to a local Windows Media Video (WMV) file, burned it onto a CD, and returned it to the instructor for commentary.

Using a captioning software program, Subtitle Workshop, the instructor viewed the recorded talk and paused the recording to enter comments into a textbox on one laptop. A second laptop contained the PowerPoint slides that were advanced by the instructor as the talk progressed. Critical instructor feedback comments were typically related to...
the slide content, delivery style, or some biological concept requiring clarification. The commentary was then saved by the Subtitle Workshop software in a Microsoft Synchronized Accessible Media Interchange (SAMI) file and e-mailed back to the videographer. The final step was for the videographer to combine the SAMI file with the Mediasite recording and forward the resultant URL to the instructor. The instructor then notified each individual student of or his or her unique URL to ensure privacy. Students viewed the recordings, with integrated instructor comments, via the Web. If downloaded, each talk with its commentary and slides would take about 10MB.

Turnaround time for the entire process was two-to-three days. On day one the talks were recorded and on days two-three the commentary was added and the annotated talks returned for uploading onto the server. Depending on the quality of the presentation, commentary entry time ranged from a few minutes to half an hour for each presentation. The availability of audiovisual technical support was an important factor in this timely return of feedback. The biology instructor and technical staff coordinated schedules as part of the planning for each semester.

In the four years since the first-time use of the rich-media technology, we switched to an alternative version of this technology that eliminates a number of the multiple steps described above to the digital recording step only (Figure 3). This rich media capture technology was called CourseCast (now renamed to Focus) by Panopto. The switch to Panopto Focus was made because of its “Notes” feature that allows synchronized textual notes to be associated with the recorded presentation, obviating the need for using captioning software (which Panopto also supports).

The instructor or a technician may upload the student presentation onto the Focus server online and, using the program Wizard, create the session and assign a URL. The commentary can be typed into a textbox as the talk is being given or at a later time using Panopto’s “Notes” feature. Students on the course website or through instructor-sent e-mails can access these URLs with the recordings secured via password. The Focus option is desirable for instructors with limited access to audiovisual assistance or to classes where immediate written commentary is desirable. The hardware and software sources for both the original and current technology remain available and are listed under the “Technology Sources” section at the end of this essay.

Figure 3: Record/Feedback Process Flowchart – Original Process versus Revised Process
Results

To obtain a sense of whether students valued this technology, the instructors administered a post-course Likert survey that assessed “importance” on a scale from 1 to 5 in response to this question: “How important was viewing the instructor’s commentary of your first presentation for the preparation of the final presentation?” The scale was ranked as follows: 1 = not at all important, 2 = somewhat important, 3 = moderately important, 4 = important and 5 = very important. An additional response of “did not use” was also available. Across three sections of this course taught by different instructors, students rated their review of the first presentation only (without instructor comments) as “somewhat to very important” (49/52 responses) with 50% limiting their ranking to “somewhat or moderately important” and three rating it as “not at all important.” In sections surveyed in which textbox commentary was included a unanimous 27 responding students rated the comments as “somewhat to very important.” In addition, two of these students volunteered the information in post course surveys that “the instructor comments” were “the most useful component” in the revision of the final presentations. Additional indications that this was a valued addition to the course is seen from selected free response statements to the question “What was the most useful course component that helped prepare you for the final presentation?” and included statements such as:

“The feedback given to me on the first presentation and watching myself”

“Feedback from the first presentation/video”

“The professor’s comments from the video”

“Being critiqued, reviewed and doing it again.”

Like editorial statements written by an instructor in the margin of a student’s written document, the technology-enabled comments in the textbox served as the basis for revision to presentation style, quality of slides, science accuracy or argument flow. The final presentations would be expected to be better than the first ones based only on repetition and viewing of the talks. A rough evaluation of the impact of this technology shows that in past classes where talks were recorded and made available for viewing (no textbox feedback) scores ranged from 77% on the first talks to 90% on the final presentation (N = 13). In subsequent classes where textbox feedback was included, scores were 80% on the first presentations to 94% (N = 49) on the final presentations (Curto and Bayer, 2005). Although the magnitude of grade change was similar (13 percentage points) in the absence and presence of the feedback technology, the direction of change placed more scores within the desirable “A” range and out of the average or “C” range.

There were several unexpected benefits from this project. Some students mentioned appreciating the private and personalized nature of this feedback. They are able to access the talk on their computers in the privacy of their dorm room or home. The textbox comments are tailored to their issues in “real time” – just as the problem occurs in the talk. Instructors also like the opportunity to provide detailed and specific comments that may not be possible in a classroom setting with its time constraints. During the actual presentation, instructor attention is divided among listening, filling out a grade rubric, evaluating slide content, and writing a meaningful commentary. With the rich-media recording, that may be paused and repeated, details can be addressed that may be overlooked during the actual presentation. Over the six years since the introduction of this technology, nine different instructors and nearly 500 students have used and continue to use this technology in biology or chemistry courses where an oral presentation is assigned.

The authors recognize that a major challenge faced in using this technology is access to rich-media recording equipment and if necessary, a technologist. Many institutions of higher learning have some recording facility or service to capture lectures or talks on their campuses. The biology instructor became aware of the potential use of this technology while attending a demonstration for its typical use to record an invited or distant speaker presentation. Repurposing its functionality for use in students’ presentations represents an effort to adapt existing technologies for not only novel, but also beneficial instruction. As education moves toward distance and online learning opportunities, educators should explore ways in which currently available technologies at their institutions may be adapted for classroom use.
Rich Media Capture Technology Facilitates Timely Feedback for Students’ Oral Presentations

**Recommendations**

This technology continues to evolve as the authors are examining additional ways to improve its ease of usability. When class size exceeds twenty students, typing in comments can become time consuming. Currently, it takes about 10-20 minutes per presentation, depending on the quality of the initial talk. There are a number of technical modifications that could improve this technology to expedite the instructor feedback. A set of “shorthand” editorial codes could be provided to students that would minimize instructor typing or a program developed that recognizes handwritten or auditory comments.

Although this technology is currently used in biology and chemistry communication courses, it has the potential for wide applicability. For example, it could support revision and evaluation of group presentations, student teaching presentations, mock trials, patient treatment protocols or interviews. The primary goal for using this technology should be to assure that communication skill is refined and facilitated, so that student knowledge is accurately demonstrated not only in a classroom, but also in critical situations such as job interviews or policy defense. For their roles as responsible citizens, these future scientists’ messages need to be easily comprehended by the public less familiar with their area of expertise. Recently, professional science groups (AAAS) note that an inability to communicate is a source of distrust between the public and scientists and can be an obstacle to funding. Facilitating instruction in general oral skills and well-expressed science is one step toward eliminating this barrier.

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*(Author bios, continued from page 93)*

and introduction to teaching in biology courses. She received her Ph.D. in Pharmacology/Toxicology from West Virginia University, M.A. from Bryn Mawr and B.A. from Chatham College.

Nicolas C. Laudato is the Associate Director with the Center for Instructional Development & Distance Education at the University of Pittsburgh. Dr. Laudato received his B.S. in Mathematics from Carnegie Mellon University and his Ph.D. in Curriculum and Supervision from the University of Pittsburgh. He regularly teaches graduate and undergraduate courses in information technology at the University of Pittsburgh.
References and Resources


Image Credits

Figure 1: Illustration of Classroom Lecture Capture Configuration, drawing by N. C. Laudato


Figure 3: Record/Feedback Process Flowchart – Original Process versus Revised Process, drawing by N. C. Laudato

Technology Sources

The technology solutions referenced in this article were:

Panopto's Focus (http://www.panopto.com/): a flexible rich media recording technology utilizing commodity equipment (Windows and Macintosh) and simple Web-based editing to produce live or on-demand streaming content and podcasts.

Sonic Foundry’s Mediasite (http://www.sonicfoundry.com/): an appliance-based rich media recorder and server technology that can stream presentations live or on-demand, create derivative podcasts, and export presentations to portable media.

URUWorks Subtitle Workshop (http://www.urusoft.net/): a (freeware) subtitle editing tool that was used to create SAMI files for input into Mediasite captioning capability.
Development for Student Success: An Undergraduate Online Course in Engineering

Rebecca J. Williams, Joseph C. Hartman, Fedro S. Zazueta, and Jennifer Smith

Background

E-learning at the University of Florida (UF) has sought to further improve the learning experience for students, facilitate the teaching process for faculty, and reduce costs of instruction. To achieve this, an enterprise program was instituted leading to a series of online course offerings for undergraduate students.

This program (Provost E-Learning Initiative, 2007 - 2011) (PELI) consisted of the production of high quality online courses designed to showcase best
the course reached a full face-to-face capacity each semester averaging 306 students per year over a five year period. The Industrial and Systems Engineering Department proposed to reduce the cost of course delivery by offering the course fully online to remove the need for a physical classroom. Additionally, advanced modules from the course would replace or augment four similar engineering courses allowing an enrollment increase to 700 students annually.

The high current and potential student enrollment, cost reduction strategy, goals for student outcomes, and the commitment of faculty to participate in the redevelopment of the course for online learning made EIN 4354, Engineering Economy a clear candidate for the PELI program. The challenge would be to reach the PELI goals while ensuring quality instruction and avoiding common pitfalls in online courses targeted to undergraduate students.

### Approach

The courses in the PELI program were developed in partnership with the faculty member and an Instructional Designer. The course structure for Engineering Economy focused on performance-based learning objectives. Lectures and activities were created based on the objectives and taught the course material. Varied assessments provided students with opportunities to show mastery of the learning objectives. Once the course architecture was completed, the challenges involved in distance education for undergraduate students had to be addressed. Challenges identified for the course are outlined in table 1.

Student-to-instructor and student-to-student interactions can diminish or have the perception of diminishing in a distance course leading to a

<table>
<thead>
<tr>
<th>For Students</th>
<th>For Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling of isolation leading to dropout (Fulford, Zhang, 1993)</td>
<td>High dropout rate (Graham, Anderson, 2005)</td>
</tr>
<tr>
<td>Time management skills (Chickering, Gamson, 1987)</td>
<td>Decreased student satisfaction</td>
</tr>
<tr>
<td>Reduced student collaboration (Chizmar, Walbert, Hurd, 1999)</td>
<td>Reduced student success rates</td>
</tr>
<tr>
<td>Limited opportunity for social and critical thinking skills acquisition (Collison, Haavind, Tinker, Elbaum, 2003)</td>
<td>Assessment validity</td>
</tr>
<tr>
<td>Limited interaction with instructors (Swan, 2002; Collison, Haavind, Tinker, Elbaum, 2003)</td>
<td></td>
</tr>
<tr>
<td>Student accountability in assessments (Muirhead, 2005)</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Challenges for Students and Faculty
feeling of isolation on the part of the student. This feeling of isolation is often cited as a major factor in student dropout rate, success in the course, and perception of learning in undergraduate distance education. To address this challenge, the design team provided opportunities for student-to-student interactions through discussion boards and group-based projects. Five discussion board activities based upon current events provided an opportunity for peer collaboration. The discussions were graded on participation and comprised a small percentage of the overall grade.

Four projects were created to evaluate higher order learning objectives that required mastery of the subject matter as well as critical thinking skills. Three of the projects were geared towards groups and one focused on individual skills. The group projects required detailed understanding of spreadsheets and statistical analysis of data. Tutorials were created instructing students on how to utilize Google Spreadsheets for the projects. The Google spreadsheets were also helpful in fostering participation and collaboration within each group as students could easily peer-edit and evaluate their projects online. Rubrics provided clear information regarding assignment requirements as well as serving as a tool for the teaching assistants to use for grading.

A series of 22 quizzes were created to provide formative assessment and keep students moving through the course material. The quizzes were worth a total of 25% of the course grade, thus reducing the impetus to cheat by reducing the point value of each individual quiz. Quizzes were randomized with questions being drawn from a pool as well as being timed. Two higher stakes examinations (midterm and final) were worth 20% of the final grade and were required as an assessment methodology by the College of Engineering. The examinations were given on campus or at a proctor-based facility for additional test security. These examinations served as summative evaluations to determine retention of information and ensure understanding of course materials. However, the overall point value of the exams were kept low to prevent students from failing due to the pressure of high stakes evaluation while still being important to overall course success.

Results

The Engineering Economy course was structured by modules that required students to perform specific tasks on a weekly basis. The course week consistently ran from Monday through Sunday throughout the semester and deadlines were 10:00pm on Friday for quizzes and 10:00pm on Sunday for all other activities, projects and discussions.

The methodologies utilized in the delivery of the Engineering Economy course were chosen to address the specific needs identified in research for undergraduate distance education students as outlined in Table 2.

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Delivery Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling of isolation leading to dropout</td>
<td>Discussion boards, group projects</td>
</tr>
<tr>
<td>Time management skills</td>
<td>Frequent and consistent deadlines</td>
</tr>
<tr>
<td>Reduced student collaboration</td>
<td>Group projects</td>
</tr>
<tr>
<td>Limited opportunity for social and critical thinking skills acquisition</td>
<td>Discussion boards, group projects</td>
</tr>
<tr>
<td>Student accountability in assessments and assessment security</td>
<td>Low-stakes assessments, group projects, proctored exams</td>
</tr>
<tr>
<td>Decreased instructor-to-student interaction</td>
<td>General course discussion board</td>
</tr>
<tr>
<td>Decreased student-to-student interaction</td>
<td>Discussion boards, group projects</td>
</tr>
</tbody>
</table>

Results

The Engineering Economy course was evaluated based on the success of the course in the context of the PELI programs goals to reduce the cost of instruction while increasing the quality of learning. Evaluation data included enrollment numbers, student grades, and student evaluations.

The cost reduction strategy of the PELI program focused on reducing the need for physical classroom space, increasing student enrollment and course offerings, and when possible increasing the student-to-instructor ratio without reducing the quality of instruction. The online redesign of Engineering Economy proved to be successful in all of these points.

The face-to-face Engineering Economy course enrollment averaged 306 students per year over a five year period. After the launch of the redesigned online course, enrollment increased to an average of 386 students per year averaged over a 5 semester period as demonstrated in Table 3.

Table 3. Average Yearly Enrollment in EIN 4345, Engineering Economy
The revenue generated by the increased enrollment was estimated by the weighted cost of delivery per Student Credit Hour as determined by the University of Florida Responsibility Center Management Operating Manual (RCM). The revenue generated due to the increase in enrollment in the Engineering Economy course is estimated at $88,449/year. The release of the face-to-face classroom for use by another department or course was also determined by the RCM at a savings of $4,860/year for the release of the square footage of space occupied by the course. The number of teaching assistants necessary to support the course was reduced by one at a cost savings of $28,830 per year.

The total cost savings of the course was determined by the value of the yearly average number of increased student credit hour dollars ($88,449) added to the average yearly cost savings of one teaching assistant ($28,830), and the average yearly value of the release of one large lecture hall for use by another course ($4,860). This number was then subtracted by the yearly cost of the learning management system which was calculated at $1,930 for the 386 average student enrollment in the online course.

The cost of proctored examinations was not factored into the cost savings as both the face-to-face and online versions of the course used the same method and facility. The total cost savings of the Engineering Economy course is estimated at $119,489 dollars per year. It is important to note, however, that the financial impact of the students taking the Engineering Economy course in lieu of another course were not calculated.

The second major goal of the PELI initiative was to improve the quality of learning for the student. This was determined by comparing overall student performance data of five years prior to the course redesign and the five semesters of the online course. Table 4 shows that grade distribution changed in the online course with a decrease in A and D grades and an increase in B, C, and F grades. The historical grade distribution of the face-to-face course had a rate of 94% passing and 6% failing while the online course grade distribution had a rate of 93% passing and 7% failing. Overall the distribution of passing grades versus failing grades when comparing the face-to-face and online course has remained well within a standard deviation of 1%.

Quality of learning was also determined by comparing student responses to surveys in comparison with the key challenges outlined for success in the undergraduate online course. The survey results showed a high level of student satisfaction in the course with specific areas identified for improvement. Areas of success were identified as a 60% or greater positive response rate. Table 5 shows a brief summary of student survey results taken from online course supporting student satisfaction within these identified challenges.

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Survey Question</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>True</td>
</tr>
<tr>
<td>Feeling of isolation leading to dropout</td>
<td>I felt connected to the students in this course.</td>
<td>65%</td>
</tr>
<tr>
<td></td>
<td>I considered dropping this course while taking it via e-Learning due to lack of interaction with other students and the instructor.</td>
<td>7%</td>
</tr>
<tr>
<td>Time management skills</td>
<td>The weekly discussion, quiz, and assignment due dates helped me stay on task with my responsibilities in the course.</td>
<td>99%</td>
</tr>
<tr>
<td></td>
<td>I had difficulties keeping up with the weekly discussion, quiz, and assignment due dates.</td>
<td>30%</td>
</tr>
<tr>
<td>Limited opportunity for social and critical thinking skills acquisition</td>
<td>This course challenged me to think about and more fully explore the topics discussed, beyond the stated lecture topics.</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>I was able to easily communicate with the EIN4354 instructor.</td>
<td>90%</td>
</tr>
<tr>
<td>Decreased student-to-instructor interaction</td>
<td>The EIN4354 instructor responded back to my emails and discussion board posts within an appropriate amount of time.</td>
<td>96%</td>
</tr>
</tbody>
</table>

Table 4. Face-to-Face vs. Online Grade Distribution Comparison

Table 5. Positive Student Satisfaction with Course Challenges
Table 6 below identifies areas of dissatisfaction. Areas of needed improvement were identified as those with a 40% or greater negative response rate within the stated challenges.

Although student surveys showed areas of needed improvement in regards to student-student interaction and instructor presence, overall student satisfaction with the course was positive.

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Survey Question</th>
<th>% Response True</th>
<th>% Response False</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling of isolation leading to dropout</td>
<td>I felt connected to the instructor of this course.</td>
<td>54%</td>
<td>46%</td>
</tr>
<tr>
<td>Reduced student collaboration</td>
<td>I established strong, collaborative relationships with the students in this course.</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>Decreased student-to-student interaction</td>
<td>I think taking this course via e-Learning provided me with the same level of academic interaction with my fellow students that I would have had in a face-to-face course.</td>
<td>59%</td>
<td>41%</td>
</tr>
</tbody>
</table>

**Recommendations**

One of the two major goals of the Provost E-Learning Initiative was to reduce the cost of instruction in high-demand courses at the University of Florida. When utilizing online courses as a methodology for reducing the cost of instruction it is important to consider the cost of the learning management system in comparison with the cost of the face-to-face classroom. In the case of Engineering Economy, when comparing the cost of the learning management system ($1,930) and its support to the cost of the physical classroom ($4,860), it is evident that the online course was indeed less costly than the face-to-face course. The additional increased revenue created by the online course was generated by increasing student enrollment and reducing the number of teaching assistants.

This fact brings into sharp relief the second goal of the PELI initiative – to improve the quality of learning. Notably in the Engineering Economy course, the issues of isolation and reduced collaboration were identified as areas of needed improvement. The reduction of a teaching assistant and increase in enrollment may have contributed to a perception of decreased interaction and collaboration. Additionally, issues related to the learning management system, such as the robustness of wiki, blog, and discussion board tools affected the design of collaborative activities within the course.

Future goals for the Engineering Economy course include conducting more research on assessment security within the online course quizzes and improving the quality of the course in the areas identified by student evaluations. In addressing these areas, care must be taken not to increase the burden of work that currently falls on both the students and the instructor. Activities that encourage students to collaborate on ungraded homework activities, increased peer-review activities, and short instructor video responses to questions with an external tool such as VoiceThread may increase communication and collaboration and reduce isolation.

Overall, student surveys reflected a positive reaction to the design of the class and specifically within the identified challenges of isolation, time management, social and critical thinking skills acquisition, and student-to-instructor communication. Another future goal for the Engineering Economy course is to add modules in order to easily meet the needs of different engineering programs. This would ultimately allow the course to replace a total of four existing courses that are teaching similar materials and increase enrollment to a projected 700 students annually. These goals will ensure that the Engineering Economy Course continues to save money while maintaining quality education.

(Author bios, continued from page 101)

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Technology, learning, and free will

G. Christopher Clark

I have never been completely satisfied with the term “educational technology.” The phrase implies two things: 1) that technology is doing the work and 2) that it educates, no matter how people use it. That sounds like determinism to me.

Determinism is a philosophical concept which suggests that everything that happens was bound to happen; all events are predestined by earlier events and we have no choice in the matter. Technological determinism, a related theory, says that technology development follows a path that is predictable, beyond cultural influence, and has inherent effects on society. In my world, technological determinism is the belief that a tool inherently has either a positive or negative effect on learning.

It may help to relate these ideas to woodworking. A real carpenter knows a hammer isn't good for everything. She uses it to pound a nail into the garage wall, but not to split a log or fasten one piece of metal to another. A professional chooses the right tool for the job at hand; to a child using a hammer for the first time everything looks like a nail. And when a man like “Tim the Tool Man” has a brand new two-speed pneumatic hammer all bets are off.
An educator wants classroom technology that is innately engaging, inexpensive, easy to use, infallible, and pedagogically effective.

The opposite of determinism is free will. It is fundamentally a theological construct, but I’m going to stretch it into my domain. In education, free will means that professors are able to make choices about how they use tools. The ways in which we can use technology are not somehow foreordained and restricted by nature.

Modern human beings live in a complex world, and we are constantly looking for ways to make our lives simpler. We hunt for the Holy Grail of risk-free easy answers: a diet pill with no side effects that makes us lose weight without having to exercise, or an investment that earns 10% annually and comes with a money-back guarantee. An educator wants classroom technology that is innately engaging, inexpensive, easy to use, infallible, and pedagogically effective.

In the process searching for useful technology, a professor will occasionally ask me, “Will this tool help?” At first blush it sounds like they believe the mere introduction of a device or piece of software could automatically improve their teaching. I’m pretty sure that’s not what they mean, so my answer is always, “It depends. How are you going to use it?” I believe that free will, as applied to technology, means that educators are free to choose to apply a tool well or use it poorly.

You’ve heard the claims

Vendors make all kinds of claims about the educational effectiveness of the technology they sell. Without much effort I was able to find the following descriptions on product websites:

• “Improves every aspect of education”
• “Everything you need to achieve long-term success”
• “Teachers worldwide use [our] products to transform teaching and learning”
• “Can be used at all grade levels to build critical thinking and writing skills”
• “Will improve learning and study skills”
• “Makes learning more effective”
• “Recommended by 99% of teachers”

We want the world to be simple, so we want to believe these claims. We would also like to believe those emails about winning the Bolivian lottery.

Some manufacturers insist their statements are based on research. Unfortunately, much of that “research” compares a traditional strategy that does not employ technology with a new strategy that uses a new technology. No effort is made to determine the impact of the strategy alone, and any successes are attributed to the technology. The fact that teachers who use smartboards get good results doesn’t necessarily mean the smartboards are responsible. It was most likely coupled with a clever and engaging activity.

Another research concern is that we often measure the impact of a new technology after a brief exposure. This increases the likelihood of a novelty effect, where performance improves initially in response to interest in the new technology itself. We’re too impatient to test the device for two semesters and give the novelty a chance to wear off. Instead we take a survey after a three-week trial, while everyone is still excited about the new tool.

After an exhaustive study of media comparisons, Richard Clark determined that the choice of one technology over another did not impact student learning “any more than the truck that delivers our groceries causes changes in our nutrition” (Clark 1983). Robert Kozma challenged Clark’s black-and-white assessment of the data: “If we move from ‘Do media influence learning?’ to ‘In what ways can we use the capabilities of media to influence learning for particular students, tasks, and situations?’ we will both advance the development of our field and contribute to the improvement of teaching and learning.” (Kozma 1984).

Example 1: PowerPoint

A growing number of college faculty members believe that PowerPoint is a bad thing. Period. Headlines favored by this anti-PowerPoint bandwagon read “Death by PowerPoint”, “PowerPoint is Evil”, and “PowerPoint is the Enemy.”

“Imagine a widely used and expensive prescription drug that promised to make us beautiful but didn’t. Instead the drug had frequent, serious side effects: It induced stupidity, turned everyone into bores, wast-
ed time, and degraded the quality and credibility of communication. These side effects would rightly lead to a worldwide product recall.” (Tufte 2003)

Shame on the people who believe the preposterous claims of vendors in the first place. PowerPoint is not a drug. You don’t simply swallow it and wait passively for it to work. Users have to make deliberate choices about how it is used. Maybe I should feel sorry for the gullibility of the people Tufte describes; they are probably also wiring scammers thousands of dollars in order to claim an inheritance.

To use an artistic analogy, the painter is more often the problem than the canvas. Lecturers misuse PowerPoint through laziness, lack of imagination, and inertia. Some believe they must keep slides on the screen all the time, as if turning off the projector would somehow break the spell. Students like having class notes appear on the screen, but does it help them learn? Educators like to transform a class outline into visuals, but is that an effective way to present content?

PowerPoint is admittedly easy to use poorly, as are Word and Excel – or chalk on a slate. Sadly, PowerPoint has become the focus of so much criticism that we hesitate to defend it. Blaming the tool conveniently deflects criticism from those who deserve it, leading the authors of lousy presentations to believe they can’t help it.

Example 2: Clickers

While PowerPoint was acquiring a bad name, audience response systems were growing in popularity. These products employ TV-remote-like devices called “clickers” that allow students to wirelessly submit responses to questions, even in a large lecture situation. What could be bad about that? Anything that helps students to participate must be a good thing, right?

Derek Bruff (2009) has written an entire book that details all kinds of ways to use clickers well. Among other potentials, they can provide shy students a way to speak up, get distracted students engaged, and help the professor get a handle on student understanding. The trouble is, the clicker itself doesn’t do these things automatically. The professor has to deliberately craft good questions and determine the best times to ask them.

Some faculty members only use clickers as a tool for taking attendance and administering pop quizzes. This is likely to give the technology a punitive connotation in the student’s mind. Imagine that in one class a student is told that their clicker responses are anonymous and they can respond freely to sensitive questions; in the next class they are signing in and being quizzed. My point here is not that attendance-taking is the “wrong” way to use clickers. Rather, it only scratches the surface of the possibilities suggested in Bruff’s book. In the same way, stopping at bullet points only hints at the potential of PowerPoint.

Consider books as a technology. There are many poorly written books, yet no one talks about “death by books.” After we read a book we are free to conclude that particular book was awful — we don’t feel obligated to criticize books as a medium. In contrast, PowerPoint is approaching the status of laughingstock, while clickers are seen as a panacea.

Recommendations

By now, I hope you are getting the message that educational success is more about strategy than technology. So what makes for effective teaching and learning? You probably already know many strategies that work well, but hundreds of books and articles are out there to provide further help. Tom Angelo (1993) offers a “Teacher’s Dozen” of strategies; here are three with potential technology applications:

- **Active learning is better than passive** – use clickers to engage students with meaningful questions. The professor could poll students regarding their views on a controversial topic as a way to introduce a related concept.
- **Learners need feedback** – use the commenting features available in software like Microsoft Word. Students could be paired up and follow a rubric to provide each other peer feedback on the first draft of an essay.
- **Organize information in personally meaningful ways** – use visual as well as textual models. Individual students could use concept-mapping software at the end of a unit to create a representation of their understanding.

The expectation for the wiki pages was that students were to produce high-quality materials from which other undergraduates studying this period could benefit.
NOTE: with any of these strategies, do not assume students can use the technology. Ask colleagues who have used the same tools about the need for training. If necessary, allow time for students to get up to speed.

When cooking, we don’t think of particular spices as inherently effective. They need to be used in appropriate amounts, added at a certain time, and combined with the right ingredients. In the end, the resulting dish will appeal to some and not others. You can also unwittingly make inappropriate choices, like offering spicy food to someone with a sensitive tummy, or serving sweets to a diabetic.

Instead of “PowerPoint is terrible,” let’s send a message to the most abusive presenters: “that was a terrible way to use of PowerPoint.” Instead of “clickers are great,” let’s encourage those who use them well: “I love the way you did that activity with the clickers.” Let’s help our colleagues move away from the all-or-nothing mentality. Use a tool when it’s appropriate, not because you believe you have to use it all the time.

If you are interested in exploring the use of a new tool, don’t expect a quick fix. The technology will not automatically improve your teaching. You have to work at it. Look for examples that employ strategies known to be effective in other situations. Read about ways other people have used the tool. That’s what this collection of essays is all about!

### References and Resources


### Images


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