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Deconstructing classroom technology in practice:
What our web instructional techniques suggest about what faculty want.

by

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ABSTRACT: This presentation deconstructs web-based techniques that the presenters have researched and developed over several years, and demonstrates how each component can be used as a model for specific strategies in the classroom and services and products that faculty can use and apply. A variety of Internet and Web technologies are shown as they apply to the teaching of a statistics course and a fine arts course, both classes using a project-based or constructionist teaching strategy. Our unique coupling of the arts and statistics reveals how the same basic approach can be used in seemingly disparate settings to achieve instructional goals that are supported by many years of pedagogical research. Various technologies are used to stimulate students to create authentic finished work, publish their work on the Web, and develop real-world problem-solving skills. Technologies and teaching strategies used will be discussed and deconstructed to reveal the characteristics of instructional technology services and products that faculty want.

INTRODUCTION

We have been researching, developing, and refining a set of web-based technologies for the teaching of statistics and fine arts courses over the last four years. We offer these courses to our students both on-campus and over the Internet. The particular teaching strategy we employ in both our fine arts and economics courses is project-oriented or constructionist in design.[1] Students like to feel that they are doing something practical, that builds real-world problem solving skills, and that results in a portfolio of authentic finished work. We use Internet and Web technologies to stimulate students to create authentic finished work, publish their work on the Web, and develop research techniques for finding data on the Internet that can be applied to real-world problem solving. Our approach uses these technologies to involve students actively in their own learning and to help prepare our students for the world of work.

Today's session extends our previous work. For CAUSE97, we explored issues of best teaching practice, administrative hurdles, and old-fashioned politics attendant to Internet delivery of instruction (Chizmar and Williams, 1997). For CAUSE95, we examined altering time and place in learning environments using network technologies (Chizmar and Williams, 1995, 1996). Today we will focus on the classroom activities and student projects, and the specific technologies used that rely heavily on the Internet for delivery, collaboration, and communication. Our unique coupling of the arts and economics shows how the same basic approach can be used in seemingly disparate settings to achieve improved instruction, and how this approach can be *deconstructed* to reveal the characteristics of instructional technology services and products that faculty members want and can successfully use in the classroom. We will offer the following "deconstructions" of faculty "wants." We present this list not only on the basis of our own research and practice, but from preliminary results of a recent survey that we conducted on our campus:

1. Faculty want instructional technology that is driven by pedagogical goals. Faculty want to use technology effectively to reach new audiences or to reach traditional audiences in new ways.
2. Faculty desire Web-based tools that are designed for a specific pedagogical task as opposed to a "Swiss-Army knife" Web-tool that is designed for many tasks. Faculty want to be able to turn to technical experts when they need help in developing a Web-based application that would require technical expertise that it beyond what should be expected based on the traditional cost/benefit ratio of faculty time.
3. Faculty desire to interact and compare notes with peers on campus who are involved in instructional technology at a comparable level.
4. Faculty desire technical support and network services that are reliable and fast enough to run sophisticated applications efficiently without frustrating students and faculty.
5. Faculty desire some recognition, both monetary and non-monetary, for developing and using instructional technology in their classrooms.

PEDAGOGICAL ISSUES

While our disciplines are as different as night is to day (dismal scientist meets starving artist), fundamentally many facets of our active learning solutions are similar. We believe this wonderful serendipity is the result of sharing fundamental instructional goals (and too many Chinese lunch buffets). We both strive to:

- provide forums to encourage student-to-student and student-to-faculty contact,
- give frequent evaluations,
- provide prompt feedback,
- challenge students with significant real-life problems,
- provide opportunities for students to publish their work and build an electronic portfolio of work,
- expect frequent, significant authentic products,
- articulate clear criteria for evaluating finished products, and
- provide opportunities for students to revise their work.

We firmly believe that pedagogy drives technology. Table 1 provides an inventory of the various technology applications we employ in our courses, all of them Web and/or Internet based. In the far left column you can see how these techniques map to the applications that we needed in order to achieve the learning goals above.

This table further illustrates that we not only use a rich array of technology tools to meet these goals, we also use a variety of teaching strategies as well. We carefully choose technology that enables us to *present* multimedia-rich information to our students and to create any-time/any-place student-to-student and student-to-faculty *interactions*. Most importantly, we choose technology to provide flexible *guides* for students to explore and create multimedia rich environments to enhance learning. We will refer back to the tools, strategies, and concepts in this table throughout our discussion.

STATISTICS AND ECONOMETRICS COURSES

Chizmar teaches undergraduate statistics and econometrics courses. The statistics course is designed to emulate the premise of an unconventional, NSF-funded statistics course called "Chance" (Snell and Finn, 1992). It enables students to learn statistical reasoning by studying important current economic controversies whose understanding requires a fundamental knowledge of statistical reasoning. Figure 1 shows a screen-shot of the statistics course homepage.

The statistics course employs a collaborative classroom/laboratory approach as its active learning pedagogy. The expository material is broken into a series of "labs"; each lab has its own Web-page linked to the on-line syllabus. The labs guide students to discover important statistical concepts on their own and challenge students to demonstrate their understanding of statistical issues by posting explanations and interpretations in NetForum and by completing a series of Mallard mastery homework quizzes.

NetForum is a web-based threaded discussion that is used in the statistic course to encourage student-to-student and student-to-faculty contact. Mallard is an ingenious Web-based system for asynchronous, interactive learning. Mallard is used in the statistics course to enable a mastery homework system. Homework exercises are created in Mallard using a combination of HTML tags and syntax idiosyncratic to Mallard. Mallard can not only immediately assess the correctness of a response to an online exercise, but it can also be programmed to help a student determine why an answer is incorrect. Since exercises are submitted and graded online, the system corrects, and even records grades. Furthermore, the system provides the instructor with detailed student grade information, e.g., the number of times a student retakes a homework assignment.

Mallard can be programmed to randomly generate and select questions. As a result, students can complete a different set of questions over the same concepts each time that they choose to retake the same homework assignment. Mallard also includes a gradebook module that gives course instructors complete control over grading policies, including late penalties and the number of times a Mallard exercise can be taken for credit. The combined features of Mallard can be used to create a mastery homework system. Figure 2 shows a screen-shot of a representative Mallard home-work quiz.

The econometrics course is designed for students to learn how to conduct econometric research by replicating published research. Based on the premise that students like to see their names in print, Chizmar uses Web technologies and the lure of publishing on the Web to stimulate students to create authentic finished work. From a list of several published articles that use data from the National Longitudinal Survey of Youth (NLSY)[2], students choose an article to replicate. Following a set of Web instruction pages, the student's first task is to extract (using the NLSY CD-ROM) a data file that replicates as closely as possible the data used in the chosen article and to import the data into the statistical software program, MiniTab.

Over the course of the semester, students write four drafts of their paper. Each draft is accompanied by its own rubric. Each rubric states, in advance, the explicit econometric issues that a student must address to earn the grade he/she desires. Figure 3 shows a screen-shot of a rubric for Economics 238.

The students publish their papers on the Web using a student-papers-publishing system created using Tango software to access the database. Students post their paper to the Web by completing a Web-form. The form automatically creates a link to the student's paper on the Student Paper page. In addition, a second link is created that invites anyone to "Click here to Post a Review" of a paper. This link brings up the appropriate rubric for the student's paper. Because the rubric is on the Web, anyone can use it to post a review. However, as a way to communicate high expectations, Chizmar requires his students to post a review of the third draft of a classmate's paper. Various on-line resources for the statistics and econometrics courses can be viewed on the Web at the following sites:[3]

- Course Home Page http://www.econ.ilstu.edu/Jack_Chizmar/ECO138/ECO138_Home.html
- A Representative Tutorial http://www.econ.ilstu.edu/Jack_Chizmar/Chizzie/scatterplot/Tut8_plot_win.html
- A Representative Lab http://www.econ.ilstu.edu/Jack_Chizmar/Int_Tech/Lab6a/Lab6a_win.html
- Mallard Mastery Homework Quizzes https://mallard.ilstu.edu/eco131/
- Student Paper Publishing System http://coyote.its.ilstu.edu/tango/chizmar/list.qry

Fine Arts Multimedia Courses

Williams teaches a two-semester course, Software Design in the Arts I and II. The course focuses on the development and design of multimedia and web applications for fine arts student. It is offered both on-campus and on-line over the Internet. Figure 4 shows a screen-shot of the class homepage for Music, Art, and Theatre 350.

The course is designed to be project oriented. Along with each project to be completed, students must also master a multimedia literacy quiz and a hands-on skills exam with items appropriate to any given project. Class times are spent with lecture/demonstration on techniques needed to complete the projects or on supervised work and question-and-answer time with students. At the end of each project, students present their work to the class (including the on-line students) followed by an open class critique of the project.

The on-line students are connected over the Internet and contemporaneously participate with the instructor and on-campus students attending class in a computer teaching lab. The lab is customized for distance learning with:

- remote controlled cameras for broadcasting views of students, the instructor, or the white boards;
- a choice of broadcasting the computer, document camera, VCR, or slide video;
- wireless microphones for the instructors and button-activated microphones at each student workstation;
- and video monitors to view the video signal being sent to the RealVideo server for broadcast.

All of these features are controlled from a touch-pad display panel on the teaching station.

On-line course materials. The course materials and the delivery method for the two-semester course are designed so that both the on-campus as well as the on-line students participates in the same class and class activities. A course web site (See Figure 4) serves as the focal point for all class activities and resources: syllabus, grading and evaluation, guidesheets and visuals for all projects, software and project templates available for downloading, links to on-line resources available elsewhere over the web, and the like. The course uses a special sets of on-line guides and tutorials designed by the instructor. The materials guide the student through the design of multimedia projects (PowerPoint, Authorware, Director, and Web pages) using a variety of models from art, music, and theatre activities from which they can construct their own productions that have direct application to professional experiences. The guides provide templates, demonstration models, links to resources and software tools, and a list of clearly prescribed skills and concepts to be mastered. Parallel to each guide are a set of web-based, hands-on activities related to specific software and digital arts skills required to successful complete the project. Students must demonstrate mastery on prescribed hands-on skills for each unit.

Two features of the Mallard web-based software package are used, similar to Chizmar's statistics classes. First, the quiz generation software is used to create practice and final versions of multimedia literacy quizzes, one for each unit of the course. These test are objective in nature but take advantage of the complex variety of test items which Mallard offers that are beyond fill-in-the-blank and multiple-choice designs. Fairly complex matching, lists, multiple-item selection, and multiple-part item construction with graphic and audio examples are used. The quizzes are immediately graded with feedback when the student submits the exam. Students are permitted practice sessions before the final exam versions, the one on which they are graded. Second, Mallard's online gradebook permits personal, password access for students to monitor their progress over the course of the semester. All activities can be entered into the gradebook, not just Mallard quizzes.

For student-to-student and instructor-to-student interaction, NetForum provides a threaded and archived discussion group on the class web site with electronic dialogue possible on any topics that the instructor or the students propose. NetForum also provides a handy group-email feature that makes it easy to send email to any set of class members.

Interaction and delivery with on-line students. Each class session is broadcast to the on-line students over the Internet using RealVideo. The broadcasts are then archived to the class web page after each session. The archives give students the option of either reviewing portions of the class from the recording, or, for students who could not attend class during the scheduled time, the opportunity to audition the complete class session at a later time. Figure 5 shows a screen-shot of the Web archive of RealVideo lectures for the fine arts course.

All key class material is placed on the course web site, and the instructor makes every attempt to keep the web materials, visuals, and the software used in class synchronized aurally during the Internet broadcast. In a sense, the on-line students become virtual students at their home site, following along with the class activities on campus. The instructor's role is akin to a play-by-play announcer for a baseball game, verbally describing activities to keep the on-line students involved in the class. The system works very well and on-line and on-campus students soon begin to respond to each other and even inquire when someone was absent.

AOL Messenger (AIM) provides the means for the on-line students to communicate with the classroom and the instructor. When the on-line students submit a comment or question over AIM, the instructor then reads the email and responds aloud to the class with simultaneous broadcast over the Internet. We are currently experimenting with using NetMeeting and ICQ to provide video and audio communication between the on-line students and the classroom in place of AIM's text-chat only format. Portions of the web site, including the RealVideo lectures and special guides and tutorials, are password protected for access to registered students only. Below are a few selected web links that illustrate various features of the courses:[4]

- Software Design in the Arts I Home Page http://www.arts.ilstu.edu/classes/softdesign
- Software Design in the Arts II Home Page http://www.arts.ilstu.edu/classes/inet
- RealVideo Lectures http://www.arts.ilstu.edu/classes/inet/RA/realaudio.html
- NetForum Threaded Discussions http://www.orat.ilstu.edu/cgi-bin/netforum/i_modelssem/a/1
- Web Etudes on Musical Themes http://www.orat.ilstu.edu/classes/inet/etudes.html
- Prescreening form for Internet and web technology prior to registering for the course http://www.orat.ilstu.edu/classes/inet/documents/onlineinfo2.html
- Online student evaluation form: http://www.orat.ilstu.edu/classes/inet/documents/classeval.html

WHAT DO FACULTY WANT?

We believe that our joint approach to using instructional technology can be *deconstructed* to reveal the essential characteristics of informational technology products and services wanted by faculty. Table 1 provides a ready guide to the key technologies, teaching strategies, and applications we have successfully put into practice. While we readily admit to being card-carrying "early adopters," we nonetheless believe that our work can be fruitfully deconstructed to yield a set of needs that is representative of all faculty, even "wary adopters." The stages of development that we have experienced as we struggled to improve our instructional technology are the same stages that a devoted novice instructional technologist will eventually pass through, perhaps kicking and screaming all the while. Of course, this assertion is testable, so we decided to survey Illinois State faculty to obtain a snapshot of faculty attitudes and needs regarding the use of instructional technology in their teaching and classroom activities.[5] Our plan, in the remainder of this paper, is to confront each of our assertions or "deconstructions" concerning "what faculty want" with a combination of anecdotal data from our classroom experience and survey data from our campus faculty at large.

Deconstruction 1. Our approach is driven by pedagogical goals. Which leads to the foremost "want" of faculty:

Faculty want instructional technology that is driven by pedagogical goals.

In a previous presentation, we emphasized the importance of choosing a technology that will support a desired pedagogical strategy, not the other way around. (Chizmar and Williams 1997, 3) We emphasize again our belief that technology must not be dominant and must not be used for its own sake. As long ago as 1972, the Carnegie Commission on Higher Education (The Fourth Revolution) created the litmus test for best use of instructional technology:

- the teaching-learning task to be performed [is] essential to the course to which it is applied, and
- the task could not be performed as well—if at all—for the students without the technology.

We believe our choices of instructional technology pass this test. Our choice of Mallard, for example, is driven by the pedagogical goals of giving frequent evaluations and providing prompt feedback (Light, 1990, 31). Our choice of NetForum is driven by the goals of creating interaction between students so they help each other find solutions to problems and at the same time build a sense of a cooperative learning community that exists beyond three 50-minute class periods.

Chizmar's choice of a Tango-based, student-paper publishing system, is driven by the goal of giving students a chance to revise and improve their work over time (Light, 1990, 9) and motivating students to create authentic finished work. William's choice of web-based tutorials to guide and encourage students in building their own multimedia productions is driven by the twin goals of creating learning environments that are rich in resources and media to contemporary information, and allowing the opportunity for creating real-world, finished products that are directly applicable to future professional needs as multimedia artists.

A corollary to Deconstruction 1 is that**:**

Faculty want to use technology to reach new student audiences or to reach traditional student audiences in new ways.

At a time when many are questioning the efficacy of using the Web and Internet delivery of instruction—considering it a demotion of academic standards and classroom practice—we must not loose sight of the ways in which technology can open new windows of opportunity, allowing us to reach new populations and teach in new and more effective ways. We concede that a student from North Dakota who is taking one of our classes is not having the same experience as the student sitting in a classroom in Normal, Illinois. However, the important consideration is that this student, through the use of the Internet, is able to fully participate from a remote location when the only other option is not having access to a unique learning opportunity and a unique community of students.

We had one key statement on our survey related to Deconstruction 1—"for instructional technology to be effective, it must first be driven by pedagogical goals." A vast majority (88 percent) of the responding faculty either "somewhat" agreed (17 percent) or "strongly" agreed (71 percent) with this statement. (See Statement 1 of Table 2.) Interestingly, faculty who classify themselves as "advanced" or "intermediate" users of instructional technology are much more likely to agree with this statement than faculty who classify themselves as "beginners." We can understand this result, however, since a novice user is more likely to be both overwhelmed and enchanted by the technology, allowing it to dominate what normally would be common-sense pedagogical decisions.

Deconstruction 2. Our approach uses off-the-shelf or personally developed software capabilities that are designed to meet specific pedagogical tasks. Which leads to:

Faculty desire Web-based tools that are designed for a specific pedagogical task as opposed to a "Swiss-Army knife" Web-tool that is designed for many tasks.

We agree with Donovan and Macklin's (1998, 11) assertion that faculty want to "accomplish specific tasks using technologies and want to be able to easily repeat these tasks in subsequent academic quarters."[6] Our choice of Mallard was based on our need for two particular features of Mallard, not the complete package: its powerful quiz generation and management feature and its online, personal gradebook. Mallard provided within its package a tool that we could use to write sophisticated, multiple-part questions at higher-order cognitive levels and publish them for our students on the Web (a feature that led to our selecting Mallard over WebCT, for example). At the same time, we did not want to be burdened by features within the chosen Web-tool that we knew we would not use because we had already found an alternative (usually better) way to accomplish a given pedagogical task, e.g., generating Web-based threaded discussion and feedback through NetForum.

Chizmar's decision to create a student paper-publishing application was based on his need for a tool whose sole purpose was to publish student papers on the Web and to tie each paper to the appropriate instructor-generated rubric and to student-generated reviews. William's choice of using RealVideo was driven by the need for a cost-effective solution to broadcasting reasonable quality video to on-line students who would be receiving the materials over modem from a computer workstation at home. Likewise, the choice of the AIM software provided Williams with a free and widely accessible chat software that any potential student could have access to and that worked unobtrusively in the background of the instructor's and on-line student's workstation.

A corollary to Deconstruction 2 is that:

Faculty want to be able to turn to technical experts when they need help in developing a Web-based application that would require technical expertise that it beyond what should be expected based on the traditional cost/benefit ratio of faculty time.

Chizmar's decision to turn to the University's instructional technology unit for help in developing the Student Paper Publishing System was based on the knowledge that his time would be better spent on more traditional teaching and research activity than in developing Tango programming skills. The Paper Publishing System is a prime example of the kind of special software modules that can be developed for faculty to meet a specific pedagogical goal. Following the University of Washington's lead, Illinois State University's instructional technology strategic plan recently envisioned the creation of a whole series of modules that faculty could choose from to add functionality to their teaching site by simply selecting from a menu of instructional modules on a Web-form.

We had several statements on our survey related to Deconstruction 2. An overwhelming majority of respondents (83 percent) either "somewhat" agreed (38 percent) or "strongly" agreed (45 percent) with the statement, "When I seek technical help it is when I want to know how to accomplish a specific task using technology." This sentiment is shared evenly by beginning, intermediate and advanced users alike. (See Statement 2 of Table 2.) Slightly more than half (52 percent) of the respondents either "somewhat" agreed (26 percent) or "strongly" agreed (27 percent) with the statement, "I prefer to pick the one application I need to solve a specific pedagogical problem rather than having to adopt a 'Swiss-army-knife' Web tool that does everything." (See Statement 3 of Table 2.) Again, advanced users are much more likely to agree with this statement. Not surprisingly, 45 percent of beginning users had "no opinion" about this statement, with the rest evenly distributed among the remaining foils. Conversely, only 33 percent of respondents either "somewhat" agreed (19 percent) or "strongly" agreed (14 percent) with the statement, "I want one 'Web tool' that does everything (e.g., mail, chat, web pages, grades, etc.)." (See Statement 4 of Table 2.) This time, advanced users are much more likely to "strongly disagree" with this statement, with beginners having no opinion. While these statistics support Deconstruction 2, our hypothesis as to why faculty would shun *"Swiss-Army knife"* Web-tool proved incorrect. Borrowing from Donovan and Macklin (1998, 12), we included the following statement on our survey, "Most 'Web-tools' (e.g., Mallard and WebCT) simplify the task of creating online instructional materials by making assumptions about the structure and shape of courses and teaching that reduce my flexibility." Only 18 percent of faculty either "somewhat" agreed (13 percent) or "strongly" agreed (5 percent) with the statement. (See Statement 5 of Table 2.) Again, the opinion of advanced users differs markedly from intermediate and beginning users. We believe that the large number of users having no opinion results from so few respondents (only 15 percent) actually having used these applications.[7]

Deconstruction 3. Our approach is fraught with frequent technology and pedagogical problems that compel us to put our heads together and compare notes on what works and how to make it work. Which leads to:

Faculty desire to interact and compare notes with peers on campus who are involved in instructional technology at a comparable level.

Development of the Mallard gradebooks and quizzes is a good of example of where we assisted each other in problem solving the complexities of this system and shared various test item solutions. Similarly, Williams' expertise with more complex programming knowledge and multimedia techniques were traded with Chizmar's statistical, survey knowledge, and cooperative learning techniques such as the one-minute paper strategy.

Williams was involved with a campus faculty group that developed a proposal for a Faculty Technology Cooperative where faculty could come together to share experiences and barter and trade expertise with the goal of working together to improve the use of instructional technology on campus. The initiative has languished for several years for lack of central support. A recent campus strategic planning initiative recognized the value in this proposal and has brought the proposal back on the table for consideration by campus administration.

Two statements on our survey are related to Deconstruction 3. An overwhelming majority (72 percent) of the respondents either "strongly" disagreed (41 percent) or "somewhat" disagreed (31 percent) with the statement, "demonstrations of the success and failure of other faculty technology projects is a waste of time." (See Statement 6 of Table 2.) This time, beginning users were more likely to disagree with this statement than advanced user. When asked whether they "would like more faculty showcases in instructional technology that demonstrates real-world applications in the classroom," 63 percent of respondents either "somewhat" agreed (34 percent) or "strongly" agreed (29 percent) with the statement. (See Statement 7 of Table 2.) Advanced users responded bi-modally. While

67 percent of advanced users either “somewhat” agreed (28 percent) or “strongly” agreed (39 percent) with the statement, it is also true that 22 percent of advance users “strongly” disagreed.

Deconstruction 4. The comprehensive nature of our approach requires fast and reliable technical support and network services. Which leads to:

Faculty desire technical support and network services that are reliable and fast enough to run sophisticated applications efficiently without frustrating students and faculty.

Nothing frustrates students, especially technophobes, more than instructional technology that does not work. When a server is down, email is not accessible, or the help desk provides an inappropriate answer, they blame the faculty member who required them to use the software or Internet service, not the server or help desk administrators whose job is to keep it running. Nothing frustrates faculty more than to prepare to give a Mallard quiz, for example, and discover that the server is down, or that the server performance has crawled to a snail’s pace because several others classes are using the server for an examination at the same time.

When catastrophes such as these occur, trust is lost between student and instructor, and confidence in instructional technology declines. Faculty desire a network and technical infrastructure that never calls attention to itself, one that does not create barriers to entry for wary faculty and students because it is too complex. The infrastructure should be transparent, much as the utility infrastructure that powers our lights and our computers – throw the switch and it works!

Two statements on our survey are related to Deconstruction 4. A majority (58 percent) of the faculty either “somewhat” agreed (34 percent) or “strongly” agreed (24 percent) with the statement, “I would use more instructional technology in my classes if I felt that there was sufficient support on campus to help me with the implementation.” (See Statement 8 of Table 2.) Beginning users were more likely to agree with this statement than advanced user. Once again, advanced users responded bi-modally with 28 percent “strongly” disagreeing and 49 percent either “somewhat” or “strongly” agreeing with the statement. A larger majority of respondents (64 percent) either “somewhat” agreed (38 percent) or “strongly” agreed (26 percent) with the statement, “The difficulties of knowing where and from whom to seek help on campus create a barrier to the adoption of instructional technology.” (See Statement 9 of Table 2.) Beginning users (76 percent) are more likely to hold this opinion then intermediate users (61 percent) and advanced users (61 percent.) The bi-modal response on this set of survey items can easily be explained by the very different needs of faculty who are novices with this type of technology, and those who are more advanced. The novices are in great need of lots of support, models to emulate, and are not sure where to turn for help.

Deconstruction 5. Our efforts at developing innovative instructional technology over several years have consumed enormous amounts of time and effort on our part. The few rewards we have received have been greatly valued whether they be intrinsic or extrinsic. Which leads to:

Faculty desire recognition, both monetary and non-monetary, for developing and using instructional technology in their classrooms.

We have both received a number of Internet teaching grants from our campus that provided some funding to compensate for the extra development time and for software purchases. However, we discovered early on that one can easily underestimate the time it takes to transfer teaching materials and techniques to new technology delivery systems. In addition, the present faculty evaluation system gives little recognition for instructional innovation when decisions of promotion and salary are considered. While we have received support, the rewards we received are not proportionate to the final products we produced.

As pioneers of Internet teaching on our campus, we were left to support ourselves as we struggled with issues of content, pedagogy, and delivery. Such is the fate of early adopters. We believe that late adopters will not be as imprudent. They will require monetary and non-monetary rewards in order to consider adopting instructional technology. In an earlier CAUSE presentation (Chizmar and Williams, 1997, 10), we stated, “The risk of not having such a reward system in place, is few faculty willing to commit the time needed to offer … courses [that incorporate instructional technology.]” This is especially true when one considers the movement on many campuses for faculty to instantly adopt their courses to Internet delivery, a process that requires facing the technology challenges of many of the techniques we have implemented over a period of four to five years.

Several statements on our survey relate to Deconstruction 5. A majority (58 percent) of the faculty either "somewhat" agreed (34 percent) or "strongly" agreed (24 percent) with the statement, "The greatest impediment to my seeking training in instructional technology is the lack of release time." (See Statement 10 of Table 2.) Likewise, a majority of respondents (57 percent) either "somewhat" agreed (33 percent) or "strongly" agreed (24 percent) with the statement, "Some tangible rewards and incentives for spending time developing classroom technology would do more to motivate me than more training." (See Statement 11 of Table 2.) About the same majority of respondents (54 percent) either "somewhat" agreed (37 percent) or "strongly" agreed (17 percent) with the statement, "The lack of campus grant funds to support the development of instructional technology is a major deterrent to its adoption." (See Statement 12 of Table 2.) Advanced users were more likely to agree (62 percent.) A priori, we surmised that most respondents would agree with statements 11 and 12. Consequently, we are surprised both by the smallness of the agreeing groups in Statements 11 and 12 and the largeness of the dissenter group in Statement 11. Perhaps the real impediment to developing instructional technology is revealed in Statement 13 of Table 2, which shows that 84 percent of faculty "somewhat" agree or "strongly" agree with the statement, "the lack of time is the most critical barrier to my experimenting with technology." Faculty, like everyone else in the information age, simply have too much to do.

CONCLUSIONS AND REFLECTIONS

In conclusion, we offer five recommendations tied to each of our technology *deconstructions*.

Solution 1. Universities should create and provide a "shopping mall" of Web-based instructional technology modules, each driven by and tied to a specific pedagogical strategy. More specifically, modules addressing the strategies listed in Table 1—presenting, interacting, guiding, and exploring—should be created so that faculty members have a diverse smorgasbord of options to fit both student and instructor needs, and can configure each module to their class Web site by simply completing a on-line form. Related to the corollary to *Deconstruction 1*, campuses should provide the technology needed for Internet delivery of courses to a world-wide audience, not as an end in itself, but as a way to deliver unique course offerings that are congruent with the mission of the university and suited to Web-based delivery. Look for those unique opportunities and talents on your campus that can be delivered to a new audience using Web-based technologies.

Solution 2. Instructional technology units should invest their efforts in discrete solutions that are mapped to instructional needs and strategies, similar to those illustrated in Table 1. Swiss-Army-knife solutions like WebCT and Mallard are useful to faculty, not as comprehensive packages, but for their separate parts. Indeed, in lieu of a specific solution, faculty members choose the Web-tool that accomplishes the specific task at hand the best with the least investment in their time. If it meets an instructional technology need, faculty will use anything they can get their hands on, even if it is a Swiss-Army knife. (Every kid knows how hard it is to open some of the blades in a Swiss-Army knife. Neither of us ever succeeded in using the fork because it was too hard to open!)

Solution 3. In ways that respect the value of faculty time, campuses need to create venues for faculty to come together to share experiences, development efforts, etc. The Faculty Coop idea mentioned earlier could serve as a model to promote the bartering and sharing of faculty expertise for both content and technology.

Solution 4. Administrators who are charged with providing instructional technology leadership must always guard against allowing technology to become dominant. To ensure that technology works flawlessly, it is sometimes better to pass on the latest change or upgrade. To ensure that a technology change doesn't disrupt instruction, it is sometimes better to wait on a software upgrade or change until instructors can make the necessary adjustments to their instructional materials. Further, when technology administrators decide to adopt a new technology, they should over, not under estimate its capacity. If they decide that current budgets can not support a generous level of capacity, then they should wait until the necessary funds become available or consider outsourcing.

Solution 5. More than any time in the past, faculty need to be rewarded for their instructional development efforts through release time, monetary awards, software and hardware support, and credit in the salary, promotion, and tenure process. Just as corporate America needs research and development funding to improve productivity and profitability, so must academic America invest in instructional technology to improve productivity and credibility.

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Endnotes

1. “Constructionist” comes from the Russian “Con Truct Ivist,” which means performing a con job on a Russian truck driver. On a more serious note, a “constructionist” approach is one in which classes are project oriented where students learn by building or constructing things.

2. Chizmar chose published articles that use data from the NLSY for two reasons. First, the NLSY data is inherently interesting to students because it concerns the problems and issues facing young people as they move into the world of work. Second, many of the research papers that use data from the NLSY use a human capital framework, which, because it is not overly mathematical, is accessible to undergraduate students.

3. All of the links to course web sites shown in this paper are "living documents" and are constantly undergoing change as we develop them for our courses.

4. If you encounter a password protected area on Williams’s web sites, send an email to dwilliam@ilstu.edu and request a temporary password for access.

5. We conducted the survey using a Web form. We asked faculty to complete the form by sending an email to four different listservs on our campus. Effectively, this approach means that we reached faculty with enough interest in and experience with instructional technology to request membership is a listserv, precisely the group we were shooting for. We received 105 responses, a response rate we believe approaches 40 percent of the relevant faculty group. For the complete results of the survey, see Chizmar and Williams, 1999.

6. We also agree with Donovan and Macklin’s (1998, 8) assertion that “the Web itself, not any one piece of software, [is] the ‘killer app’.” Donovan and Macklin offer six reasons in support of their assertion. We add that because Swiss–Army knife Web-tools are designed to accomplish many pedagogical tasks, they must make assumptions about the teaching-learning process, assumptions that many faculty members will oppose.

7. In fact, 63 percent of respondents who have used these applications either “somewhat” agreed (13 percent) or “strongly” agreed (50 percent) with the statement, “I prefer to pick the one application I need to solve a specific pedagogical problem rather than having to adopt a ‘Swiss-army-knife’ Web tool that does everything.”

Figure 1. Class homepage for Economics 138

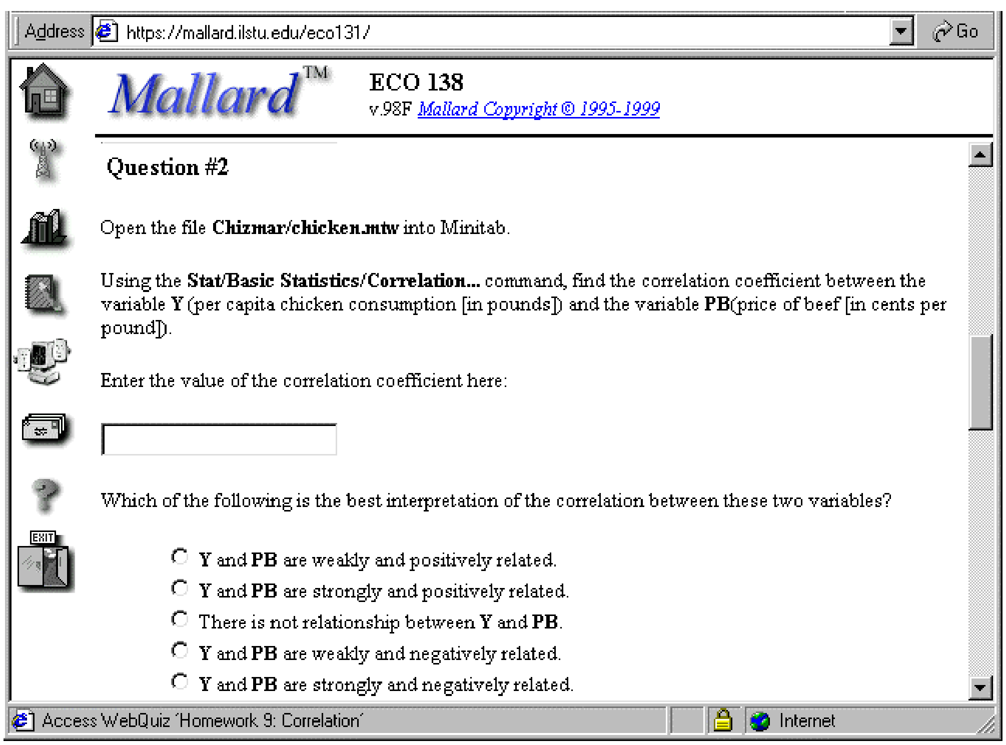

Figure 2: Mallard Quiz for Economics 138

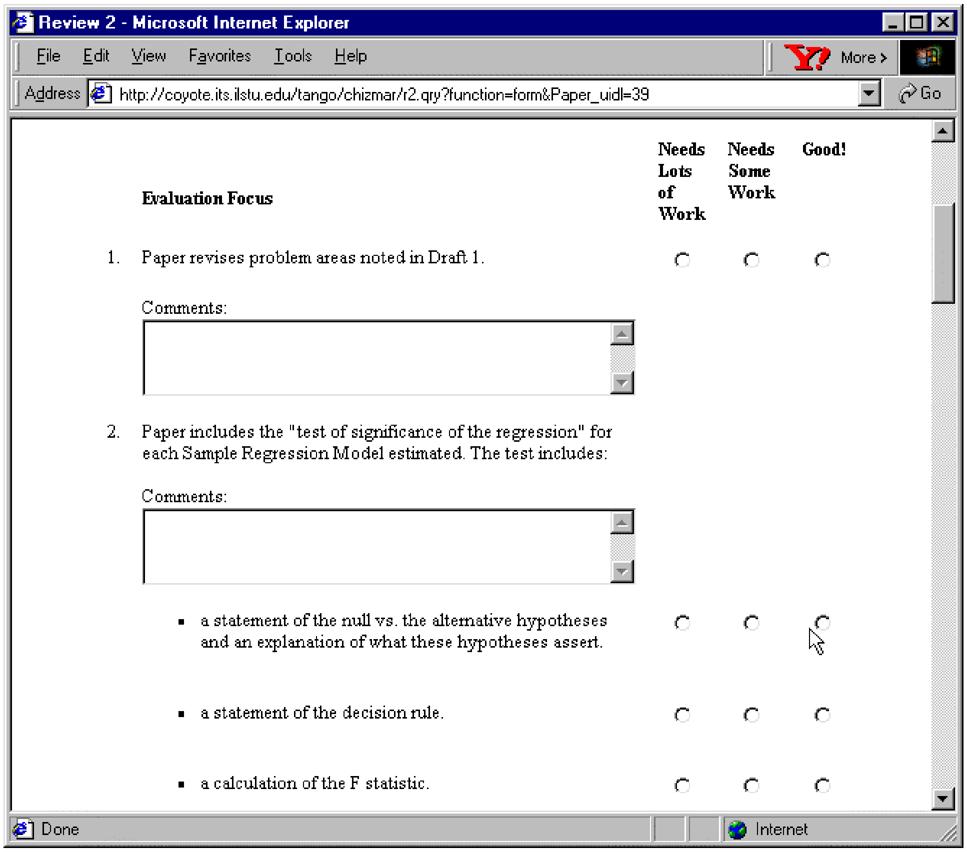

Figure 3. Rubric for Economics 238

Figure 4. Class homepage for Music, Art, and Theatre 350, Software Design in the Arts I

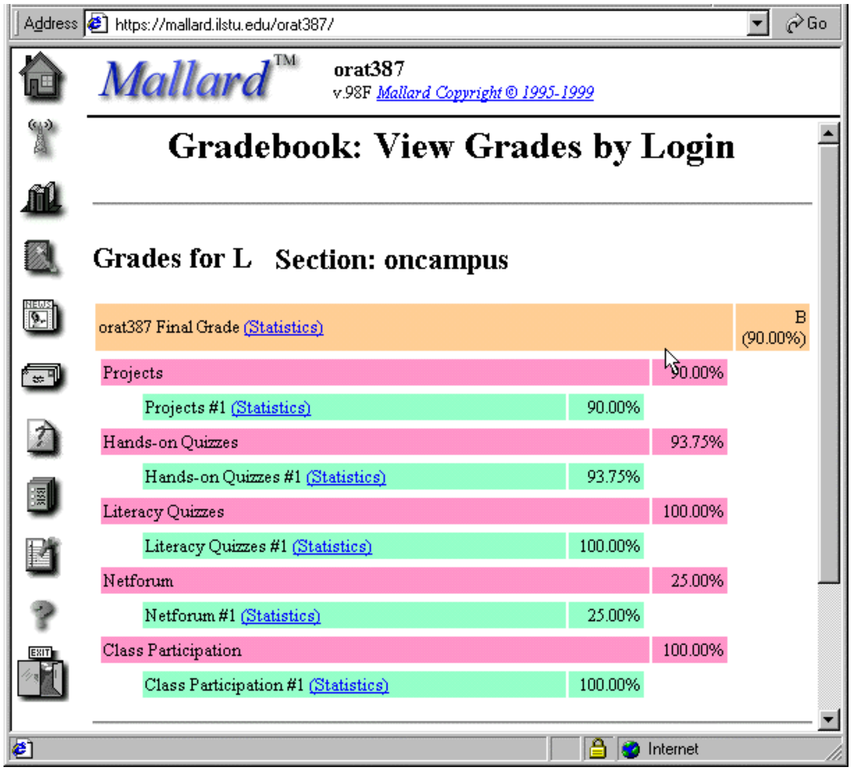

Figure 5. Mallard grade report for a student in Software Design in the Arts

Figure 6. The Web archive of RealAudio lectures for the fine arts course.

Table 1
Inventory of Instructional Technology Techniques

Technology Tool	*Course*	*Strategy*	*Application*
Web documents	EC/FA	Present	Distribution of class documents
RealAudio/Video	FA	Present	Archived & live online delivery of instruction
Mallard Gradebook	EC/FA	Present	Online access to personal evaluation and immediate feedback on progress
Forms (CGIMail)	EC/FA	Interact	Online, format student responses and quick surveys, One-Minute Paper
Email critiques	EC/FA	Interact	Electronic quality exchanges of information between instructor and student
Listservs & NetForum	EC/FA	Interact	Archived interaction & discussion (bullet board style)
AIM & Chat	FA	Interact	Real-time conversations
Mallard Quizzes	EC/FA	Interact	Practice exams, online exams with automatic feedback
Web-based guides, tutorials, and labs	EC/FA	Guide & Explore	Rich sets of learning resources create by the instructor for the students, or generated by the students themselves
Interactive database (Tango)	EC	Guide & Explore	Online, interactive publications of student research

Note: EC = Economics; FA = Fine Arts

Table 2
Survey of Faculty Needs and Attitudes for Instructional Technology

Statement 1: For instructional technology to be effective, it must first be driven by pedagogical needs and goals.

	1	2	3	4	5	All
beginner	3.45	3.45	6.90	20.69	65.52	100.00
intermediate	5.17	--	6.90	15.52	72.41	100.00
advanced	5.56	--	5.56	16.67	72.22	100.00
All	4.76	0.95	6.67	17.14	70.48	100.00

Statement 2: When I seek technical help it is when I want to know how to accomplish a specific task using technology.

	1	2	3	4	5	All
beginner	3.45	--	10.34	44.83	41.38	100.00
intermediate	3.45	8.62	8.62	39.66	39.66	100.00
advanced	5.56	--	5.56	22.22	66.67	100.00
All	3.81	4.76	8.57	38.10	44.76	100.00

Statement 3: I prefer to pick the one application I need to solve a specific pedagogical problem rather than having to adopt a "Swiss-army-knife" Web tool that does everything.

	1	2	3	4	5	All
beginner	13.79	6.90	44.83	17.24	17.24	100.00
intermediate	10.34	18.97	15.52	29.31	25.86	100.00
advanced	11.11	11.11	5.56	27.78	44.44	100.00
All	11.43	14.29	21.90	25.71	26.67	100.00

Statement 4: I want one "Web tool" that does everything for (e.g., mail, chat, web pages, grades, etc.).

	1	2	3	4	5	All
beginner	6.90	17.24	37.93	24.14	13.79	100.00
intermediate	24.14	20.69	24.14	17.24	13.79	100.00
advanced	38.89	16.67	11.11	16.67	16.67	100.00
All	21.90	19.05	25.71	19.05	14.29	100.00

Statement 5: Most "Web-tools" (e.g., Mallard and WebCT) simplify the task of creating online instructional materials by making assumptions about the structure and shape of courses and teaching that reduce my flexibility.

	1	2	3	4	5	All
beginner	10.34	13.79	68.97	3.45	3.45	100.00
intermediate	8.62	15.52	55.17	15.52	5.17	100.00
advanced	22.22	16.67	33.33	22.22	5.56	100.00
All	11.43	15.24	55.24	13.33	4.76	100.00

Statement 6: Demonstrations of the success and failure of other faculty technology projects is a waste of time.

	1	2	3	4	5	All
beginner	41.38	37.93	10.34	6.90	3.45	100.00

intermediate	36.21	32.76	18.97	6.90	5.17	100.00
advanced	55.56	11.11	16.67	5.56	11.11	100.00
All	40.95	30.48	16.19	6.67	5.71	100.00

Statement 7: I would like more faculty showcases of instructional technology that demonstrate real-world applications in the classroom.

	1	2	3	4	5	All
beginner	3.45	10.34	27.59	37.93	20.69	100.00
intermediate	8.62	10.34	17.24	34.48	29.31	100.00
advanced	22.22	--	11.11	27.78	38.89	100.00
All	9.52	8.57	19.05	34.29	28.57	100.00

Statement 8: I would use more instructional technology in my classes if I felt that there was sufficient support on campus to help me with the implementation.

	1	2	3	4	5	All
beginner	6.90	10.34	17.24	37.93	27.59	100.00
Intermediate	13.79	13.79	15.52	34.48	22.41	100.00
advanced	27.78	16.67	5.56	27.78	22.22	100.00
All	14.29	13.33	14.29	34.29	23.81	100.00

Statement 9: The difficulties of knowing where and from whom to seek help on campus create a barrier to the adoption of instructional technology.

	1	2	3	4	5	All
beginner	3.45	6.90	13.79	44.83	31.03	100.00
intermediate	8.62	20.69	12.07	37.93	20.69	100.00
advanced	11.11	16.67	11.11	27.78	33.33	100.00
All	7.62	16.19	12.38	38.10	25.71	100.00

Statement 10: The greatest impediment to my seeking training in instructional technology is the lack of release time.

	1	2	3	4	5	All
beginner	17.24	6.90	13.79	24.14	37.93	100.00
intermediate	12.07	17.24	13.79	39.66	17.24	100.00
advanced	16.67	--	27.78	33.33	22.22	100.00
All	14.29	11.43	16.19	34.29	23.81	100.00

Statement 11: Some tangible rewards and incentives for spending time developing classroom technology would do more to motivate me than more training.

	1	2	3	4	5	All
beginner	20.69	10.34	17.24	31.03	20.69	100.00
intermediate	6.90	13.79	18.97	37.93	22.41	100.00
advanced	22.22	16.67	5.56	22.22	33.33	100.00
All	13.33	13.33	16.19	33.33	23.81	100.00

Statement 12: The lack of campus grant funds to support the development of instructional technology is a major deterrent to its adoption.

	1	2	3	4	5	All
beginner	--	10.34	31.03	44.83	13.79	100.00
intermediate	10.34	15.52	25.86	31.03	17.24	100.00
advanced	5.56	5.56	22.22	44.44	22.22	100.00
All	6.67	12.38	26.67	37.14	17.14	100.00

Statement 13: The lack of time is the most critical barrier to my experimenting with technology.

	1	2	3	4	5	All
beginner	3.45	13.79	--	6.90	75.86	100.00
intermediate	5.17	1.72	5.17	41.38	46.55	100.00
advanced	11.11	--	11.11	33.33	44.44	100.00
All	5.71	4.76	4.76	30.48	54.29	100.00