You Can Produce a Video Tutorial in Under an Hour—Even Your First!

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Introduction

I had been searching for software which would allow me to create CD-based learning modules without the heavy learning curve often associated with such productions. The creation and distribution of a multimedia product via the web or on a CD can seem daunting to the inexperienced user. It is often assumed that the developer must have weeks/months of training and experience. It is also often assumed that you must utilize expensive and complicated software to produce and distribute such a product. It might never occur to you that a faculty member with very little technical experience might single-handedly tackle such a project. After finding and using the software we will discuss today for a few weeks, I offered a brown-bag workshop to other media-production-wannabees on my campus. After a very short "show-and-tell" similar to what you'll see today, they were ready to set off on their own and start developing materials.

This paper and related session will introduce users to Camtasia™, a piece of software that is:

- Inexpensive
- Easy for a non-computer-faculty to learn its "basics"
- Useful to those wishing to produce multimedia learning modules
- Capable of more advanced features once the user is more experienced
- Flexible in that ALL SORTS of "presentations" can be produced including "PR" materials, web-tour productions, lab-based-recordings, software demonstrations, etc.

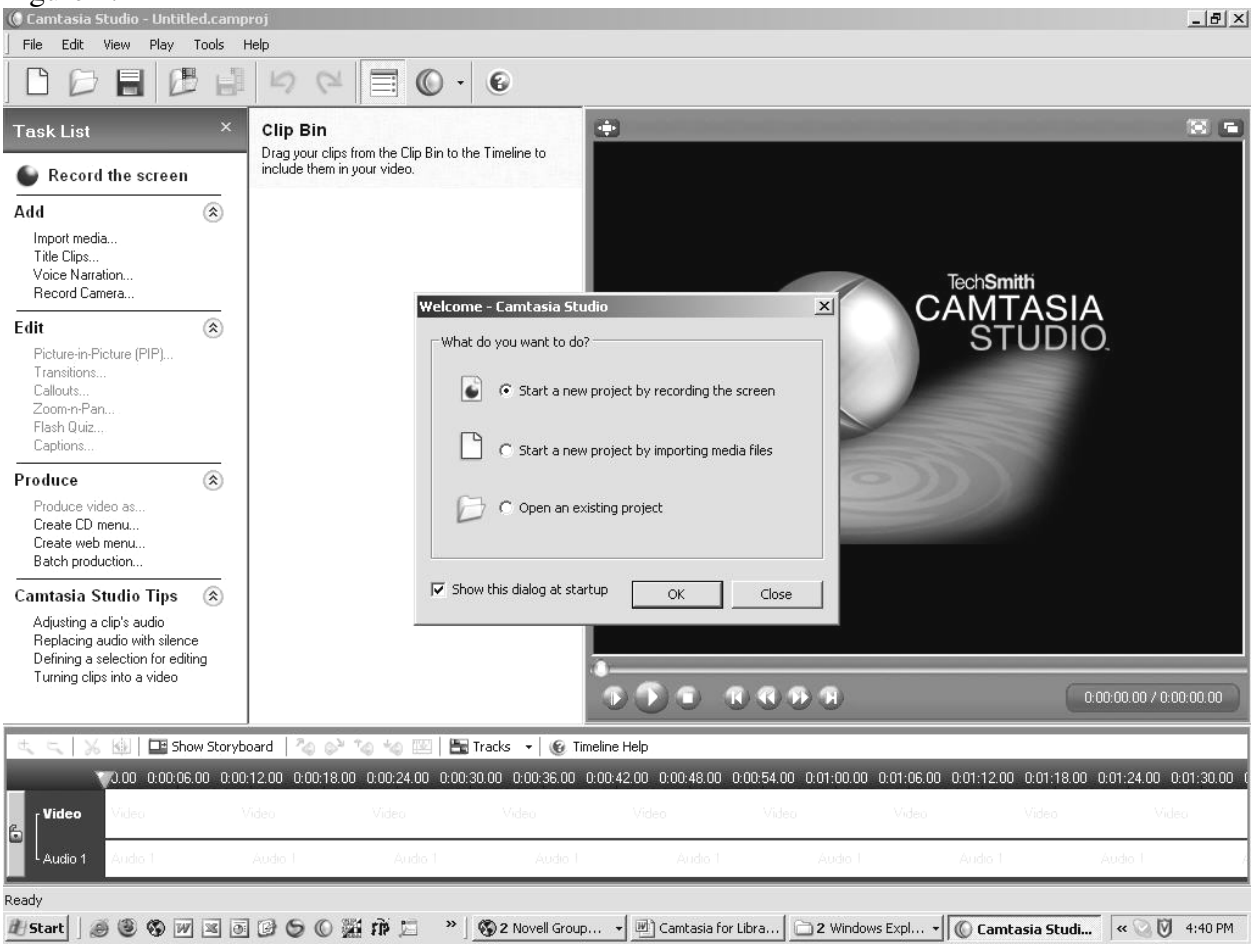
Basically, if you can see it on a computer screen, you can narrate it and produce a CD-based or on-line presentation with little or no training.

We will discuss the process of capturing video from cameras as well as screen captures, and we will see some typical examples of modules which have been developed utilizing this software. We will also demonstrate how to use Camtasia™ to actually create such a module during the paper session. The software discussed at the session are available for thirty-day trial periods from: http://www.techsmith.comand I will make CD's available at the presentation as well. For those who feel they MUST walk away with something TANGIBLE, there might even be some Techsmith marketing "give-aways" which will be distributed at the paper presentation.

Camtasia Basics

The entire Camtasia screen is displayed in Figure 1. It is straightforward to navigate and after a very short while, we were quite comfortable with basic capture, viewing and editing capabilities.

Figure 1:



The four areas of the workspace include the task list (left section), the clip bin (center), the preview area (right) and the timeline/storyboard area (bottom). Note the dialog box near the center which has the option to begin a new screen capture, import audio/video files into this new project, or continue work on a previously saved project. The default file type for a Camtasia™ project is ***.camproj** and a project links all the video, audio and support files into one "project" file.

The following screen captures (captured by SnagIt™, also from Techsmith) display the progression of screens seen when opting to perform a screen capture. Figures 2-5 show that I have opted to capture a specific window by "selecting" it (by rolling the mouse over its title bar), then selecting if I want to narrate it and/or record from a videocam for a "talking head" effect or ANY other camera capture you desire. Disabling the display acceleration is advised for optimal performance.

Figure 2:

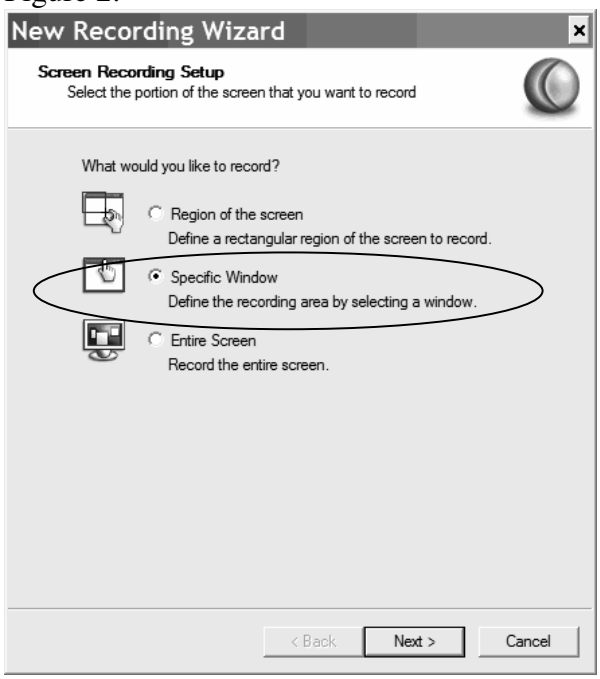


Figure 3:

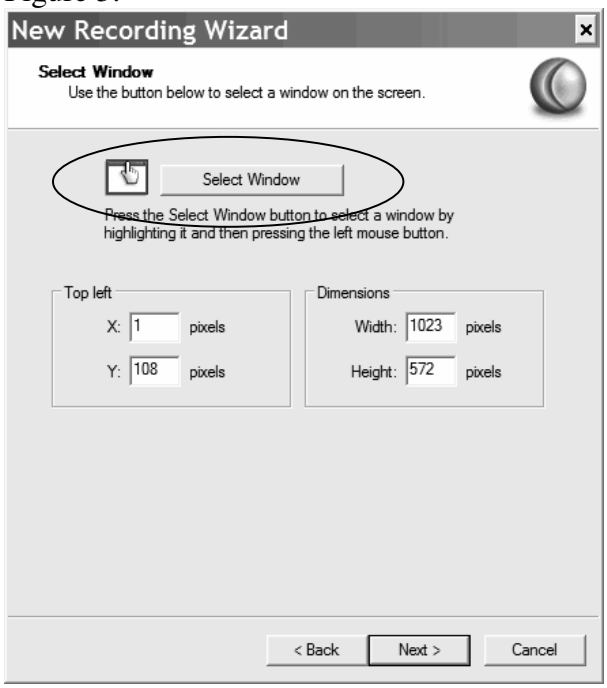


Figure 4:

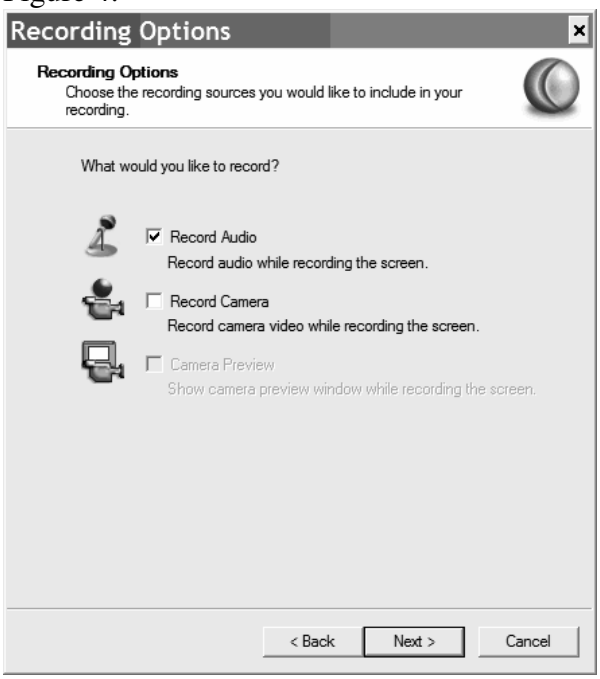


Figure 5:

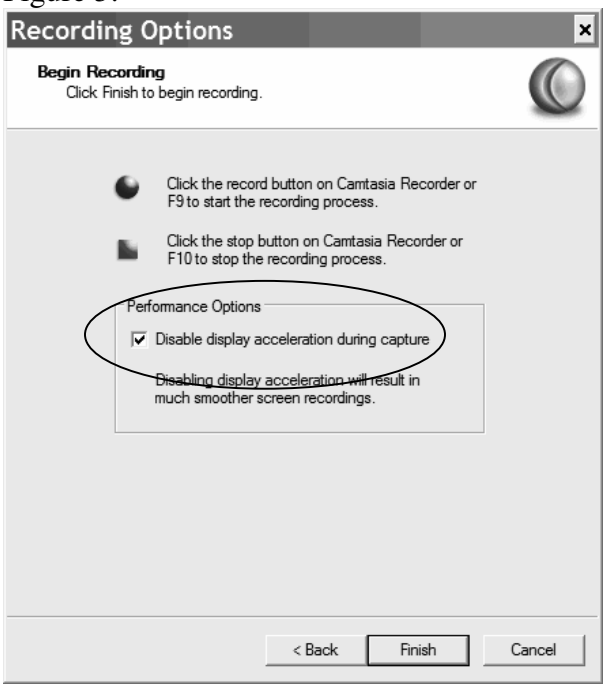
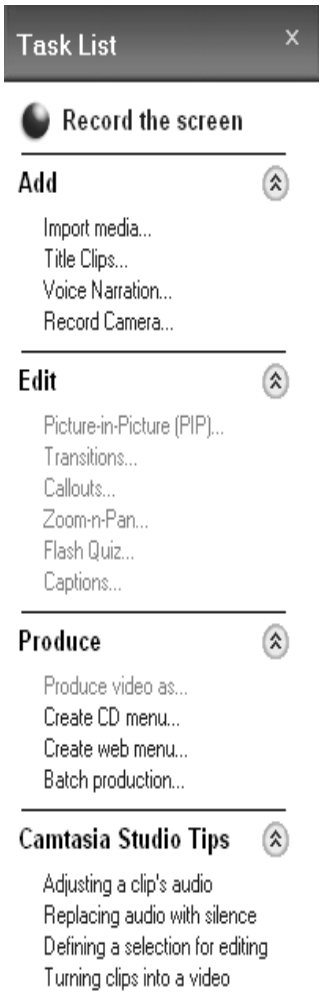


Figure 6:

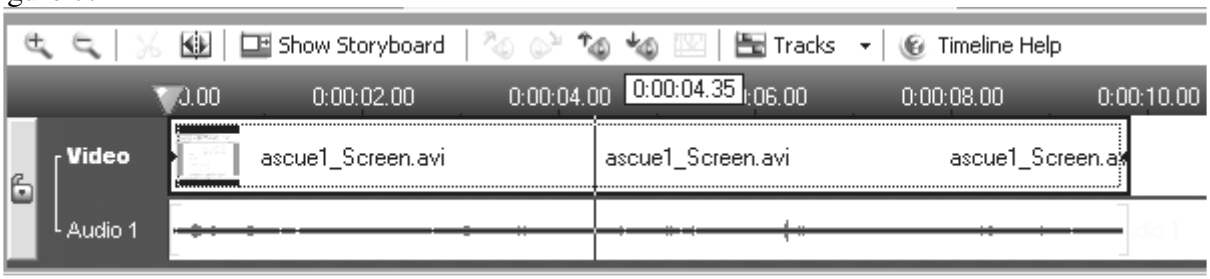


Although there are commands in the Task List shown in Figure 6 to "Import video, audio and images", it should be noted that this importing directly from a digital device is NOT supported. To capture digital video from a digital camera (still or moving) you might want to utilize Microsoft Moviemaker, now freely available with Windows and at the MS web site. Many cameras have such software packaged with them, but you are encouraged to test others for ease of use and richness of content. Once captured onto a disk drive, you may import digital media files already stored on any disk drive.

Note the most unique command, ***Record the screen***, allows you to start a screen recording, that is, a live capture of all or part of any part of a screen (you choose the exact region you wish to record activity on.) This definitely sets this software apart from most other video editing software. There are other software titles which now allow this feature, but we will not present a comparison here due to space limitations. Perhaps we will visit this in a future paper. All of them appear to have very similar capabilities. Some do things "differently" but end up with very similar productions when completed.

Once you have captured screen activity, or you have imported video, audio, or still images, they will all be displayed in the "clip bin," from which they can be dragged down onto the "timeline" near the bottom of the screen. Once on the time line, the audio and video tracks are displayed as shown in figure 7.

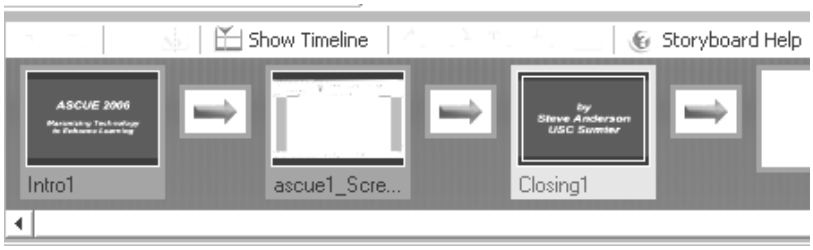
Figure 7:



As in most video editing software, the timeline has two "views", a timeline view and a storyboard view. The timeline view (currently displayed) is more appropriate for micro-editing such as the deletion of small portions of the clip, etc. The storyboard is best for macro-editing, such as

the rearrangement of individual video clips and still images in a more discrete fashion as shown in figure 8:

Figure 8:



Note that I have created two "Title Slides" and I have dragged them onto the storyboard line at the bottom of the Camtasia screen. Note that in the storyboard view as shown in figure 5, the clips are viewed as discrete units which can be rearranged, even repeated, over the course of the finished video. Transitions can be added between clips for a more professional feel, or they flow one into the other continuously if no transitions are utilized.

As you are creating the storyboard, the video can be previewed in the preview area. Camtasia utilizes familiar "recorder buttons" to control playback as shown in figure 9.

Figure 9:

As you begin editing the video, especially when performing deletions, it is imperative to see the time line in MUCH greater detail so the exact boundaries you wish to delete can easily be identified.

In figure 10, I have zoomed in so the timeline shows much greater detail (those measurements are SECONDS!)… essential to deleting EXACT audio clips as this allows us to drag the marker much more precisely. Small movements (nudges) can also be made with the Step Back and Step Forward buttons in the Preview area. We see how Camtasia clearly identifies the exact highlighted portion in the clip with triangular markers which are placed by clicking and dragging. The selection can be totally deleted using the delete key or the scissors icon identified below. Also, a clip can be split apart at a given point using the split icon. The audio volume of the highlighted area can be increased, decreased, deleted, faded in or faded out with simple mouse clicks. The options are quite rich.

Figure 10:

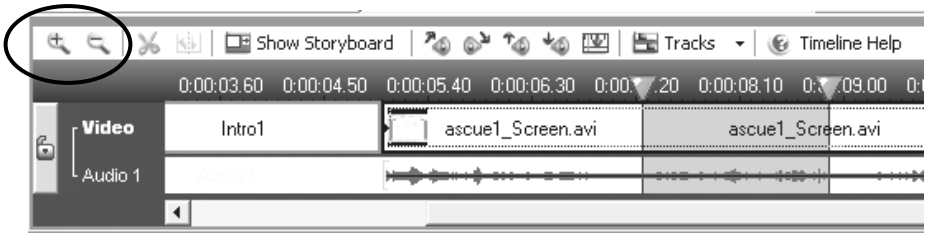
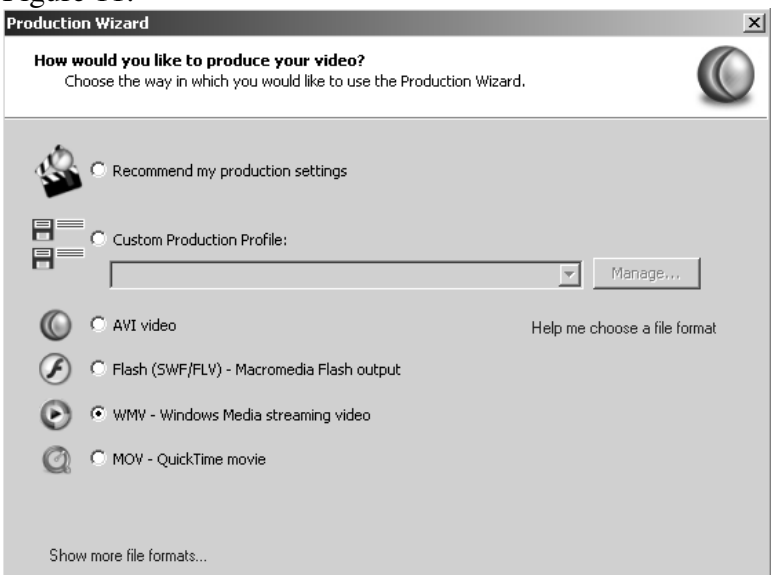


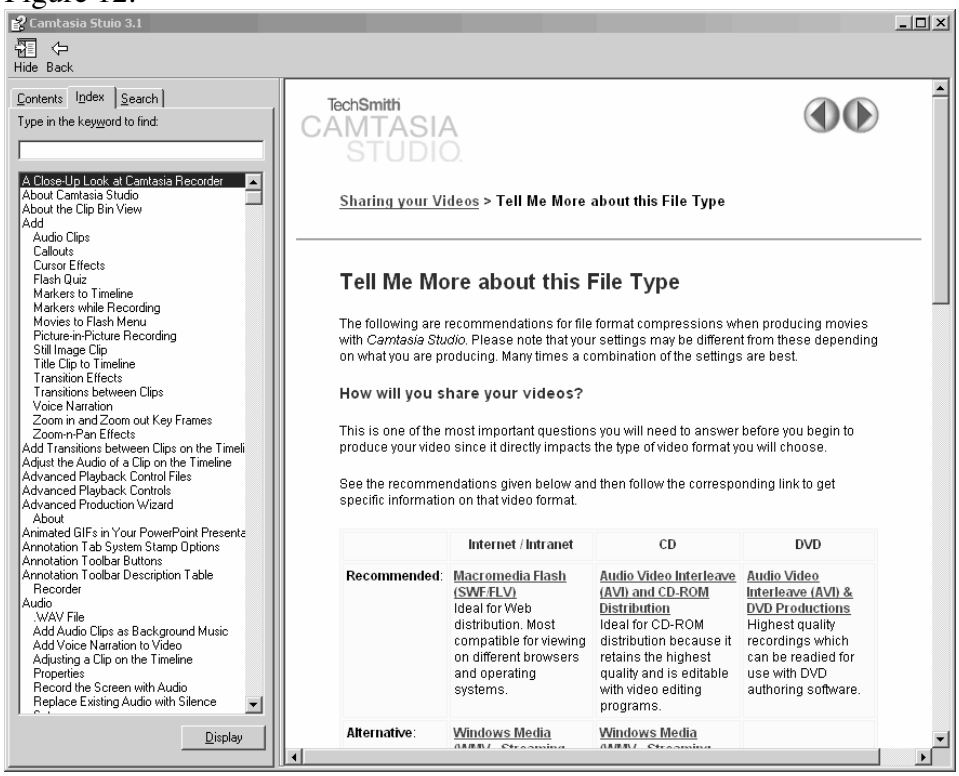
Figure 11:



Once all editing changes have been made, it is time to "produce" the video. Camtasia is very rich in production output file format options including AVI, SWF, WMV, and MOV formats. Each has their plusses and minuses and Camtasia tries to guide you as to which is appropriate as shown in the dialogue box in figure 11 below… using the "Recommend my production settings" option shown.

The extensive Help features (Figure 12) of Camtasia are some of the best tutorials on video production I have seen. They are simple, yet reasonably complete. They get technical enough for the savvy, yet the techno-lingo can be glossed over with little or no loss of information for the less savvy.

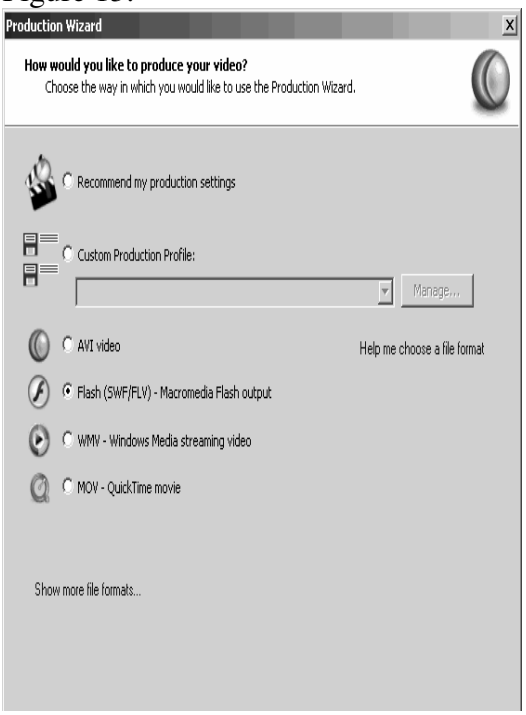
Figure 12:



Publishing Videos on Blackboard

Most of us are utilizing a course management platform, and we could argue all day as to the benefits of each (just as we could video production tools such as Camtasia™). The University of South Carolina has committed to Blackboard as a course management platform. When it is time to distribute a video you have created, there are many options. Camtasia™ conveniently produces not only the QuickTime, AVI, Flash or WMV video file format, but also the entire set of support files, including an html "cover page" to quickly publish your results to any web server. It conveniently creates a folder with all the necessary files so you know exactly what files need to be FTP'd to your web server. I have captured a few windows of this process to demonstrate its ease of use:

Figure 13:



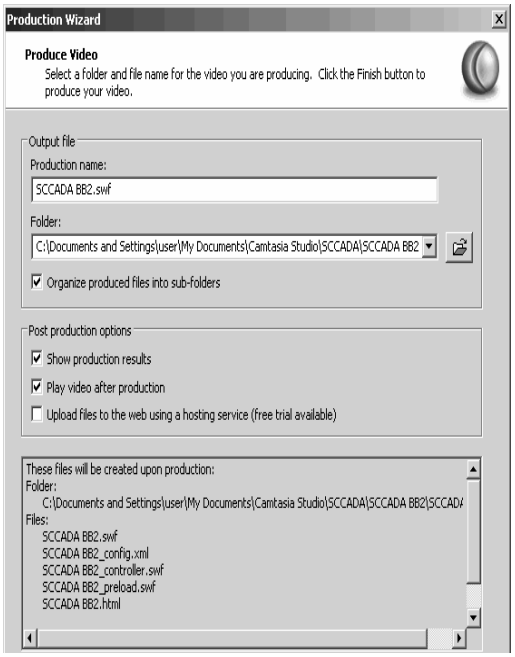
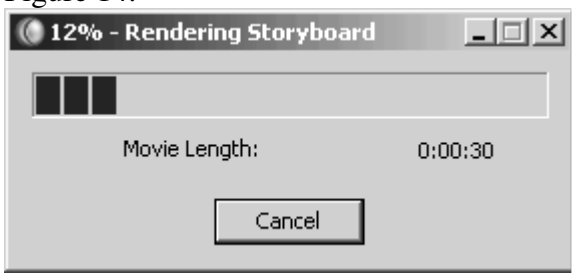


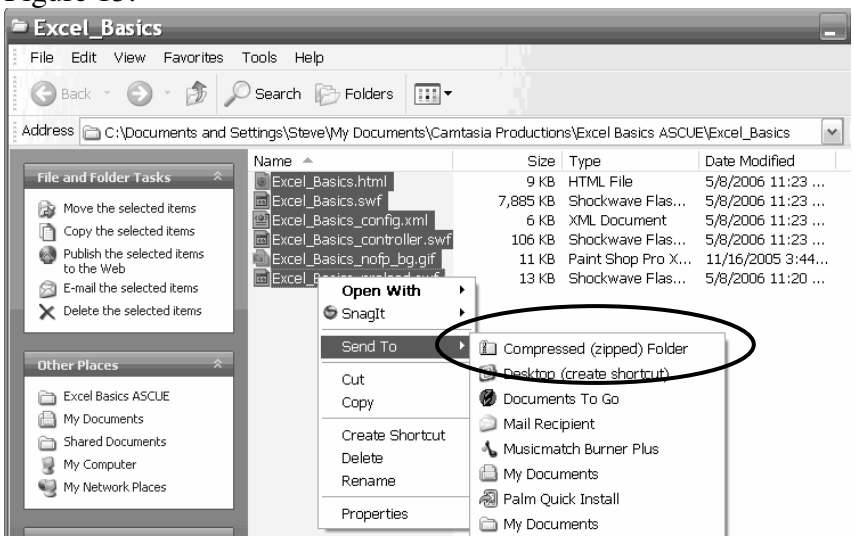
Figure 14:



It does take quite a few minutes, depending on the speed of your processor, to produce the videos. This CPU-intensive process can be scheduled as a batch production job in the "after-hours" as it does intensely utilize the system. Plan on a one-to-one ratio, where a 10 minute clip will take around 10 minutes to produce. Screen capture takes a bit less, but full motion requires LOTS more processing time.

Once the files have been produced, they can be "zipped" into one file to make it easier to publish on Blackboard. I simply highlight the entire set of files (Camtasia saves them all in one folder) and right-click and choose "Send To" a compressed file.

Figure 15:

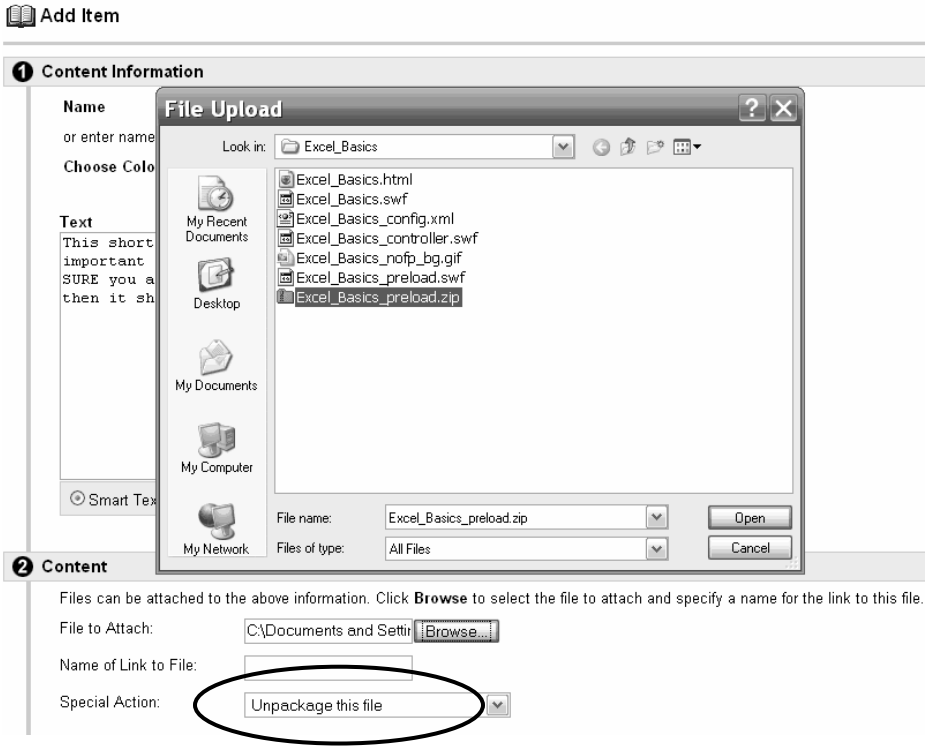


After the "creation" of the zipped file, it is time to publish it to your Blackboard course site. I use "Manage Course Menu" in the Control Panel to add a content are I call Video Tutorials which creates a separate button on my BB site to point to the tutorials as shown below:

Figure 16:

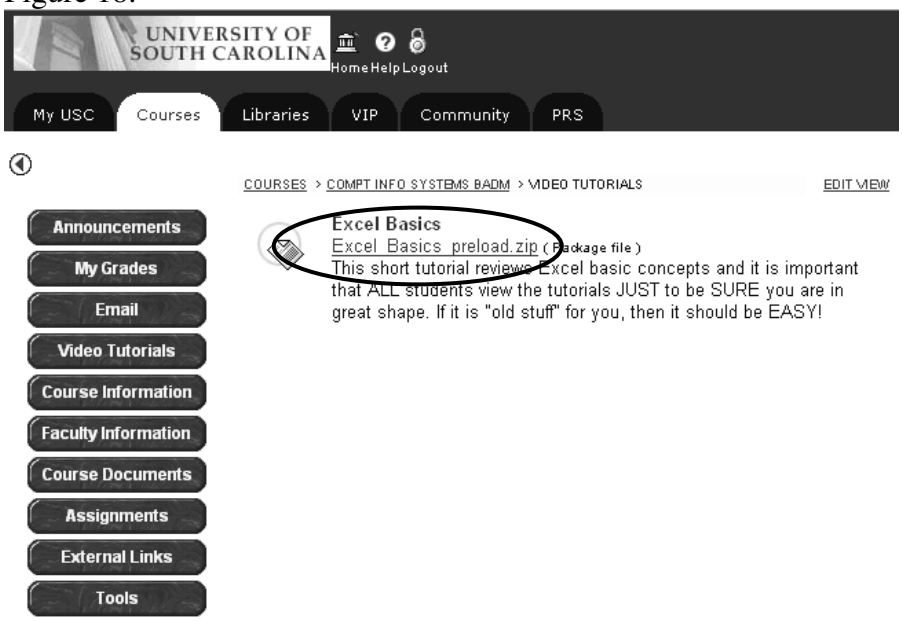
I then use the Control Panel to "Add an Item" to the content area **Video Tutorials** I created. I identify the "zipped" file as shown below and choose the option to "unpackage this file"

Figure 17:



At this point, all the student need do is to click on the Video Tutorials button to find the following screen, then click on the link for the zipped file:

Figure 18:



Next we shall review some of the many situations where we have utilized Camtasia™ to build video learning materials.

Camtasia in Action

The most prolific application I have identified is the creation of support materials for my hybrid classes (traditional class format with a large on-line contingent) which are highly quantitative in nature. My Statistics and Production/Operations Management classes benefited from the video tutorials I produced which they could view many times, both before and after the material was presented in class. Their feedback was very clear… they LOVED the ability to "listen and watch" the virtual lectures, especially over material near the end of the course when it got more challenging. It allowed me to spend more time in class identifying the real challenges they faced in learning the materials since they spent LOTS more time going over it by themselves. It tended to prevent the "paralysis" involved with feeling SO LOST that they simply could not pick up the book or even feel like they could ask an intelligent question in class. It was much more effective to "go over a portion of the video clip" than it was for them to generically identify that they "don't understand the material." We could play portions in class and discover weaknesses in their logic (or weaknesses in the tutorial which leads to improved productions!)

Another example of how much difference there can be was a project I worked on with a group of Psychology students. They were creating a film clip of child activity levels after consuming various snacks, some high in sugar content, some high in artificial sweeteners and a third group of natural foods. They had to splice 55 minutes of film footage on four cameras into around 5 minutes of footage displaying "typical activity levels." Then they had to build three "front ends" to introduce the test condition being viewed… but they used the exact same footage in all of the clips. The test, you see, was NOT about the student activity level, but rather in measuring the bias of the audience as to their predisposition in believing that sugars and/or artificial sweeteners might cause behavioral differences as compared to natural snacks.

Our first attempt at producing the 7 minute video was to use AVI format since it was suggested for highest quality CD-based distribution. The resulting file was "Packed and Showed" and resulted in a zip file (with the CODEC and Player hidden in it) of over 1.3GB, larger than a CD! We lowered the screen recording size to 640x480 and got it to fit on one CD at around 650MB. The second two we chose to use WMV format and the same 640x480 option. The resulting file sizes were approximately 14MB, a huge savings. Granted, the WMV files were a touch blurry compared to the AVI format but the loss was acceptable. In hindsight and greater lead time (remember that STUDENTS were involved—of course I NEVER PROCRASTINATE!!!) we would have tried other options such as increasing the sampling rate to improve quality at a modest file size increase.

Another project involved the development of multimedia library materials and another wonderful add-in Camtasia offers is the ability to create menu systems and HTML support pages automatically. This enables us to export (FTP) the resulting files to a web server with ease and have our productions available quickly. We did learn some important points. If you are utilizing the screen recorder to produce a "class" (like I did to supplement my on-campus classes while I attend the conference) then you should minimize the "editing" to save time. Students tolerate our hesitations/slips/etc in class, so they do not tend to freak out when we do them on "tape." Large bloopers can be deleted easily, especially if you remember to leave some hesitations every so often which allow easier editing later. Also learn to utilize the F-9 function key to pause the recording if you get "flustered" or interrupted during the recording process. I used it a lot while recording

at home near or four dogs and at my office if the phone rang or the door slammed in the hallway outside my office.

Summary

In summary, we found Camtasia to be an excellent screen capture as well as overall video editor. It is filled with useful help, costs a very reasonable amount, has many output options to help control file size, and has useful menu generation programs to help you produce a professional output without having to become a super expert in multimedia production. The students learned it quickly as did the library staff who attempted it. We do not have everyone on board yet (but then not all need to use it either). If you get interested in learning more about the costs and features of Camtasia and/or SnagIt, visit the Techsmith web site at **http:www.techsmith.com**
Current educational discount pricing as of 4/20/2006 is as follows:

Standard Licensing Options

Single User Education Pricing	
SnagIt	$24.95
Camtasia Studio	$149.00
Camtasia Studio / SnagIt Bundle	$169.00

Techsmith has also donated a copy of some of their software to "raffle off" at the ASCUE conference business meeting. I usually bring other promotional give-aways which I will distribute during the paper presentation (sure—bribery does work sometimes!)

Digital Media Center – Sharing Ideas

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Abstract

The Digital Media Center is in its infancy at Gettysburg College. It was made possible by a grant and a lot of planning and hard work by quite a few people on staff. It is located in the Library, in the basement where the members of the Instructional Technology and Training Department of the Information Technology Division reside.

Students, faculty, and staff now have the ability to perform tasks such as scanning, poster printing, and media conversion themselves at the self-service stations available. There is also a team of trained student workers that man the Student Helpdesk nearby to offer basic support for this equipment. These student workers also handle the signing in/out of loaner AV equipment available for academic use on campus.

Being involved in the entire planning process and named its coordinator, I would merely like to talk with anyone from other institutions about any phase of a Digital Center: planning one, running one, what has or has not worked for others, etc.

Note: This is a panel session and no paper is expected. The panelists may provide handouts at the conference or via the web or email.

Using MS Producer in a Beginning Programming Course

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Introduction

After attending presentations on Camtasia and Producer at the 2005 ASCUE conference, I decided to try and integrate these products into the presentation of materials in a beginning programming course.

Today's students are the "web generation" and their expectations are different than past generations.(1) Combining the rich media presentations common to online courses with the material presentation of a traditional course into a hybrid class integrates the 24x7 availability of the web with the face-to-face contact of traditional classes. The impact of the introduction of rich media presentations was measured by student evaluations before and after their inclusion in the course. The results as measured by student evaluations were phenomenal. This paper discusses the philosophy behind the production of the rich media presentations and reports the results. The conference presentation will demonstrate how to develop a rich media presentation using Microsoft Producer and demonstrate presentations used in the course.

Case Study

The beginning programming course for MIS majors in the College of Business uses VB.NET in the ASP.NET 2.0 environment. The students develop interactive web pages using Microsoft's Visual Web Developer. The basic programming constructs that are typically found in a beginning programming course are covered. Since the course covers the development of web applications rather than Windows applications, there are very few materials available from traditional book publishers at the beginning programming level. Customized materials were developed to meet the needs of the course. Microsoft Producer was used to create rich media presentations which were distributed to students over the web. All students have access to Windows XP machines and high speed Internet connections. Distributing the rich media presentations from the course web site is appropriate for the student population taking the course. MS Producer was chosen because it is a free download (3) and there was a short learning curve needed to develop materials. Using the screen capture function, an application was developed as the instructor explained the concepts being illustrated. The rich media presentation was customized for a given business scenario and covered the design of the user interface, programming constructs, documentation, and logic in a step-by-step process. Students developed websites for business scenarios such as on-line retailers, reservation systems and order entry systems. Students were required to watch the presentation and create the same website as demonstrated in the rich media materials. Presentations could be stopped, paused, or advanced which allowed students to cover material as many times as needed. Anecdotal comments from students indicated that they preferred the presentations to be fifteen to twenty minutes in length. Even though they could stop and start

again at a later time the preference was for the rich media content to be broken down into smaller segments and presented to them in the order they were to be completed. Students watched the presentation when it was convenient for them, not at a time imposed by class scheduling. It was not uncommon to see time stamps of very early morning hours for assignments posted to the student server. Some students seem to prefer working at 3:00am, others prefer midnight and a few worked in the afternoon. Each student engaged in the learning process on their schedule. Each student "self-selected" the appropriate time to engage in the learning process. Kolb suggests that the learning process is filled with tension.(2) Making the learning activity available to students when they choose to engage in the learning process provides an opportunity to reduce the tension and conflict inherent in learning.

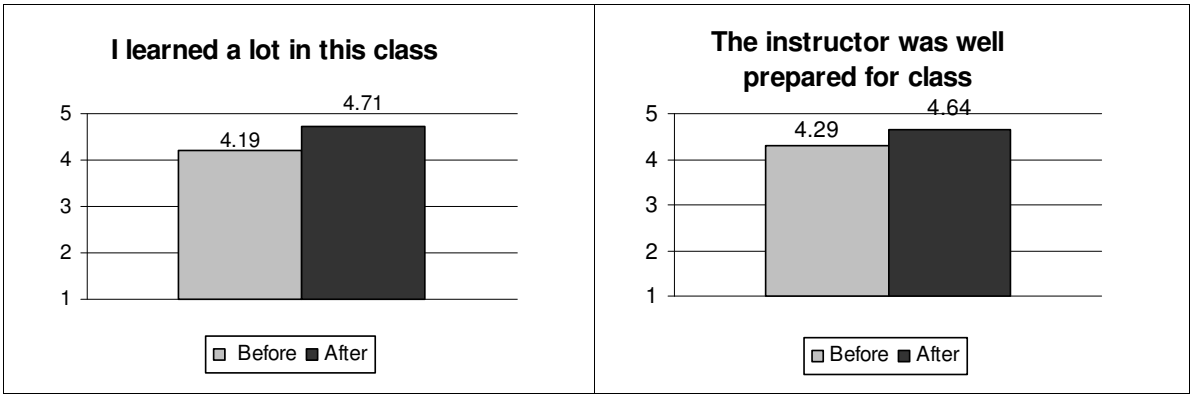
Prior to the rich media presentations, student absences would increase as the material became more difficult. But after the introduction of the rich media presentations, class absences were virtually non-existent. The types and level of questions asked in class indicated a deeper understanding of the material, moving from "how to do something" to "what would be the effect" level.

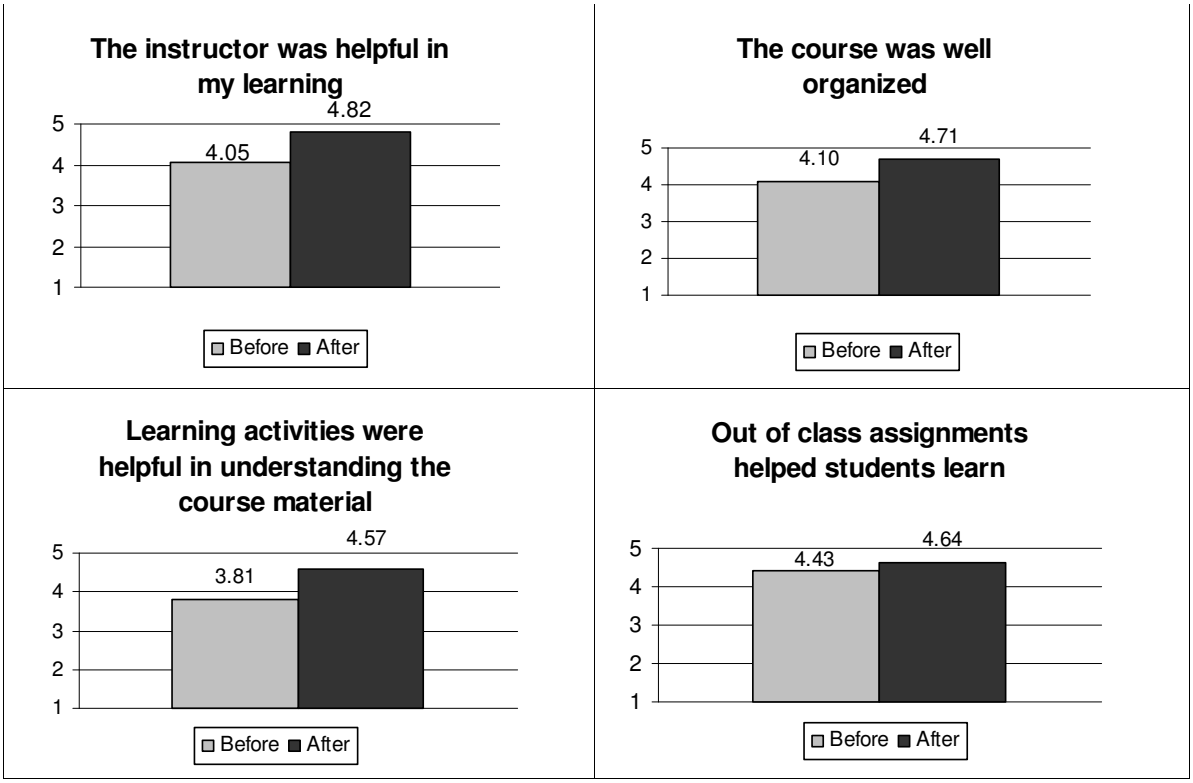
Results

The results from two courses are shown below. The courses had the same instructor, the same written notes and assessments and were offered at the same time of day. The difference between the two courses was the introduction of the rich media presentations.
The student evaluations are measured on a five point Likert scale as shown:

1 Strongly disagree
2 Agree
3 Neutral
4 Agree
5 Strongly agree.

The results of student evaluations from courses before and after the introduction of rich media presentations are shown below.





Summary

The results of the student evaluations indicate the introduction of rich media presentations has been very successful. Evaluations reflect increases in student perceptions of the usefulness of learning activities, the amount students' learned, the helpfulness and preparation of the instructor, as well as the organization of the class.

References

1. Johnstone, S.M., Ewell, P., Paulson, K. (2002). *Student Learning as Academic Currency*. American Council on Education Center for Policy Analysis. Available http://www.acenet.edu/bookstore/pdf/distributed-learning/distributed-learning-04.pdf

2. Kolb, David A. (1984*). Experiential Learning: Experience as the Source of Learning and Development.* Englewood Cliffs, NJ: Prentice-Hall, Inc.

3. Microsoft. [online], Available http://www.microsoft.com/downloads/details.aspx?FamilyID=1b3c76d5-fc75-4f99-94bc-784919468e73&DisplayLang=en

An Introduction to the Lego Mindstorms

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Abstract

This tutorial provides an introduction to the LEGO Mindstorms Robotics Invention Systems (RIS), contemporary learning tools that have been used to teach a number of concepts in technology related courses. First, a general overview of the Mindstorms and their history as educational tools is presented. Next, the process of building and programming robots using the visual programming language provided with the RIS kits is described, focusing on how the general algorithmic constructs of sequence, selection, and repetition can be implemented with the Mindstorm programming language. This tutorial concludes with a general discussion of how to successfully incorporate the Mindstorms into a course, and provides an overview of resources available to make teaching with the Mindstorms a success.

Introduction

LEGO first introduced the Mindstorms in 1998, with version 1.0 of the Robotics Invention System (RIS) kits [1]. Since that time, the Mindstorms have caught the interest of numerous hackers, programmers, and even teachers. Wolz [2] was one of the first to incorporate the Mindstorms into a computing course, using them to teach students in an introduction to programming class about good design and project management concepts. Fagin, Merkle, and Eggers [3] were also some of the early users of Mindstorms in the classroom. They developed a number of instructional examples using the language Ada and the Mindstorms, which teach students about programming topics such as sequential control, variables, procedures, selection structures, and arrays. The Mindstorms have since been used in computer science sources to teach concepts from object-oriented programming [4] to artificial intelligence [5]. They have even been used to introduce children to the exciting world of computing [6]. The LEGO robots are often said to increase the interest of students in computing courses, and they make class work more fun and exciting.

The purpose of this paper is to serve as an introduction to the LEGO Mindstorms for faculty members who are interested in incorporating these robots into their courses. The Mindstorms can be a great way to introduce programming and computing concepts to students in a fun and nonthreatening manner. The next section of this paper will discuss the building of LEGO robots, followed by a tutorial on programming the Mindstorms. The final section will introduce a number of resources, as well as provide practical advice for making Mindstorms use a success in the classroom.

Building Robots

The central component of any LEGO Mindstorm robot is the RCX brick, which contains a small computer based on the Hitachi H8 series microprocessor and 32K of RAM [7]. The RCX unit (the yellow block that can be seen in Figure 1) has three input ports (labeled 1, 2, and 3) to which sensors can be attached, and three output ports (labeled A, B, and C) through which motors can be connected. The RIS kits come standard with two touch sensors, one light sensor, and two motors. Angle and temperature sensors can be purchased separately.

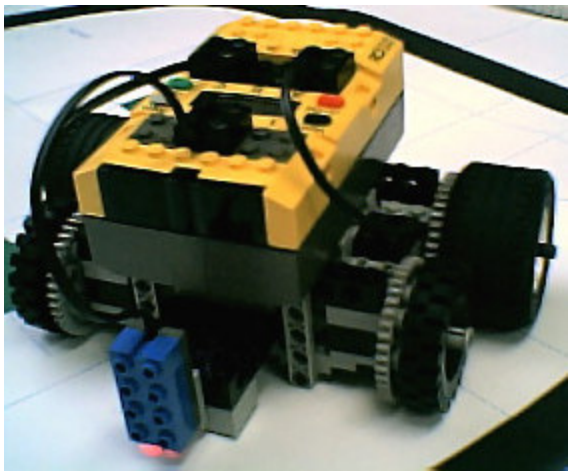

FIGURE 1

Building robots is straight forward, and the RIS kits come with a "constructopedia" that contains directions for the assembly of a number of different designs. In my courses, I typically have students build some version of the "roverbot", a robot designed to drive in relatively straight lines and make sharp turns. These robots are good for navigation tasks. A fully constructed robot with a light sensor attached to port 2 is shown in figure 1.

Programming the RCX

The RIS kits contain an easy-to-use visual programming language for communicating instructions to the RCX. A number of alternative programming interfaces have been developed [7, 8, 9, 10] by programmers outside the LEGO Corporation. These will be discussed later. For now, we will use the visual programming language provided by LEGO to instruct our robots.

When the LEGO software is started, users will be presented with the screen shown in figure 2A. To begin programming, click on the options "Program" and then "Freestyle" (from the screen that comes up next). This will bring up the visual programming interface shown in figure 2B.

FIGURE 2

I use the Mindstorms in an introductory computer science course to teach non-majors about the general algorithmic constructs of *sequence*, *selection*, and *repetition*. The remainder of this programming tutorial will focus on designing a robot's program that introduces these three concepts. As a concrete example, let us say that we wanted a robot to continually drive around a track – defined by a black ring on a white piece of paper (such a piece of paper is actually included with the RIS kits). Our robot would need to be able to drive forward until it *sensed* with the light sensor (connected to port 2) that it was no longer over the black line. The robot would then need to turn towards the inside of the circle a small amount (for the sake of this example, we will assume that the inside of the circle is always to the robot's left). The robot would then repeat the described process.

To begin our program, we need a repetition structure that could continually instruct the robot to drive forward, looking for white paper. Clicking on the "Repeat" button on the left hand side of the programming interface exposes a number of options. We want the "Repeat Forever" block. This block can be clicked and dragged so that it is attached to our program in the black programming area on the right. Next, we need an instruction that tells the robot to drive forward. This command can be found in the "Big Blocks – Roverbot" section of the interface on the left. Click and drag the "Forward" block so that it is inside of our repetition structure. By right clicking on this block, we can adjust the amount of time that the robot drives forward before it sequentially does its next task. We really want this to be a small amount of time, so set it to 0.1 seconds. Now we need to tell the robot to check for white paper (which will notify the robot that it is driving off the black line, and needs to turn left). To do this, click on the "Yes or No" button on the left, and drag the "Yes or No" block so that it is connected to our program after the "Forward" block, but inside our "Repeat Forever" loop. Right click on the "Yes or No" block and tell the robot that we want it to: 1) use a light sensor; 2) attached to Port 2; 3) look for a brightness event; and 4) use automatic settings. You will notice that the "Yes or No" block has two paths, one for if the condition is true and the other for if the condition is false. In the yes path, we want to tell the robot to turn left, so select the "Left" block from the Big Blocks – Roverbot section, and set the time to 0.5 seconds. On the "No" path, place a "Forward" block that executes for 0.1 seconds. Figure 3 shows the complete program.

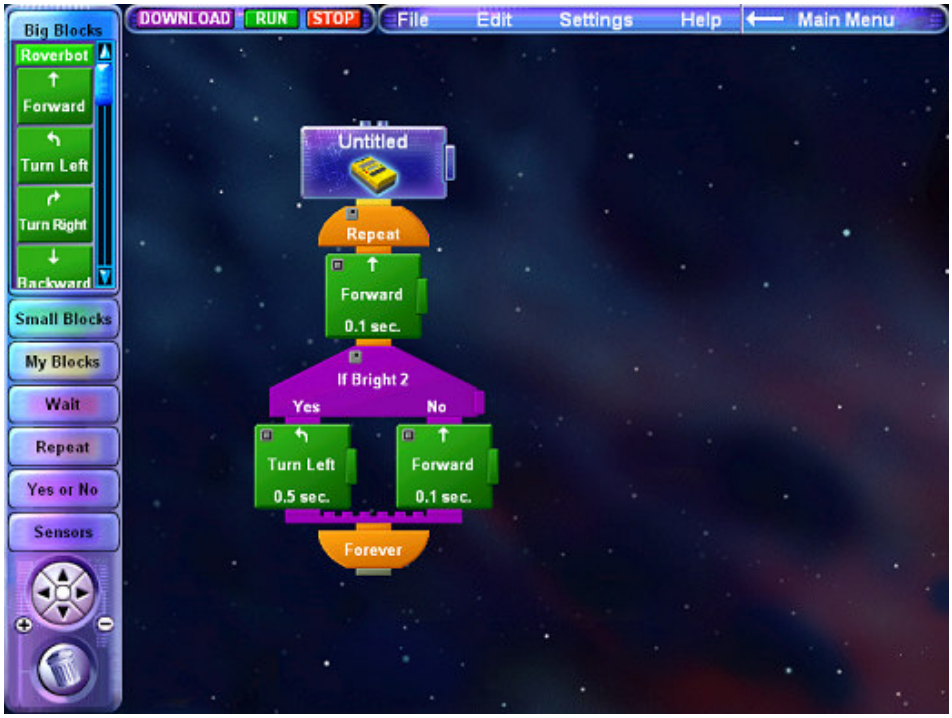

FIGURE 3

The wonderful thing about this programming interface is that students can visually identify the algorithmic constructs they are using in their programs. Green blocks represent instructions that are to be executed *sequentially*; the purple blocks are *selection* structures, and the orange blocks are *repetition* structures. This is a programming language that anyone can learn. The interface is very nonthreatening for students who are computer phobic, and can be a lot of fun.

To get our robot to execute the program, it must first be downloaded to the robot using the IR tower (which needs to be connected to the computer through the USB port). Make sure that the RCX is on and facing the tower, then click the download button at the top of the interface to send the program to the RCX. When the program is downloaded, you will hear a series of beeps. To run the program, press the green "run" button on the RCX.

If you try out the program exactly as I have it above, you will quickly notice that the RCX will turn left much too long if told to go 0.5 seconds. A smaller number, like 0.2, is probably better, but will not make the robot work every time. It is likely that the robot will eventually "overturn" and head into the middle of the track. This is actually a good learning experience for the students. To fix the problem, we can use a nested repetition structure inside our selection structure. Try and add a "Repeat While" structure inside the "Yes or No" block that makes the robot turn left, in 0.1 second increments, as long as the light sensor detects brightness. Thus, when the robot detects the dark of the black line, it will stop turning and just go straight. This should make the robot work every time. The complete program can be found in figure 4.

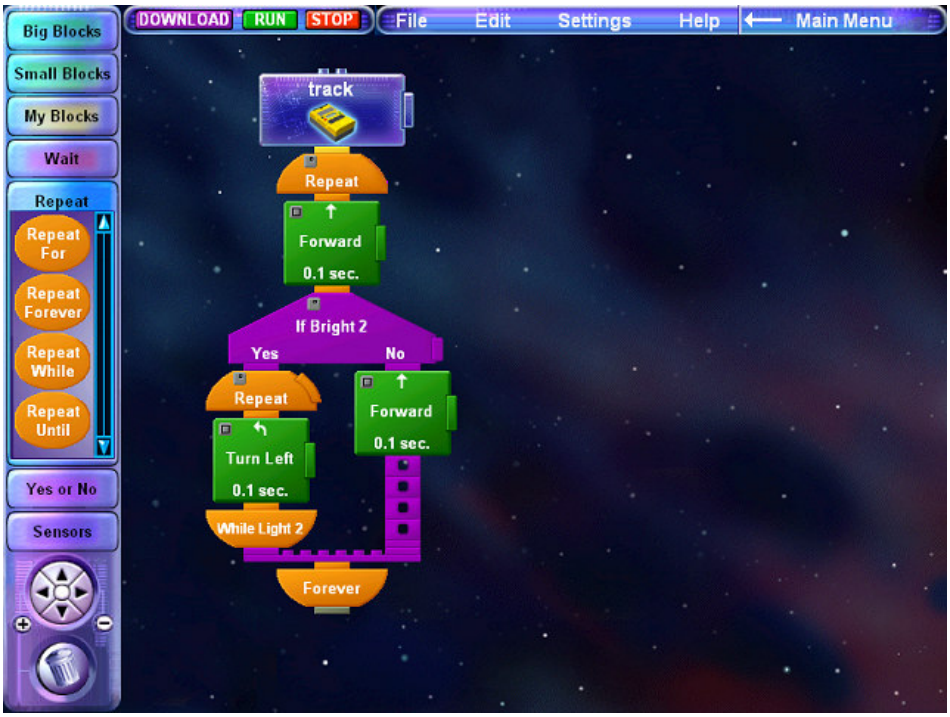

FIGURE 4

The LEGO software included with the kits contains interactive tutorials that teach students the basics of programming the RCX unit using this visual programming language. To access these tutorials, simply choose "Missions" from the main screen (shown in figure 2A), then "Training Missions" from the screen that comes up next. These training missions make great laboratory activities to get students started with the Mindstorms.

LEGO Mindstorms Resources

The LEGO Mindstorm Robotics Invention Systems 2.0 kits can be purchased through target.com and eBay for about $200. A criticism of the RIS kits is that they do not contain a large number of sensors (and do not even include the angle and temperature sensors). Extra Mindstorms parts can be purchased through LEGO Education [11]. The extra sensors can make it possible for robots to perform more interesting tasks.

As mentioned earlier in the paper, a number of other options are available for programming the Mindstorms, in addition to the visual language provided with the RIS kits. If you are interested in teaching a programming class with a significant Mindstorms component, you may prefer a language that more closely resembles what is already taught in your course. Dave Baum has developed a C-like language (called NQC) that can be used for writing Mindstorms programs. He has authored a text [7] which both describes NQC and several robot designs not found in the constructopedia. A Java like programming environment is also available [9] for the Mindstorms, as well as a development environment for C and C++ using the gcc and g++ compilers [8]. There is even a LISP programming environment for the RCX [10]. Patterson-McNeill and Binkerd have published a detailed listing of LEGO Mindstorm programming interfaces [12]. Erwin's text [13] contains a number of additional interesting robot designs and projects.

Using the Mindstorms in a Computing Course

The Mindstorms often have great appeal to both students and faculty at the beginning of a course. Playing with LEGOs can be quite fun. A few years ago, many faculty members felt that the Mindstorms were the next great tool for teaching computer science. However, this excitement has begun to wane somewhat, as many instructors have observed that the Mindstorms do not have the positive impact on student performance in computing courses that many had hoped [14]. Incorporating the Mindstorms into a course can also be more difficult than it initially seems. The robots do not always perform in exactly the same manner, even when executing the same program. Environmental factors such as friction or battery power can cause the motors (and wheels attached to them) to behave differently each time a program runs. For instance, the time it takes a robot to make a 90 degree left turn on carpet, is likely different that the time required on a table top. The light sensors are also difficult to calibrate. Shadows and glare from light sources can make a robot's light sensors provide very different reading across the same surface. These issues can frustrate students, and should be taken into account when planning assignments for computing courses. I usually give students a number of trial runs and just count the best performance, when their robots are competing in graded challenges. This seems to ease the students' anxiety somewhat, but the inconsistencies of the robots can still be very aggravating.

As mentioned earlier in this tutorial, I use the Mindstorms in a computer science course for non-majors, to teach introductory programming concepts. The Mindstorms are very effective teaching tools for a course such as this. Most students come into the class with no background in computer programming, and the Mindstorms can make learning this skill fun. I give the students lab time over a three week period to build and program their robots, so the Mindstorms do not add an out-of-class burden for the students. I have also tried to incorporate the Mindstorms into introductory programming courses for computer science majors. In this course, the Mindstorms were not as effective. In order to continue covering the same amount of material as had been covered in previous semesters, I was not able to give the students as much lab time for robot building, as in the non-major course. Thus, the students in the introductory programming courses had to work on their robots outside of class. This became difficult for a number of reasons. First, students had to work in groups since it was not economically feasible for each student to have his or her own kit. The students often had difficulties finding times when they could all meet. Typically, one student ended up doing all of the robot building. A number of parts also became lost when the students took the RIS kits to their rooms. After several semesters, enough parts can go missing from kits that they need to be replaced.

An approach that has been tried in other introductory programming courses [12], which has been successful, is to introduce programming early with the Mindstorms using the visual language provided with the kits. Later, students move on to a more powerful language like NQC. This approach has the advantage that students can reuse robots from earlier portions of a course while they learn a new programming language, allowing them to focus on the language itself and not robot building.

The LEGO Corporation is planning to replace the Robotics Invention Systems 2.0 kits with a new and improved model, the Mindstorms NXT, in the fall of 2006. The NXT kits will contain 3 servo motors, 4 sensors (light, touch, sound, and ultrasound), and support wireless Bluetooth technology, for a price of around $250 [1]. This could have several ramifications for the RIS

kits. In some sense, the technology is becoming obsolete. However, the RCX powered robots will still be capable of teaching the topics discussed in this paper; and the number of third party programming options available for the NXT will not be as plentiful as for the RCX (for at least a few years). The cost of RIS kits will likely go down once the NXT kits become commercially available too, so if price is a consideration, the RIS kits will still be an excellent option.

Robots add a lot to the classroom. They can provide motivation for students who do not have much interest in technology. They can serve as concrete examples of programming concepts that may otherwise seem very abstract. Robots can also offer a change of pace in a course that may sometimes get bogged down in technical details. However, developing good Mindstorms projects takes time and careful consideration. For students to enjoy working with LEGO robots, instructors need to plan appropriate challenges and provide ample opportunities for students to be successful.

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24/7 INFORMATION TECHNOLOGY SUPPORT - Implementing After-Hours Support for a Small Residential Campus

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Abstract

Technology services on a residential liberal arts campus have become highly desired, no, better yet highly demanded services which are expected by faculty, students, and administrators alike to be available beyond the normal hours of both administrative and academic operations. With this growing expectation of ubiquitous technology comes the necessity for support and uptime. Most small liberal arts colleges with limited budgets and staff find it a challenge to meet these expectations. Cornell College, in the rural historic town of Mount Vernon, Iowa operating on a very stringent calendar of delivering courses one at a time, created a 24/7 technology support model that leverages Campus Safety's 24-hour presence and a mobile phone to address the demand for critical technology services after normal business hours.

Introduction

Since technology has become an integral part of both work and life on residential liberal arts campuses, operations and support beyond normal business hours are essential to meet the expectations of faculty, students, and administrators and ensure quality customer service.

The intent of this paper is to explain how the division of information technology (IT) at Cornell College went about gaining campus support for after-hours technology assistance, developing the model that best fits Cornell's environment, and how the model was implemented on the campus.

As a residential liberal arts campus, Cornell College houses approximately 90% of its students in on-campus facilities. Roughly 90% of the students living in campus housing have one or more personal computers. For computer access, the other 10% depend on friends as well as public access computers in computer labs and common areas around the campus. One of Cornell's distinctions is the One-Course-At-A-Time instructional delivery method where students and faculty spend 3.5 weeks focused on a single course. This delivery method requires high availability of resources both during the day and throughout the evening hours. In addition to computer, network, and Internet availability, the campus community also depends on telephone and video services. So whether it is work or entertainment, technology support is expected 24 hours a day, 7 days a week.

The IT staff never complained about being called in, however, because there was no system to handle these occurrences, many campus members did not know what to do in the event services

were unavailable. This led to frustration and complacency on the part of both the campus community and IT staff members. It was apparent that a system was needed to identify exactly what technology services were considered critical enough for immediate attention, a process for reporting service outages, a method for verifying those downed services, and a channel for communicating system failures to IT.

Gaining Campus Support

The first step was to gain support from various campus groups to move forward with a model to address a "round-the-clock watch and respond" effort for technology services. Four primary groups were identified to work through the details of introducing extended hours support for technology services: the IT staff, the Information Technology Advisory Committee (ITAC), the President's Council, and Human Resources along with the Salary Review Committee.

As stated earlier, because of their commitment to the campus as a support group, the IT staff never complained about having to come in on occasion to address a downed service. However, when the subject came up about a systematic approach for reporting and responding to technology service outages outside of normal business hours, they were a bit apprehensive. In addition to the idea that it was not in their job description to be "on-call", they were concerned that the campus community might abuse a service like this for non-emergency-type calls. It took a number of conversations with the IT staff to bring them "on board" with the idea of a structured process for after hours IT support.

After discussing the idea of after hours support with the President, it was recommended that the Information Technology Advisory Committee (ITAC) be included in the discussions to get a better community perspective on needed services after hours. The ITAC is a group of representatives from staff, faculty, and students which makes policy recommendations to the President's Council on technology-related issues. The idea was well received and viewed as a positive development for a residential campus that was dependent on technology for academics, research, communication and entertainment. The discussion moved from ITAC to the President's Council where the decision was made to support this new initiative. It was concluded that focusing on those critical services that had the greatest impact would be adequate and reasonable funding would be provided.

Also during these discussions, the vice president for student life volunteered the use of Campus Safety as the central contact point on campus to help screen and forward valid outages to on-call IT personnel.

Now that the specific outages had been identified and reasonable funding had been approved, it was necessary to work with Human Resources and the Salary Review Committee to determine fair and reasonable compensation for implementing the new extended coverage. Several models were discussed with Human Resources for compensating staff for these new job expectations which will be discussed later.

Developing the Model

Once the IT staff was on board with the idea of providing support after hours for technology services and other necessary approvals were granted, it was necessary to establish a model for delivering extended hours to the campus. The challenge at this level was to develop a structured list of outages that affect users for which IT could be responsible and compensation for this extra ordinary expectation that was agreeable with the College.

The structured list was developed by working with the IT staff to list all technology services that are directly supported and maintained by IT. This list included 27 potential service outages in six technology areas and grouped into three categories: 24-hour coverage, 12-hour coverage, and next business day coverage. The six technology-related areas included:

1. *Network Infrastructure*
2. *Server*
3. *Academic Software*
4. *Administrative Applications*
5. *Voice & Telephone*
6. *Cable TV*

The rationale used for priority ranking was based on three criteria: is an individual's safety at risk, does it directly affect the performance of the college's academic programs, or is the college at risk of losing prospective students. Using these criteria each of the 27 potential outages were sorted and placed into one of the three categories.

These categorized services were then shared with ITAC. This group was asked to review the list and help ensure that they were categorized properly from a user-based perspective. The idea was to arrive at some consensus with a representative group from the user community on service priorities. After some adjustments were made based on their recommendations, the list was presented to the President's Council for discussion and final approval.

The President's Council concluded that the College would support a model that covered those services which ranked within the 24-hour coverage category. The 27 potential technology outages originally identified were reduced to five areas of covered services:

1. Cornell e-mail system
2. Internet access
3. Cornell's webpage
4. Cornell telecommunications system
5. Network Applications and Home Directories

Since the idea of being available on a rotating basis for after hours support was new to the IT staff, it was agreed by both the President's Council and the Salary Review Committee that compensation may be in order with these new job expectations. Human Resources looked at several models as consideration was given to compensation. If personnel are asked to be available outside of normal business hours, then there must be a communication device such as a pager or cell phone carried to ensure they could be reached. It was discussed whether to pay an hourly rate for

carrying the device or a flat rate. It was also discussed whether they would earn additional monetary compensation for actual work performed or provided time off for time worked.

It was concluded for Cornell that since IT personnel are salaried there should be no pay for this additional responsibility. It was also decided that the time and effort needed to maintain records when someone is called in would not be feasible. Therefore, it was decided and approved by the Salary Review Committee to provide a small salary increase for each of the staff expected to be on-call and to include the responsibility in job descriptions for future hires. It was also decided that staff stay within a 30-mile radius of the campus while on call.

To incorporate Campus Safety into this model required IT to provide training and documentation on which services ranked within the 24-hour coverage, how to verify, validate, and report covered outages, and simple resolutions that could be performed by Campus Safety. Follow up responses were also provided to Campus Safety to assist them in their new responsibilities.

The IT staff use InterMapper (http://www.intermapper.com/index.html), a network monitoring and alerting tool, to monitor many of the campus technology data services. Documentation was created with instructions on how to use InterMapper to verify outages related to email, Internet access, College web server, and network applications. Additional instructions were included for verifying and validating campus phone and video services.

The training included how to use InterMapper to determine which data services were down and how to verify the down services as well as how to determine and verify downed voice services. Instructions were provided on how to respond to callers. If the reported outage met the criteria for an emergency response, Campus Safety was given specific instructions on how and what to say to the caller. Likewise, instructions were given on how to respond to calls that did not meet the criteria for an emergency response.

Several meetings occurred with the Vice President of Student Life and Director of Campus Safety to review and discuss the documentation and instructions to ensure clarity and usability for non-technical readers and users. After several iterations, a generally clear and easy to follow set of instructions were produced. In addition to instructions on verifying and validating reported outages, Campus Safety was also provided with follow up responses for communicating to callers.

Communication was developed to inform the campus community of the new service and how it should be used.

Implementing the Model

Once the model was established, implementing it was simple. The first thing that was done to implement the model was to train the Campus Safety staff using the documentation and instructions on how to verify, validate, and report an outage. Copies of the documentation was provided to Campus Safety for inclusion in their Standard Operating Procedures manual, and IT assumed the responsibility to keep Campus Safety up-to-date on all changes that occur in the extended hours service initiative.

The next step was to inform the campus community via email of the existence of the after hours support with instructions on what services qualified for an emergency response and how to report the outages. The information was also posted on the IT web site. IT job descriptions were updated to include participation in the on-call duties.

In order for IT to track emergency responses, a small Access application was written and implemented by IT. The application tracks the calls, the IT technician who resolved the issue and the solution. This application also provides a routine for scheduling on-call technicians.

Since the model was implemented in March 2005 there have been only 16 calls which required the IT staff to respond after hours. This is about 1.2 calls per month. Since the original communication to the campus community, two additional communiqués have been distributed via email. Efforts will be made over the next year to increase the frequency of reminding the community of the service and the process for reporting outages.

CONCLUSION

The availability of technology services beyond normal business hours of both administrative and academic operations on residential liberal arts campuses has become necessary to meet the demands of faculty, students, and administrators. With this growing expectation of ubiquitous technology, comes the necessity for support and uptime. Cornell College developed and implemented a model that suits their campus and culture. Support for the model was gained through the collaboration of the IT staff, IT community, the President's Council, and Human Resources. These collaboration efforts helped establish a model that fairly addressed priority outages and personnel expectations with a simple and sustainable implementation.

Computer Security Breaches a Threat to Credit Sales

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Abstract

Business security has progressed from the wooden cash box to the cash register and now the nightmare of the computer. Control has progressively slipped from the control of the instrument operator to a little understood collection of networked instruments. This evolution of difficulty has created numerous protection problems for the business operator. Not only does the cash and other payment means need collection and protection, but now the payment instrument itself has fallen under the responsibility of the vendor.

Business owners are as much at risk from cyber security as from physical security. Thieves don't have to rush the store with guns blazing to steal money in fact they don't have to steal money from the store at all. Information and data are the sources of new gold. The information collected from customers' credit cards contains enough data to secure riches for any enterprising evil doer.

In addition to normal data growth, regulatory compliance (Sarbanes/Oxley (SOX), SEC17a, HIPAA, Patriot Act, Freedom of Information etc.) is contributing exponentially to data growth, as more records are generated; more regulations are created in more industries. This creates a big fat target as much a target as any "old west" bank, and businesses are responsible for the protection and security of customers' data.

Hackers used to attack computer systems for the fame, more recently; attackers seem to be turning their attention to cybercrime for profit. Cybercrime is a term used to describe criminal activities conducted over the Internet. The most recent Symantec Internet Security Threat Report (2006) found that financial services was the most frequently targeted industry between July 1 and December 31, 2005, up from the number three spot in the first half of 2005. Symantec expects that attacks targeted against the financial services industry will continue to rise as attackers become more profit driven.

Understanding how the attackers are getting into the financial institution's system is the first step in fighting back against the criminals. By understanding how the crimes work, financial institutions can reduce their likelihood of being a victim.

What methods are attackers using to gain financial information? According to Ted Crooks, vice president of Identity Protection Solutions at Fair Issac, new [internet] scams emerge faster than experts are able to identify and combat (as cited in Bauknight, 2005, p.19). Phishing is a prime example. While a recent increase in stories in the media are educating the general public about it for the first time and are convincing business owners that phishing is a major problem, the attackers are already beginning to move on to more sophisticated and specialized techniques of

information theft (Bauknight, 2005, para. 19). Phishing and a similar scam called pharming, are two of the most popular methods for stealing confidential information recently. The best way to fight against these types of attacks is to understand how each one is used to gain access and how widespread the method is used. By learning that information, financial institutions can begin cutting off that access.

According to a study conduced by Time Warner Inc.'s Internet unit AOL and the National Cyber Security Alliance; about one in four U.S. Internet users are targets of phishing attacks and 70% of consumers who were targeted, believed they were being contacted by a legitimate company (as cited in *PC Magazine Online*, Dec 7, 2005). So what is phishing? The Federal Deposit Insurance Corporation, a federal regulator of financial institutions, defines phishing as a scam that encompasses fraudulently obtaining and using an individual's personal or financial information (Consumer Alerts, May 5, 2005).

> In a typical phishing scam, you receive an e-mail supposedly from a company or financial institution you may or may not do business with or from a government agency. The e-mail describes a reason you must "verify" or "resubmit" confidential information – such as bank account and credit card numbers, Social Security numbers, passwords and personal identification numbers (PINs) – using a return e-mail, a form on a linked Web site, or a pop-up message with the name and even the logo of the company or government agency. Perhaps you're told that your bank account information has been lost or stolen or that limits may be imposed on your account unless you provide additional details. If you comply, the thieves hiding behind the seemingly legitimate Web site or e-mail can use the information to make unauthorized withdrawals from your bank account, pay for online purchases using your credit card, or even sell your personal information to other thieves (FDIC Consumer News, Winter 2003/2004).

Identity thieves have even posed as representatives of the Internal Revenue Service (IRS) to try and trick taxpayers into revealing private information that could be used to steal from their financial accounts. Phishing was number three on the list of the 2006 "Dirty Dozen" issued by the IRS in February, 2006. The "Dirty Dozen" is the IRS's annual tally of some of the most notorious tax scams. The Treasury Inspector General for Tax Administration (TIGTA) has reported that it found 12 separate Web sites in 18 different countries hosting variations of the IRS phishing scheme (www.irs.gov, Feb 7, 2006).

Tatiana Platt, AOL's Chief Trust Officer, stated that "Phishers are getting better at tricking consumers into revealing their bank account and financial information, and most Americans can't tell the difference between real e-mails and the growing flood of scams that lead to fraud and identity theft" (as cited by *PC Magazine Online*, Dec 7, 2005). This is a problem for financial institutions for more than the obvious reason of risk to their customers. Phishing has become so widespread, that their customers, who are so fed-up with the daily con attempts, are now unwittingly throwing out the legitimate messages along with the fraudulent ones (Brandt, 2005, p.34).

> "You wanted to know who I am, Zero Cool? Well, let me explain the New World Order. Governments and corporations need people like you and me. We are Samurai...the Keyboard Cowboys...and all those other people who have no idea what's going on are the cattle....Moooo." (Hackers 1995)

> This is our world now... the world of the electron and the switch, the beauty of the baud. We make use of a service already existing without paying for what could be dirt-cheap if it wasn't run by profiteering gluttons, and you call us criminals. We explore... and you call us criminals. We seek after knowledge... and you call us criminals. We exist without skin color, without nationality, without religious bias... and you call us criminals. You build atomic bombs, you wage wars, you murder, cheat, and lie to us and try to make us believe it's for our own good, yet we're the criminals.
>
> Yes, I am a criminal. My crime is that of curiosity. My crime is that of judging people by what they say and think, not what they look like. My crime is that of outsmarting you, something that you will never forgive me for.
>
> I am a hacker, and this is my manifesto. You may stop this individual, but you can't stop us all... after all, we're all alike. (The Mentor, 1986)

Say cybercrime and this is what many people think of, young computer kids breaking into banks and controlling stoplights like they do in the 1995 movie, *Hackers*. The reality is that cybercrime is far more insidious and far reaching than hackers and hacker exploits.

Yes, virus attacks, Trojan horses, and worms are very real threats to computer security, yet the real threat to computer security is often overlooked; the human element. With the ever expanding growth of the Internet and the constantly increasing numbers of users connected to the Internet, there is really no question that cybercrime will continue to increase in the coming years. According to Charlie Fuller (2003), in his book, *Crime and Detection: Cyber Crime,* "Internet traffic increased 25-fold between then [1989] and 1994" (p. 13). By 2002 544.2 million people were using the Internet, a total of 8.96% of the population. Of course criminals are going to be more and more prevalent as Internet use continues to grow.

Before one can detail cybercrime, how it is perpetrated, how authorities fight it, and how the criminal element continues the cycle by circumventing the enforcement forces, one must define just what cybercrime is.

The *Oxford English Dictionary* defines cybercrime as, "**cybercrime** n.., crime or a crime committed using computers or the Internet." (OED.com, 2006) According to this definition, the perpetration of any crime involving a computer or the Internet is a cybercrime. Technically, this could be considered anything from stealing a computer program to using the Internet to take over the operating account of a Fortune 500 company.

Hackers and hacking are likely the cybercrimes that garner the most media attention. This could be because of the marginalization of the perpetrators or the fact that many of these exploits occur on smaller businesses that do not have the resources to keep the attack quiet and out of the press. There are two types of hackers one has to consider in any discussion of cybercrime.

White hat and black hat. Like the old black and white cowboy movies, the cowboy in the white hat fought for good, while he of the black hat was a villain through and through. White hat hackers do their work to benefit the common good. Curiosity drives these individuals to explore the world of bytes and bits and when, in the midst of their exploits they find an error or weak-

ness, these good hackers inform the author of a software or the network security officer of the network where a weakness was found so that these errors can be repaired to prevent further breaches.

Black hat hackers, as the name implies, are not so benign. They hack for many of the same reasons as their White hat brethren, but their ends are destructive. These hackers find weaknesses in software or network security and exploit these for their own gain. From breaking copyright protection to incrementally siphoning money from bank accounts to their own, these hackers often have the same moral code as your common criminal, they just happen to posses an extensive computer knowledge. And any hacker has to have a well stocked tool box of computer skills. There are a number of 'universal tools' which every hacker, white or black hat seems to posses:

- Knowledge of computer languages such as: C, Java, Perl, C++, and VisualBasic
- General UNIX and/or systems administration knowledge
- Knowledge of network hardware and software
- Security protocol information
- Plenty of spare time (Schell and Martin, 2004, p. 53)

Contrary to the ideas many have about criminal activities, computer criminals are far from being unintelligent thugs, rather they are intelligent people who unfortunately use their knowledge and skills for illegal ends.

These hackers try the patience of policing authorities as they have time and are highly intelligent and seem able to quickly circumvent any new steps the authorities take to block their crimes. The white hat hackers also tend to become the greatest weapon against cybercrime that enforcement agencies have. These hackers turn their natural curiosity and talent against their criminal opposites in an effort to reduce cybercrime.

As soon as the white hat guys and gals come up with a defensive tactic against the blackhats, the criminal element, as in the real world, devise new schemes to get around the enforcement agencies' blocks. Obviously, this aspect of cybercrime becomes a never ending cycle of exploit, defense, and new exploit. Many times these crimes are nothing more than a guy or gal in his or her bedroom or basement just seeing if they can breach some piece of security or copyright, but not always.

It would be nice to say that hackers are the only cybercriminals one would have worry about, but this is not the case. With the proliferation of the Internet and the personal computer, even common, less educated criminals can harness the power of the web to commit crimes. There seem to be far too many news reports of pedophiles being busted because of their use of computer networks to find under-aged targets. From MySpace to simple Internet searches, pedophiles make use of the power of the computer world to remain anonymous and find victims.

The web makes it so easy for criminals to cover their tracks that it is hard for law enforcement to keep on top of the problem. Unfortunately, the problem is not limited to pimple faced kids hacking in parent's basements and mentally deranged criminals who would commit their crimes with or without the Internet. There are many, many other serious cybercrimes and criminals out there in cyberspace.

Identity theft, a traditional crime, once executed through dumpster diving; the practice of going through garbage looking for things such as social security numbers, account numbers, and other information used to take over another's identity is now aided by the computer and Internet. In a matter of hours, a criminal can completely assume the identity of most anyone on the planet. These criminals divert funds from the mark's bank account to unmarked accounts, secure credit cards in the mark's name, and other exploits to monetarily gain from other's personal information. Because it often takes time for discrepancies to appear on a credit report, many victims do not know they have been affected until a loan application or credit card application has been denied. By this time the criminal's trail is often so cold that it is near impossible to track him or her down.

Apart from being hard to find the perpetrator, identity theft is an expensive crime for the victim to recover from. It takes years for a victim's credit to rebuild fully and it can cost the victim up to or over 10,000 dollars to clean up all the records affected by the thief's activities. In the case of identity theft, the authorities state that the best defense is a good offense. Social security numbers are the key that these criminals need to access the victim's information and steal an identity, so enforcement agencies warn to remove social security numbers from driver's licenses and other identifying documents. As noted on http://www.IDtheftcenter.org, "Guard your Social Security number. When possible, don't carry your Social Security card with you" (Idtheftcenter.org, 2006)

Identity theft is just one traditional crime that has moved to the Internet. Money laundering, "the metaphorical 'cleaning of money' with regards to appearances in law, is the practice of engaging in specific financial transactions in order to conceal the identity, source and/or destination of money and is a main operation of underground economy" is big Internet business (Wikipedia, 2006). The proceeds of money laundering often go to fund the commission of 'real world' crimes such as drug trafficking and terrorist acts. The criminal's use the Internet to route monetary devices through a convoluted path of off shore banks and into different devices such as deposit certificates, bonds, pre-paid credit cards, and gift cards. Through the use of these devices, the criminal is able to wash the illegal source of the money.

To combat this type of cybercrime, the US government has created a number of regulations that US based banks must comply with to help prevent money laundering. However, these steps do not prevent the exclusive use of off-shore banks for money laundering. This adds a dimension of complication when law enforcement is called in to help in a potential money laundering case.

Money laundering, as mentioned above, often leads to terrorist acts, and terrorists are using the Internet in a number of ways to coordinate their activities. As all Americans heard after 9-11, the Internet was a major communicative channel for those involved in the attacks. As of yet, a serious cyber-terrorist attack has not occurred, but the prospect is a chilling one. Since most every aspect of our daily lives connect to computers in some manner, a well devised attack of terrorist funded hackers could literally bring America, and the world to a standstill. Walter Laqueur, an expert on terrorist activity is quoted in the book *Cybercrimes* by Gina DeAngelis as saying, "one U.S. Intelligence official has boasted that, with $1 billion and 20 capable hackers, he could shut down America" (DeAngelis 2000, p. 37).

The best defense against this sort of attack is constant vigilance against the new exploits that hackers use to penetrate networks. By constantly improving and adjusting security measures, the

hacker's jobs are made that much harder as the tools in the hacker's bag of tricks are continually made obsolete.

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Using RSS in Higher Education

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Abstract

RSS is an XML-based markup language used for distributing announcements and other types of information across the Internet. Due to its ease of use and versatility, RSS has become increasingly popular in higher education. RSS can be used to distribute information such as campus announcements, course materials, and many other types of data including audio data. The purpose of this session is to introduce the major RSS standards, demonstrate how to develop RSS content, and discuss how RSS technologies can be used to support academic goals in higher education.

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

Using Wireless Technologies to Develop Web-based Applications

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Abstract

In recent years, wireless technology has grown rapidly, providing users with capabilities to access data using mobile devices including PDAs, PDA phones, and cellular phones. The focus of this session is on the planning, development, and implementation of web-based applications using the latest technologies so that users can access web resources with mobile devices. Using technologies such as ASP.NET, XML, WML, and various scripting languages, these applications are dynamic and user-friendly. The purpose of this session is to demonstrate these technologies, showing the relative ease and viability of producing Web-deliverable applications using common mobile controls and server capabilities. Special emphasis will be placed on applications that support academic functions.

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

ARTstor- A Digitized Library of Art Images

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Abstract

This session will introduce users to ARTstor, a non-profit organization created by the Andrew W. Mellon Foundation. It is a digital library of art images, associated information and software tools designed to enhance learning, teaching and scholarship. It contains approximately 400,000 images from a wide variety of culture and time periods. ARTstor documents artistic traditions across many times and cultures and embraces architecture, painting, sculpture, photography, decorative arts, and design as well as many other forms of visual culture. In its richness, scope and variety, this service supports the needs of professors and scholars throughout the arts and humanities.

This presentation will demonstrate how to utilize ARTstor and how it is used at Franklin College. It will also walk through the process of searching for art work as well as downloading and manipulating images.

The Offline Image Viewer will also be demonstrated. This presentation tool gives you the capability of giving reliable, internet-independent classroom presentations as well as creates presentations of personal/institutional images with or without ARTstor images.

Content for ARTstor comes from many Collections, The University of California, San Diego, Museums, and First Fleet Collection to name just a few. There are also specialized Collections such as Art History Survey Collection, and the Huntington Archive of Asian Art.

Artstor contains digital images of art, architecture and archeology browsable by collection, category and Image Group. Artstor's definition of 'art' is all-encompassing. It includes:

- architecture
- painting
- photography
- prints
- drawings
- sculpture
- decorative arts and design
- archaeological objects
- anthropological objects

Each image contains descriptive data about the image including creator, title, object date, creator birth/death dates.

Shared Folders can be created in Artstor giving the ability to create image groups within the folders. You can control the access that other users will have to these shared folders and image groups. There is also the capability to create student folders.

You do not have to be a registered user to utilize ARTstor. As an unregistered user you can search, browse, open images and analyze the image data. In order to save images into groups, and use the higher-level features you have to be a registered user. ARTstor has over 25,000 people from 470 participating institutions that are registered users.

Background

The Franklin College Art professors used to present curriculum by utilizing a slide projector. Downfalls with using slide projectors included the cost involved in replacing damaged slides, slide organization was burdensome and time consuming and not having a database of the slides and their related information was inconvenient.

As the art professors' technology skills advanced, the slides were then being scanned and the images were being inserted into Microsoft PowerPoint presentations and the curriculum was being presented via a laptop and multimedia projector.

In the spring of 2004, Franklin College received an e-mail informing us about the site of a new digital art library, posted that day in the Chronicle of Higher Education / Information Technology. The art professor immediately investigated all the information available in reference to this online repository of art images, called ARTstor, and decided that this might be something very useful for all art classes (and other classes that make use of art images) taught at Franklin College. They were able to obtain a two week trial and tested the performance of this online repository in the classroom.

They were impressed by the quality of the images within ARTstor, the user friendliness of the software and the capabilities within ARTstor to display and zoom in on artwork. ARTstor was then purchased for use campus wide at Franklin College.

ARTstor is utilized greatly by the art professors at Franklin College. Faculty and students have access to this online service. Artstor is accessible on campus as well as off campus through our EZ Proxy server.

We continue to train and educate the Faculty and students at Franklin College on the utilization of this software.

Pros of Artstor

Downloaded images are not pixilated and the quality is not diminished. Sharpness is incredibly important for art history classes.

Artstor's Image Viewer provides the capability to view enlarged views of images and enables you to zoom in on details, pan to different sections and rotate the image 360 degrees.

Multiple images of a specific piece of artwork can be displayed side by side.

Offline Image Viewer gives reliable, internet-independent classroom presentation capability.

Cons of Artstor

Some categories display such a magnitude of images it is time consuming to examine all and determine the best images.

Modern Art is very limited in Artstor.

Cost factor

In conclusion it is the opinion of some at Franklin College that Art history majors or major programs would be very well served to utilize Artstor. We hope to see Artstor get more images of Modern Art and continue adding to their current collection.

1. The ARTstor Digital library provides professors with a resource that allows for the expansion of pedagogical practices and techniques in the classroom, introducing new exercise and creativity into lessons.

2. Cross-Discipline Research: ARTstor's large and broad collection of high quality images has resonance across a variety of disciplines.

3. Information Integrity: Professors and students value ARTstor as a trusted source of credible data, especially at a time when students rely heavily on the internet as a source for images and data. The information that accompanies each ARTstor image enables access to relevant content in the appropriate context.

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http://www.artstor.org

Testing One, Two, Three!

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Background of the College

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

Enrollment is approximately 1100 students. Hampden-Sydney men are traditional aged and reside on the campus. The student/faculty ratio is 10:1, with a large percentage of the approximate 110 members of the faculty electing to live on campus.

Introduction to Project

Faculty at Hampden-Sydney College are heavily involved in the governance and operation of the College. In May 2004, in response to an earlier vote to make computer literacy a goal of the College, the faculty voted to initiate a requirement that students be tested for computer literacy. After much debate, the faculty elected not to make the test a condition of graduation but rather that testing be done to determine whether our students showed improvement in their computer literacy skills as a result of their time at the College.

The faculty resolution for computer testing was flexible in that it did not require that all students be tested. However, it did specifically name Microsoft Word, Excel, and PowerPoint as the three software packages that the faculty felt all students should have a working knowledge.

Initial Assessment Proposal

The Associate Dean of the Faculty, a psychologist, was given the task of developing the research design for the assessment. He proposed a combination of a cross-sectional and longitudinal study. The cross-sectional measurement would come from testing freshmen and seniors in the same year. A longitudinal measure would come in the fourth year when the seniors taking the test would be the same students who had also taken it as freshmen. In the first three years, we would be able to compare freshmen with seniors but in the fourth year, senior scores could be compared with their freshmen scores.

Scoring of the assessment would be used to determine growth of computer skills. A defining score for judgment of an acceptable level of growth would not be implemented in the initial stage of the assessment. After four years of study, when the first freshmen class would be tested as seniors, then we would begin to have data that would allow us to define, for Hampden-Sydney, a

measurable goal. The first three years of the assessment was designed to collect data to define current skill levels.

The participant sample for the assessment would include sixty freshmen and eighty seniors. Freshmen selection would be by advising group with an attempt made to obtain a representative sample of students. For example, an advising group of honors students would be included as well as an advising group identified as at-risk. The senior sample would be randomly selected from all seniors. Freshmen would be tested early in their first semester and seniors would be tested in their final semester sometime prior to spring break.

Incentives for students to participate and do their best on the test would be put in place. Freshmen advisors would "require" their advisees to participate as part of advising activities, and seniors would be offered cash -- $10. In addition, for each class, a $100 gift certificate from the College Bookstore would be awarded in a drawing made up of those who achieved the top 25% of scores.

Assessment Selection

The faculty vote to initiate the computer literacy testing took place at the final faculty meeting for the academic year. As part of passing the assessment requirement, faculty voted for testing to begin in the fall 2004 semester. Because of this tight deadline, it was obvious that there was no time to develop our own testing measure. A commercial product was the obvious solution.

The Thomson Course Technology Skills Assessment Manager 2003 (SAM 2003) was selected because of its software coverage and its flexibility. It fully covered the three software products we wanted to assess -- Word, Excel, and PowerPoint. SAM 2003 also provided a variety of question formats for test creation. It offered true/false questions, multiple-choice questions, skills based scenarios, and the ability to create custom questions.

Development of Assessment

For the creation of the assessment, an ad hoc (Computer Assessment Project or "CAP") committee of faculty, administrators, and administrative and academic computing technicians was created. Faculty represented the hard and soft sciences, the humanities, and economics – the heaviest users of the three software packages to be assessed. The committee met during the summer of 2004 to select the specific questions to make up the exam.

Initially the CAP committee members met to explore the options available to them in the SAM 2003 product. They quickly agreed that the use of the skills based scenarios offered the kind of assessment that they were after. The skills based scenarios would require students to manipulate the actual software being tested instead of answering true/false or multiple choice questions about it and time was too short to create custom questions.

The committee held several brainstorming sessions to develop a list of skills which it felt all students should be able to accomplish. As the same test would be given to freshmen as well as seniors, the test needed to include some scenarios at a higher level of difficulty in order to measure growth in skills development. Therefore, each item on the skills list was ranked by the committee to be basic, intermediate, or advanced.

The length of the exam in relation to the amount of time it would take to administer the assessment was then considered. The committee wanted an exam that could be completed in thirty minutes or less and would have a balance of questions from Word, Excel, and PowerPoint as well as basic, intermediate, and advanced.

To select the exact questions to use in the exam, each committee member was given administrative access to SAM and was asked to survey the over 1000 scenarios available. The individual members selected questions and added them to a master SAM exam. As a group, the committee reviewed the master exam and culled the questions into what became colloquially known as the "CAP exam" or the "SAM test."

Forty-one questions were selected to comprise the assessment. See table below for specifics.

Word	Basic	Open file/close file Copy/paste/drag/drop Line spacing Change font Highlight text Align text Tabs Printing
	Intermediate	Find/replace Symbols Spell check Headers/footers Breaks
	Advanced	Outline Comments Endnotes
Excel	Basic	Insert rows/columns Save file as Adjust rows/columns Insert worksheet Rename worksheet
	Intermediate	"Type of data (text, general, currency, etc.)" Sorting Borders/fill color/titles Move worksheet
	Advanced	Basic formulas Headers/footers Absolute and relative cell value Chart/graph

PowerPoint	Basic	Create intro slide Design template Using different views Adding/deleting slides Create text slide Choose and change slide layout
	Intermediate	Manipulate text outline Create chart/graph Slide transitions Insert hyperlink
	Advanced	Animation and timing Save as web/HTML

Year One Testing

Prior to deploying the assessment to the freshmen class, the committee felt that a pilot test should be run with a small, selected group of students. Committee members recommended several upper-class students and seven of them were asked to take the exam. Each student was given $5.00 for providing this assistance. This student group encountered only a few minor glitches that were easily fixed before deploying to the freshmen class.

Although the original plan was to test freshmen early in the semester, it was mid-October before the exam was ready. To take the test, students would first need the SAM software on their computer. We decided to use Blackboard to deliver the software to them. Students selected to take the exam were enrolled in a Blackboard course where they could get the software and the SAM login URL. Once a student downloaded the software, he could easily login into SAM and take the exam at his convenience within the two-week window that had been set for the exam.

The freshman testing was doomed to failure for a series of reasons. By waiting to the middle of the semester to deploy the exam, advisors had lost the power of "requiring" advisees and a drawing for two $50 gift certificates for the College Bookstore was not enough of an incentive to take the exam. The few students who attempted to take the exam grew impatient with the slowness of downloading SAM's large software files. In addition, we did not know that SAM only works with Internet Explorer and that the College's Computing Center had that fall decided to switch from Internet Explorer to Mozilla Firefox as the default browser on new computers purchased through them. Therefore, with approximately 98% of freshmen purchasing new computers through the College, freshmen only had access to Mozilla Firefox and not Internet Explorer. When the testing period was over, only five freshmen had taken the exam with only two completing it.

Senior testing in the spring saw a complete change in the deployment of the exam. Instead of delivering the test via Blackboard, we elected to schedule time in the computer lab where students could take the test at regularly scheduled times over a period of two weeks. The software was preloaded on the computers so that students had only to take the test. All seniors were invited to take the exam and seventy-one of them took us up on our offer to pay them $15 to do so.

Also, as we had offered the freshmen, there was a drawing for two $50 gift certificates for the College Bookstore.

Year Two Testing

The resulting attendance of the senior class in the first year left us feeling some success in the project after our initial failure with the freshmen. We moved into the second year of testing assuming that we had finally worked through any problems with the testing process. We were not completely correct.

Again for freshmen, advising groups were identified and invited to participate in the testing. Realizing that we needed an incentive for freshmen to come, we offered $5.00 gift certificates to the Starbucks coffee shop that had recently opened on campus as well as a drawing for two $50.00 gift certificates for the College Bookstore. The test was again deployed in the computer lab at regularly scheduled times over a two-week period. Initial student attendance was very hopeful with honor student advising groups showing high levels of attendance. However, after the first week of testing, the numbers began to dwindle down to one or two students at each session. We extended the period of testing another two weeks and asked several faculty of all freshmen courses to bring their students for the test during class time. With this effort, we were able to achieve a reasonable sample of approximately sixty freshmen to take the exam.

For senior testing we repeated the process used in the first year and expected similar results. Seniors were offered $15.00 for taking the exam as well as the drawing for two $50.00 gift certificates for the College Bookstore. Attendance for the first two sessions was at full capacity. However, the following sessions brought almost similar results as the freshmen – three to five students per session. Additional sessions were added; we bombarded seniors with email inviting them to come. After sufficient begging and coercing to improve attendance, we finished the testing with approximately sixty seniors taking the SAM test.

Results

Data from the second year of testing has not yet been fully analyzed. However, the trend shows that results between the freshmen and the seniors are similar in their performance on PowerPoint, which is predominately high, while Word and Excel results varied depending on the skill level of the task. Seniors outscored freshmen in Word, Excel, and PowerPoint with Excel showing the biggest difference. Also, thus far, little relationship has been shown between a student's major and his overall performance or his performance on a particular software application. Nor has there been any correlation seen between grade point average and SAM scores.

We are continuing to extrapolate the second year data and make comparisons with the first year data.

Future Plans

Testing as it is now done will continue on freshmen and seniors in the coming years. When we reach the fourth (and probably more importantly the fifth) year of testing, we will specifically invite seniors who took the exam in their freshman year. At that point, we can begin the longitudinal part of the study by comparing freshman and senior results from the same individual. How

long the testing will continue into the longitudinal study has yet to be determined. In addition, how we apply the knowledge gained through the test results has yet to be determined.

Problems and Issues

Our first most obvious problem is finding an incentive for students to participate in the assessment. We found that "requiring" freshmen did not work. Paying seniors on the surface appears to work but we discovered that the financial office was requiring the students to complete so much paperwork before receiving their $15.00 that many of them never collected it. As seniors tell underclassmen about this paperwork "glitch," we anticipate that we will no longer be able to attract seniors with the promise of money. We are exploring the idea of offering gift certificates for Dominos, local restaurants, the College Bookstore, or Wal-Mart. Gift certificates would not require students to fill in any paperwork.

The timing of the exam is also a major issue. We still aim to have the freshmen testing as early as possible but so much is scheduled for freshmen at the beginning of their first semester that we are having difficulty finding room for the exam. For seniors we want to wait as late as we can in their final semester but run into the problem that if we do the testing after spring break the seniors are either too busy with major projects and paper deadlines to participate or they have come down with senioritis by then and are no longer interested in participating.

Conclusion

The development and creation of the assessment using the SAM 2003 product was easy and with few technical concerns. We are very pleased with the scenario based questioning offered by SAM 2003. However, it is the software-generated reports that make it an ideal product for our project. The reports permit us to see not only overall test scores for the exam but also each keystroke taken by each student in his attempt to complete each task required in the scenario. Therefore, we can collect data that includes not just correct and incorrect responses but near completions and reasonable errors. The resulting data can then be accumulated and formulated into a method for assisting students in their growth in computer literacy. Thus far, we have used this information to develop web-based tutorials to address common errors that we have identified from the SAM reports. We hope to see such more use of this data as we continue in the project.

Student Response Systems: A New Kind of Point and Click

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Background

Contemporary educational theory views learning as an interactive process. Students are believed to learn more and develop a deeper understanding of content when they are engaged in the learning process. This theory stands in contradiction to the traditional teaching strategies employed in many university classrooms across the nation.

The most common mode of instruction currently utilized in the university is lecture. This allows faculty to instruct a large number of students and cover a massive amount of material in a limited amount of time. A typical lecture can last anywhere from 30 minutes to over two hours and may involve little or no time devoted to questions from the students about the material covered.

The onus of learning in this instructional model falls squarely on the student. There are limited checks of understanding and the lecture continues regardless of if learning actually takes place. The students serve as "empty vessels" to be filled with the knowledge imparted by the faculty. This is a highly auditory form of learning that is now often supplemented with lectures created in PowerPoint or some other similar presentation software.

Presentation software such as PowerPoint can supplement lectures in a variety of ways. Most presentation software allow the inclusion of images, audio and video. Providing a graphical representation of a process or including a video or image of the content being studied helps engage visual learners. Furthermore, using the typical "PowerPoint outline" format helps scaffold students who struggle with note taking skills. However, the inclusion of multimedia still does not make the lecture experience interactive.

One innovative use of presentation software is the integration of student response systems. Student response systems transform the traditional lecture experience by adding interaction and allowing for frequent checks of understanding. Even in large lecture classes of over 100 students, student response systems have been effectively used to assess understanding, provide student feedback, promote discussion and encourage
higher order thinking.

Student Response Systems

Student response systems (SRS) are known by a variety of names including:

- Audience Voting System
- Classroom Communication System

- Classroom Performance System
- Classroom Response System
- Electronic Response System
- Personal Response System

and are often referred to as "clickers" due to the remote control like device used as a student interface. SRS first emerged as novelty item used in corporate training seminars, but have been quickly redefined as an educational innovation. Today, some SRS are packaged or offered as supplements to textbooks and may even include pre-created quizzes, exams and learning "games."

There are numerous student response systems currently on the market (see the resources section for a partial listing of companies), but most have the same components. The majority of SRS include software, the "clickers" or student interface and some type of receiver. Most SRS use stand alone software, but a few systems integrate directly into presentation software. In addition to providing the functionality to make lectures interactive, most software will also "grade" student responses (if activated by the user) and save both individual student answers and class data.

The student interface component, the "clickers," may take a variety of forms. Some systems use small "credit card" style responders while others use large "boxy" ones. Smaller clickers are easier to transport, but are also limited in their functionality. Most small responders can only answer multiple choice style questions while the larger models may allow for text or symbol input. Some SRS also offer the ability to interface with PDAs or laptops.

All student response systems also include some type of receiver that "communicates" the individual student responses to the SRS software. Systems that support PDAs or laptops may use a wireless network to do this, but most SRS use a physical receiver. The two most common types of receivers are infrared (IR) and radio frequency (RF). Systems that employ IR receivers tend to be less expensive (sometimes significantly less) but have limitations. Many IR systems support only a limited number of responders and are "line of sight" which means students must point their clickers responders directly at the receiver with nothing blocking the path. In addition, IR is affected by sunlight and may exhibit reduced functionality in brightly lit classrooms.

Prices for student response systems vary widely. Some systems are bundled with certain textbooks and offered free of charge to faculty who select that particular text. In most of these instances, the software and clicker(s) are provided free of charge to the instructor and students much purchase their own clickers. Student prices for receivers can run anywhere from $20 to over $200 depending on the receiver type and the publisher. Furthermore, if the use of SRS is not coordinated, students may find themselves required to purchase a different responder for each class. Typically students can resell their responder the same way they'd resell their textbooks.

Another purchase option for SRS is the "classroom set." In this scenario the purchase price is the combination of the costs for the software license(s), the receiver(s) and the responders. Depending on the number of receivers and responders purchased, this price is likely to be several thousand dollars. The advantage to purchasing a classroom set is that there is no cost to students, students do not need to remember to bring the responders to class and the set can be used by multiple faculty members as long as the timing is coordinated. However, the use of a classroom set

does need to be coordinated and, if the instructor is tracking individual student data, students need to use the same responder each class meeting.

Student Response Systems at Miami University Middletown

On Miami University's Middletown (MUM) campus, student response systems have been used across disciplines and by assorted offices. Originally, faculty in the physics and math departments purchased classroom sets of the eInstruction system. This system uses stand alone software that includes the ability to create interactive games similar to Jeopardy and others. As more faculty began to request SRS, the Educational Technology Center (ETC) explored purchasing a classroom set to be shared by the interested parties.

The ETC purchased the TurningPoint system with 30 responders and an IR receiver. TurningPoint was selected because it integrated directly into PowerPoint, which permitted the integration of multimedia. In addition, our faculty are already familiar with PowerPoint which meant a low learning curve and quick adoption of the system. The system was grouped with a tablet notebook and a projector so faculty could use the system in any classroom on (or off) campus.

To date, the system has been used in botany, chemistry, computer information technology, English, history, nursing and physics courses with anywhere between 10 and 80 students at a time. The system has also been used by admissions to poll and collect data about students attending information sessions, by student services to add interaction to freshman orientation sessions, and by the Center for Teaching and Learning (CTL) for small group instructional diagnosis. The botany and chemistry departments recently purchased their own TurningPoint system; nursing and the CTL are considering this option as well.

Most faculty who are using the system to supplement lecture use an adapted lecture model that assesses student understanding of new concepts and promotes application and extension of those concepts. In this model, a typical 50 minute lecture is broken down into 4 or 5 "mini-lectures" that cover a distinct concept or group of concepts. At the end of the mini-lecture, the instructor uses the SRS to pose 2 or 3 questions to assess understanding. Some instructors pose a question, display the aggregate student responses and then ask students to discuss their responses with the people sitting near them (prior to disclosing the correct response). The instructor then poses the same question again to assess whether peer interaction increased understanding of the concept.

This type of assessment provides valuable feedback to the instructor. As one instructor stated, "[SRS] enabled me to vary the lecture format. Students appeared to enjoy the interaction. I knew immediately what concepts were not understood." This model helps the instructor determine if a concept needs to be explained further or in more detail. This is especially important when concepts build upon each other. This model also encourages students to process and interact with new concepts while they are still "fresh" in their mind and employs frequent breaks in lecture to prevent confusion.

While the nursing department has been using the lecture model outlined above, they've also developed a unique application of the system that fits the practical nature of nursing. Nursing courses tend to have large enrollments which makes scenario activities difficult to organize and manage. The student response system has helped nursing faculty address this issue through the development of scenario based presentations. These presentations can assume a variety of for-

mats. A faculty member might give a verbal description of the scenario, provide an image or audio file of symptoms or show a short video. The students then respond to a number of questions where they indicate how they should respond, choose the correct procedure or make a diagnosis. This allows students to begin applying knowledge prior to entering the field.

The English department and the Center for Teaching and Learning have also developed a unique application of our student response system. Faculty have often reported that students are reluctant to engage in discussion particularly when probed about controversial topics. Even when the discussion topic seems relatively mundane, some students never engage. Using the SRS to ask difficult questions, students have a "voice" to respond while maintaining their anonymity. Furthermore, posting the aggregate responses has proved to ignite discussion as the computer boldly "starts the conversation." One faculty member stated, "the 'clickers' definitely helped increase class discussion. Once the results of certain questions were posted everyone wanted to say something!"

Perhaps due to the novelty of the SRS, student responses have also been positive. Student anecdotes from various faculty surveys include:

> "More interesting than regular lecture."
> "I knew right away if I didn't understand something"
> "Let me think about stuff before we moved on."
> "Gave me a way to participate without talking."
> "I liked talking about answers and then getting a second chance!"
> "Helped me realize I wasn't the only clueless one in class."

There have been challenges, but our students tend to understand some problems with new technologies. Students today appear to feel very comfortable with a "remote control" type device in their hands. They want and appreciate the immediate feedback they receive when SRS systems are used.

Recommendations

Based on our experiences using SRS, we would like to make the following recommendations:

- If you require students to purchase a responder, plan to use it regularly. This is particularly important if the responders will be considered expensive by your students.
- Use your SRS for surveys or non-graded assignments several times before attempting any type testing that impacts student grades. This gives you and your students a chance to familiarize yourselves with the system and work out any issues that might impact the testing procedure.
- Ask your textbook publisher if your textbook can be bundled with a SRS. If so, ask if you can "borrow" a system to try with your students prior to committing.
- Encourage your Center for Teaching and Learning or Technology Services to purchase a classroom set that interested faculty can borrow.
- Test your first few presentations using actual responders. Be sure to test any timings your system might allow you to add.

- Plan for problems. Keep extra batteries on hand and have a back-up plan in case the system isn't working properly.
- Think outside the box when using SRS. The more interaction and higher order thinking you can build into the presentation the better.
- Have fun!

Resources

Audience Response **http://www.audienceresponse.com**

Class in Hand **http://classinhand.wfu.edu**

H-iTT **http://www.h-itt.com**

Qwizdom **http://www.qwizdom.com**

eInstruction **http://www.einstruction.com**

TurningPoint **http://www.turningtechnologies.com**

Reply Systems **http://www.replysystems.com**

Numina **http://aa.uncw.edu/numina/srs**

From Refrigerators to Fantasy Football Teams – Using Excel Solver

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Introduction

The objective of this session is to introduce you to two of the advanced tools found in MS Excel. Most of you know spreadsheet basics but until you have taught an advanced Excel class you may not be aware of two of Excel's most powerful tools - Goal Seek and Solver. This session briefly introduces Goal Seek and concentrates on demonstrating Solver. Solver is used to arrive at a solution of a complicated problem.

Many problems can be solved using trial and error, multiple what-if-analyses, and/or one and two variable data tables. However, some problems are too complex to be solved using these techniques; we have to use stronger, more advanced techniques. Fortunately, Excel provides several tools that will solve complex, multi-variable problems. Today we will look at two built-in tools.

Let's assume that you are the owner of the Sumter Superstore. The appliance manufacturer is having a promotion that we want to take advantage of. We have 39 customer orders that we must fill, we have a budget of $50,000 and only have 1300 cf of available storage space in our warehouse. Keeping in mind these limitations, we need to figure out how many appliances to order to arrive at our greatest profit.

Sumter Superstore Orders

	Refrigerators	Stoves	Microwaves	Limits	
Unit Wholesale Cost	$850	$420	$195	Budget	50000
Unit Retail Price	$1,250	$595	$250	Storage Space	1300cf
Profit per Unit	$400	$175	$55	Cust. Orders	
Cubic feet per Unit	25	18	3	6 refrigerators	
				14 stoves	
Customer Orders	6	14	19	19 microwaves	
Quantity to Order	6	14	19		
Total Cost	$5,100	$5,880	$3,705	Find Most Profitable Mix	

Finding a Solution Using Goal Seek (GS)

Usually, trial and error is done by changing input cells and examining the result. GS solves the problem the opposite way; when you use GS, you specify the result you want, and GS changes the value in an input cell to arrive at the result. For example, we could specify the net income we want and tell GS to change one of the inputs until it arrives at that goal. GS is used when you know what answer you want but you do not know the value to place in a cell that is involved in the formula. To invoke GS, from the Tools menu, select Goal Seek. The GS dialog box will then appear. In the Set cell: reference box, enter the address of the result cell we are interested in. In the To Value: box enter the figure you want. In the By Changing cell: box enter the cell address of the input cell you want to change. The limitation of GS is that it only allows you to change one input cell. After clicking OK, GS will report its success in the GS Status box.

One of the problems with GS is caused by the fact that GS does not differentiate between integers and real numbers (we wouldn't want to buy part of a refrigerator, for example). Once GS gives you an answer, you could manually change the answer to a whole number.

Finding a Solution Using Solver

Our problem is to find the best solution – the one that yields the maximum net income. We could do several trials using Goal Seek, and see which one of them is better, but we can't be sure that we have found the best one. The only way to be absolutely sure that you have found the best solution using the trial-and-error method is to create all the solutions and then pick the best one. In the current problem, there are thousands of different combinations, certainly more than we want to run. Fortunately, Excel has an add-in program called Solver, a much more powerful alternative to GS.

Installing Solver

First check the **Tools** menu to see if Solver is installed and activated on your computer. If it is, the word **Solver** will appear on the **Tools** menu. If Solver does not appear, it is either installed and not activated, or not installed. If it is installed, it can be activated by clicking **Add-Ins** on the **Tools** menu. This will bring up a list of the add-in programs available to activate. Solver can be found on the list, and its box checked, and **OK** chosen. If it is installed, this will activate it, and it is available for use. If it is not installed, a dialog box will appear that will walk you through the installation of Solver. The Microsoft Office CD is needed to complete the installation. Once Solver is installed, you will not need to install it again. It will be available on the Tools menu to use any time it is needed.

Introduction to Solver

Solver's ability to maximize or minimize the results of a formula makes it a powerful tool. Complex business scenarios can be set up in a worksheet enabling you to use Solver to determine the optimal set of decisions to meet an objective, such as maximizing profits or minimizing expenses. Because Solver can answer very complex questions, it is an excellent tool for determining the best way to allocate resources, such as money, materials, or people.

Choosing **Solver** on the **Tools** menu brings up the Solver Parameters dialog box. Solver needs four types of information:
(1) It needs the address of the target cell that you want to maximize, minimize, or set to a specific value.
(2) It needs to know what you want to do with the target cell. (You have three choices – you can ask Solver to set the target cell's value to the greatest possible value, to the least possible value, or to a certain value which you enter.)
(3) Which cells it can change to arrive at the desired result.
(4) Constraints that limit how to solve the problem.

You will enter these values in the Solver Parameter dialog box. In our example, the target cell is the cell where the net income is, and we want Solver to find the maximum possible value. Changing cells (also called adjustable cells) are those cells that will be modified by Solver to solve the problem. The cells that Solver can change to solve the problem are the cells containing the count of each kind of appliance. The next step is to enter the requirements, or constraints. A constraint is sometimes (as in our problem) a limiting factor. Constraints are requirements that have been placed on certain values. The first requirement is that we order at least the number of appliances that customers already have ordered. We also are limited to a maximum order of $50,000 and all the appliances cannot take up more than 1300 cubic feet in our warehouse. Using these parameters I will walk you through solving the problem. We will type the constraints in the Add Constraint dialog box like this: First, click on **Add** in the **Constraints** section of the Solver Parameters dialog box. This brings up the Add Constraint dialog box, which has three boxes to enter values in. The first box asks for references to the cells in question. The second box lets you choose from several comparison options. The third box asks you for the address of the constraining cells.

Once all the constraints are set up, the **Solve** button in the Solver Parameters dialog box can be clicked. In the status bar, Solver can be seen trying several different solutions. When Solver finds the optimal solution, it displays a Solver Results box, saying that it has found a solution.

Creating a Solver Answer Report

Now that we have examined the optimal solution created by Solver, we can create a report that captures the important facts about the solution. Solver allows the capability to create an answer report. You create the answer report from the Solver Results window. Run Solver again. Click the **Solve** button and wait for the Solver Results window to appear. Check the Keep Solver Solution check box, and click on **Answer** in the Reports box. (Besides the Answer report, Solver also offers a Sensitivity report and a Limits report. Since these last two reports do not apply to problems where some cells are constrained to integer, we cannot create them for this problem.) Click **OK**. Solver creates the answer report and stores it in a separate worksheet called “Answer Report 1”. If you run Solver again, and create another answer report, it will be stored on a worksheet called “Answer Report 2”, and so on, for as many answer reports as you wish to create.

The answer report has four sections. Section one is the title section, containing identifying information. Section two is the Target Cell section. It shows the optimization goal (in this case, “Max”), the cell's address, the cell's name, the cell's value at the beginning of the Solver run, and the cell's value at the end of the run. The third section is the Adjustable Cells section, containing the same information (address, name, start value, ending value) about all of the changing cells.

The fourth section is the Constraints section. In addition to the cell address, name, and ending value for each of the constrained cells, there are three other columns. You include information about the constraining formula, the current status of the cell relative to the constraining formula, and the cell's slack. Each cell's status is either "Binding", which means it is at the constraint limit, or "Not Binding", which means the cell did not limit the solution. The slack (which is zero for all cells with binding status) shows the difference between the current value of the cell and the value at the constraint limit.

Saving and Loading Solver Models

There may be times when you will want to save the parameters of a Solver model. To do so, return to the original worksheet. Solver will save the parameters in some cells on this worksheet. From the **Tools** menu, choose **Solver**. From the Solver Parameters dialog box, click the **Options** button, which will bring up the Solver Options dialog box. Click the **Save Model** button. In the Save Model dialog box, you will see the suggested addresses of the cells where Solver will save the parameters. Change these addresses (it is only necessary to give Solver the starting address) so that Solver will not write the parameters over sections of the worksheet that have data in them, and click **OK**. It is a good idea to label this model. Now you may go back to Solver and change the parameters (perhaps to minimize the inventory, or maximize the count of one particular model), and run Solver again. You can reload the saved parameters at any time, by clicking **Tools**, **Solver**, **Options**, and **Load Model**, then entering the address of the cells where the parameters are saved. Then, click **OK** as many times as necessary to return to the Solver Parameters dialog box. The Solver Parameters dialog box will display the saved parameters.

Understanding Solver

Solver is designed to use an iterative process. That is, it starts with an initial solution, and then does the problem over and over, using different values in the changing variables. When a change to a variable results in a better solution, Solver makes another change to the same variable in the same direction. When a change results in a worse solution, Solver does not make any more changes to that variable in that direction. Solver continues to make changes and re-run the problem, until it arrives at a solution that is not significantly better than the previous one. At that point, Solver reports success. Solver uses a technique called linear programming to solve problems. (Linear programming is a complex mathematical process used to solve problems that include multiple variables and the minimizing or maximizing result values).

The Solver Options dialog box has the following choice boxes, where you can control the way Solver runs: (1) Max Time – Solver will stop when it has been looking for a solution for this much time. If it has not yet found a solution, it will give you the option of stopping without an optimal solution or continuing for another time set. (2) Iterations – Solver will stop when it has done the problem this many times, even though it may not have arrived at a solution. Again, it will give you the option to stop or continue. (3) Precision – Solver continues to work until the constraints are satisfied within this precision. (4) Tolerance – similar to Precision, but for integer constraints. Solver stops when the answer is within this per cent of the constraint value. (5) Convergence – Solver uses this to determine when a solution is "significantly better" than the previous one. If the change in the two solutions is less than or equal to this value, Solver will stop and declare that it has found a solution. (6) Assume Linear Model – if you know your problem can be solved with linear functions, you can speed up Solver by checking this box. A linear

function is a function that can be written as the sum of a series of variables, where each variable is multiplied by some constant. A non-linear function involves using some mathematical operation other than summation. Solver sometimes has problems arriving at a solution to non-linear problems, simply because in a non-linear problem, there may be many avenues that Solver could travel to find solutions, and it is not always possible to determine which of these directions is best. The rest of the choice boxes in the Solver Options dialog box have to do with helping Solver solve non-linear problems. These options are for the advanced user.

Knowing about these options sometimes allows us to reduce the time and effort Solver uses to solve a problem. For example, as was previously stated, checking the Assume Linear Model box will greatly speed up Solver. You can also reduce the time and iteration count, and raise the precision, tolerance and convergence levels. You can do any or all of these things to help Solver arrive at a solution, thus fitting Solver to the data of your problem, thereby making it more efficient. Most problems are solved without these advanced settings.

I plan to conclude the demonstration by using solver to pick your winning fantasy football team. This will enable to win the office pool. Isn't ASCUE wonderful?

Summary

GS allows you to change only one cell while trial and error requires too much time to solve complex problems. Because GS is limited to one input and one output, you learned how to use Solver to manage multiple inputs to maximize the value in a target cell (goal). Solver allows you to solve complex problems where a number of variables can be changed in a worksheet in order to meet a goal in a particular cell. Because Solver changes the values in up to 200 cells to arrive at the desired value in the target cell, it is an indispensable tool for optimization problems in which you must determine the best way to arrive at a goal.
Solver is a very useful tool. Like anything complex, practice is the key.

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Maximizing Learning by Teaching Blended Courses

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Abstract

A blended course is defined as a course that combines face-to-face learning and distance learning to provide students with the best practices of both delivery methods. Learning and teaching through this method require a close evaluation of those components that should be adopted from traditional learning and distance education. This paper defines and discusses the reasons behind offering class in this mode. Further, this research discusses the benefits of using this method to meet the strategic plan of an institution. The planning and the design of a blended course are discussed in order to provide an understanding for both administration and faculty. Further, there is an examination to the existing technology to effectively deliver quality education in this mode. This research should greatly enhance the reader's understanding of blended learning as a balanced teaching method.

Introduction

The purpose of this research is to give a brief understanding of blended learning. It distinguishes blended/hybrid learning from both traditional learning and distance education. Although not all learning methods are perfect, this paper emphasizes mostly the benefits and advantages that blended learning can provide to both students and instructors. This paper discusses briefly some of the existing blended learning models. Further, this paper examines some of the existing models for blended learning.

Blended Learning Definitions

There are multiple definitions for blended learning. From the web portal, TeAchnology, the author defined blended learning as "an educational formation that integrates elearning techniques including on-line delivery of materials through web pages, discussion boards and/or email with traditional teaching methods including lectures, in-person discussions, seminars, or tutorials."

In their attempt to define blended learning, Singh and Reed (2001) focused on the learning outcome instead of the process of mixing and matching of different delivery methods in order to optimize the learning process. Also, to make it clearer, Singh and Reed proposed to refine the definition of blended learning by stating that "blended learning focuses on optimizing achievement

of learning objectives by applying the 'right' learning technologies to match the 'right' personal learning style to transfer the 'right' skills to the 'right' person at the 'right' time." The authors decided to embed four main principles in the definition. These include:

1. The focus must be on the learning objective instead of the delivery method.
2. To satisfy many learners, different learning styles must be applied.
3. Each person involved in the process of learning brings his/her own experience to the learning environment.
4. Most often, what the learner needs to know within a certain time period is the "most effective learning strategy."

Blended learning has become a widespread teaching phenomenon. From Vaughan and Garrison (2005) presentation to Educuase, the authors referred to Arabasz and Baker who found out that 93% of doctoral programs and 80% of all American universities and colleges offered blended learning classes. The above mentioned fact does support the notion that blended education has become a reality in the higher education. Further, the authors referred to Marquis whose study showed that 94% of British universities and colleges believe that combining traditional education with online learning can produce a more effective teaching style than face-to-face learning alone. Also, 85% of Britain's faculty believes that the use of teaching technologies are enhancing access to learning.

Maximizing Learning through Blended Learning

Skill and knowledge are prerequisites for succeeding in the business world these days. The life span for any system is a fraction of what it used to be a few years ago. Gray (n.d.) revisited these thoughts by stating how in order to excel in the business world, a business needs an able and trained workforce. In order to continue being competitive, an organization needs to create a learning place that will provide a continuous enhancement to its employees. The author is not only calling for behavioral changes but for sustaining good behavior. The author stated that blended learning allows for "sustainability to occur" in less costly and in a timely manner. This conclusion was reached as a result of comparing blended learning to both face-to-face learning and pure distance learning. Blended learning allows for the use of the most effective methods within the different phases of the learning process.

Another experience was observed in teaching technical writing. Spilka (2002) noted that most professional workers write their documents in the following manners:

- Without direct supervision. They also do it by themselves or collaboratively.
- Without dependency on their local coworkers, but they also depend on other members who might be geographically dispersed.
- With office automation equipment such as computers.
- With autonomy to make decisions as to when and where to communicate with other coworkers, how to deal with lack of response and how to submit the final outcome on due dates regardless of the hindrances and problems faced through the process of completing the project.

Spilka's observation was followed by a good question, which asks how business and professional writing professors can include all of the above mentioned points to be part of a traditional class. Spilka's finding noted the hardship she had to face in stimulating the class to represent the reality of the business world. In the hybrid class, it was obligatory for the learners to show maturity, accountability, and the agility to start, maintain and uphold the process in order to complete a pro-

ject. In addition to that, they needed the ability of judging their environment to succeed in collaborating with different people to produce a highly desired outcome. They needed to use their own judgment to overcome the challenges of collaborating with people they hardly knew, in order to produce coherent, high-quality documents.

From Spilka's experience it is obvious that traditional learning is capable of providing the learners with different activities that only blended learning is able to provide. Since blended learning by definition is to use whatever is best for the learner, it is clear that the freedom applied to choose any technique or approach gives the instructor and the learners multiple inputs to choose from before they arrive at the best possible learning experience.

Some Difficulties to Blended Learning

No situation is perfect and that is a given. The following list is to remind decision makers and educators that there are some points that need to be addressed. To avoid these points might reduce the quality of teaching in this mode. These might include:

1. Arabasz and Baker (2003) stated that "E-learning classes cannot function if instructors and students cannot operate the necessary hardware and software. "
2. Faculty compensation and initial difficulties to cope up with the learning requirement to teach in this mode.
3. Not all instructors are as effective in teaching blended courses.
4. Lack of time to train on various technological tools.
5. Students might have different computers with different bandwidth capabilities.
6. Different speed of computers used by the students.

The Benefits of Blended Learning

According to the research, blended learning replaced distance learning as the choice to meet the need of the learner in academia or in the business world. In the 1990's many people were fascinated by distance education (Bersin and Associates). The article continues to state that the expectations of distance learning were not the answers for all learners. The reality of learning required multiple solutions with multiple mixes of delivery methods and media. Further, the article noted that to succeed in obtaining the right training is to use "the right mix to a given business problem." As a result of all that mix, blended learning has become the effective choice compared to e-learning.

One of the most notable benefits to blended learning is the ability of the learners to continue asking questions about a topic that was not clear in the classroom in the first place. Learners usually don't have the ability to grasp the whole lecture in a traditional class. They have to wait until the next class or schedule a meeting to see their professor in person for the additional clarification. The waiting period for an answer could limit their understanding of subsequent materials in the same chapter.

Since most blended learning is supported by the use of technology in order to make up for the missing time in the classroom, students can easily communicate with their instructors or leave them a question in the discussion section. Students don't have to wait until the next meeting or

schedule some time to see the instructor in their office. The quick response time through the utilization of technology provides an additional level of interactivity.

There are many other benefits to blended learning. To answer the question "*Why use blended instruction,*" the author of *UCLA Blended Instruction Case Studies* came up with a comprehensive list of these benefits. The author started by emphasizing the goal of blended instruction as a method of teaching to provide quality education by increasing the benefits of both elearning and traditional education. The list contains the following items:

1. Class goals can easily be met.
2. Uniformed classes for multi-section offerings.
3. Redesigning courses so the educational outcome can be measured easily.
4. Effective use of class time
5. Enhanced computer literacy among students and instructors.
6. Flexible classroom scheduling.
7. Increased chances for doing research.
8. Course documents are available to learner 24 hours a day.
9. Using the World Wide Web resources to support class activities.
10. Students can participate at any time.
11. Students can collaborate on their own time.
12. Supply students with additional learning materials if they need them.
13. Reduce the instructor's redundant tasks.
14. Increase the quality of communications between the instructor and learner.
15. Better ability to monitor student involvement and advancement.
16. Using interactive programs that produce quick feedback and an advice for any remedial work.
17. Reduced rates of "DFW" which stands for drop, fail, and withdrawal respectively.

Advantages at a Local Level at Florida Keys Community College (FKCC)

The following paragraph states the administration's stand about blended learning. There is a clear understanding that blended learning is another avenue that FKCC should consider in attempting to serve the community better.

One of the most important factors in education is meeting the needs of the students. This is a creative task for institutions that must face fiscal restraint on one hand while providing opportunity to learn on the other hand. Blended learning meets this challenge in many ways. First, it accommodates the student's life schedule. Second, it provides for a necessary social connection that is so important for true communication to take place and for retention and success to occur. Today's educational delivery must reflect the changing nature of the medium while maintaining the crucial elements of quality instruction and design. Educational leadership must embrace this and ensure that students and faculty have the resources and support necessary to strengthen the learning continuum with advances in education such as blended learning.

At FKCC, the concept is new to the college teaching environment, but it is supported as seen by the above paragraph. Students usually meet the instructor on a face-to-face for a percentage of the time allotted for the class. In addition to the classroom time, students have access through the internet to a learning support system, Desire to Learn. The basic components can include but are not limited to:

1. Lectures notes usually written using PowerPoint presentation software
2. Readings and other explanatory materials relative to the topics of the course
3. An open discussion section where student/teacher and student/student interaction occurs around questions put forward by either the teacher or the students. This can be done at any time, day or night.

For the short period of time using blended learning, instructors have started to realize the advantages of blended learning at FKCC. These might include:

1. It gives the instructor and the student full time access to each other through the buffer of a course web page.
2. It allows students to ask questions when they occur to them and get answers promptly.
3. It allows for the discussion of nuances that might not come up in the classroom.
4. It allows the instructor to more accurately and specifically determine student progress.
5. It allows the instructor to add more elaborate clarification when student questions indicate it is necessary.
6. It promotes deductive and inductive reasoning skills by posing thoughtful questions for students to answer and giving them the time necessary to think them through.

In addition to the above pedagogical benefits, other advantages can result from taking blended classes. These include:

1. Less time spent in driving to attend classes at the college. This time can be invested in learning.
2. Less cost associated with traveling for long distances. Some students attending FKCC, even though the number is small, might have to drive about 50 miles to attend classes.
3. Less number of cars in the parking lot all the time.
4. More utilization of classroom space.

Some of the above points were truly emphasized after an interview with Ms. Julie Bailey, the Coordinator of Distance Learning at FKCC. When I asked Ms. Bailey "how does blended learning maximize learning," she noted that blended learning is able to:

1. Fulfill the mission statement of the college by serving the community better. For example, blended learning reduces the commutable distance.
2. Utilize the space of the college more efficiently.
3. Save students the extra expense by reducing the use of fuel because of attending classes one time a week instead of three times a week.
4. Continue the train of thought after the lecture by utilizing the "simmer effect."
5. Encourage creative thinking by not binding or limiting the thinking process only to a physical lecture.
6. Reduce inhibition of students by reserving their own judgments imposed by themselves or others. Students don't have to ask a question within the lecture, rather they can wait to ask it through the other communication tools available to support the activities after the class.
7. Enhance critical thinking since students don't have to come up with spontaneous answers to the questions asked in the classes. Students usually have longer period of time to come up with an answer.

Quick Review of Blended Learning Models

Valiathan (2002) discussed different types of blended learning models. Valiathan categorized these models into three types:

1. Skill driven model which requires an instructor or facilitator to support self-paced learners in order to acquire a pertinent skill or knowledge. This model demands constant feedback from the instructor to build the activities of the model. The author also emphasized a list of requirements that must be established for the process to be successful. These include:
2. A strict plan for a self-paced learning style but with a schedule.
3. The instructor should discuss an overview and a closing for each learning session.
4. Use a synchronous delivery method including online and face-to-face teaching to explain procedures.
5. Use email systems for additional communication.
6. Attitude-driven model which requires the collaboration between traditional classroom meeting and the use of multiple technological innovation to develop certain behaviors. For example a "behavior-driven approach" requires an effective communication among multiple participants in a"risk-free environment." Group projects and assignments should be completed offline. To accomplish these tasks, learners can use simulation and apply role-playing with the other learners.
7. Competency-driven model which requires the extraction of tacit knowledge from the experts at the job site. The learning can be supported by using various technological applications such as email and online discussion, assigning mentors as part of the learning and the creation of a knowledge warehouse are part of the learning model.

Other models do exist. Oliver (n.d.) discussed three types of models for blended learning. The model names are Model A, Model B and Model C. Model A has some of its elements available electronically but doesn't require students to be online. Model B requires student to access part of the materials online. Model C is fully delivered on online where students must access all materials online. A model by Drummond and Guerin (n.d.) includes multiple technologies including live satellite presentation to cover a larger geographical area. Other methods of delivery include traditional tutorial sessions, course materials, self-evaluation and collaborative learning.

It seems no matter what is the existing model for blended learning, a model tends to be unique and more pertaining to the local need or specific learning environment. The blending of the different delivery methods is not to establish a general model that can be applicable to all situations, but rather to create a model that serves a particular institution's or business' mission.

Conclusion

Not every moment of teaching is a teachable moment and not every moment for a learner is a learning moment. Blended learning allows students to come back and ask the questions they could not have an answer for during the face-to face lecture. The different technological tools and telecommunication innovations can extend the level of interactivity between the learners and the instructor. These technologies include the Web; the teaching support tools such as Desire 2 Learn and WebCT; the discussion and chat forum found in these tools; and email. With the ability to mix the benefits of traditional learning with the technological tools, which deals with the factors of distance and time, the benefits of blended learning have exceeded those found in both traditional learning and distance education.

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Maximize Your Programming Experience by Using ArrayList instead of Traditional Array in Visual Basic .NET

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Abstract

This paper compares the use of a traditional array, as data a structure, to an Arraylist, as a class with powerful methods and properties, in Visual Basic .Net. One of the most significant drawbacks of using arrays is their inability to adjust to different sizes. Arraylists can be added or deleted dynamically at run time. This paper should provide the reader with a comprehensive comparison between Arrays and ArrayLists. The obvious benefit of this research is to show the flexibility and the ease of using Arraylists in order to maximize and produce elegant code using Visual Basic .Net.

What is ArrayList?

The ArrayList class is found in the system.collection namespace. The ArrayList is an extremely effective and helpful class in VB .net (Roith, 2002). Roith continued by stating that ArrayList is dissimilar to an array because the number of its objects (elements) can grow dynamically. For example, a programmer can easily add an object at the end of the list by using the method Add(). Also multiple elements can be added by using the method AddRange(). Also inserting an object somewhere with the list of elements can be added by using either the method Insert() or InsertRange(), which allows for the insertion of multiple values. Finally, Roith stated that similarly a programmer can remove an item or multiple items by using Remove() and RemoveRange() respectively. Obviously from the above discussion ArrayList can expand or shrink.

Why ArrayList?

The most obvious reason for using ArrayList, in comparison to regular array, is that ArrayList can be expanded in runtime. While arrays are helpful and much more effective comparing to individual variables, they are inflexible and fixed in their size (Doke and Williams, 2005). The authors noted that "it is extremely difficult to change the number of array elements as your code is executing." Further a programmer can resize the number of elements dynamically with an ArrayList.

Since ArrayList is a .NET technology, it is available for C# also. When programmers switch from C or C++ to C#, they realize that there is no dynamic memory allocation (CSharpFriends.com, n.d.). Further, the reason for not having the dynamic memory allocation is

that ArrayList can do the same functionality but easier. As a result, programmers don't have to worry about freeing the memory or concern themselves with "array bound overflow."

Helpful Properties and Methods Used in ArrayList

Common Properties

The following list of ArrayList properties was selected from the Microsoft Developer Network (MSDN). To see the complete list of the properties for the ArrayList class, visit Microsoft at: http://msdn2.microsoft.com/en-US/library/system.collections.arraylist_members(VS.80).aspx

Name	Description
Capacity	"Gets or sets the number of elements that the **ArrayList** can contain."
Count	"Gets the number of elements actually contained in the **ArrayList**."

Common Methods

To give the reader an idea about the enormous functionality of an ArrayList, the following list of ArrayList methods was selected from The Microsoft Developer Network (MSDN). To see the complete list of the methods for the ArrayList class, visit Microsoft at: http://msdn2.microsoft.com/en-US/library/system.collections.arraylist_members(VS.80).aspx

Name	Description
Add	"Adds an object to the end of the **ArrayList**."
AddRange	"Adds the elements of an ICollection to the end of the **ArrayList**."
BinarySearch	"Overloaded. Uses a binary search algorithm to locate a specific element in the sorted **ArrayList** or a portion of it."
Clear	"Removes all elements from the **ArrayList**."
Clone	"Creates a shallow copy of the **ArrayList**."
Contains	"Determines whether an element is in the **ArrayList**."
CopyTo	"Overloaded. Copies the **ArrayList** or a portion of it to a one-dimensional array."
Equals	"Overloaded. Determines whether two Object instances are equal. (Inherited from Object.)"
FixedSize	"Overloaded. Returns a list wrapper with a fixed size, where elements are allowed to be modified, but not added or removed."
GetRange	"Returns an **ArrayList** which represents a subset of the elements in the source **ArrayList**."
GetType	"Gets the Type of the current instance. (Inherited from Object.)"

IndexOf	"Overloaded. Returns the zero-based index of the first occurrence of a value in the **ArrayList** or in a portion of it."
Insert	"Inserts an element into the **ArrayList** at the specified index."
InsertRange	"Inserts the elements of a collection into the **ArrayList** at the specified index."
LastIndexOf	"Overloaded. Returns the zero-based index of the last occurrence of a value in the **ArrayList** or in a portion of it."
ReadOnly	"Overloaded. Returns a list wrapper that is read-only."
Remove	"Removes the first occurrence of a specific object from the **ArrayList**."
RemoveAt	"Removes the element at the specified index of the **ArrayList**."
RemoveRange	"Removes a range of elements from the **ArrayList**."
Reverse	"Overloaded. Reverses the order of the elements in the **ArrayList** or a portion of it."
SetRange	"Copies the elements of a collection over a range of elements in the **ArrayList**."
Sort	"Overloaded. Sorts the elements in the **ArrayList** or a portion of it."
ToArray	"Overloaded. Copies the elements of the **ArrayList** to a new array."
ToString	"Returns a String that represents the current **Object**. (Inherited from Object.)"
TrimToSize	"Sets the capacity to the actual number of elements in the **ArrayList**."

Example One

This first example is to show the dynamic nature of an ArrayList. In line 7 below, myArrayList was created as an ArrayList with four elements. Lines 9 through 11, show how to assign values to the elements of myArrayList using the method Add(). As a result of the adding the three values, the following will take place in the memory:

- myArrayList(0) = "Bit"
- myArrayList(1) = "Byte"
- myArrayList(2) = "Kilobyte"

In order to show a value on the screen in console mode, we need to use console class and WriteLine( ) or Write( ) method. Once the method WriteLine( ) finishes printing a line, it advance the carriage return to the next line, while the method Write( ) doesn't.

Line 14 prints the capacity of myArrayList, using the MyArrayList.Capacity( )method. The result is 4. We reserved 4 items for the ArrayList initially and we used 3, therefore the capacity has not been totally used. It is still 4. When we used the method Count( ) with myArralyList.count(), it shows in the output the value 3. The value 3 indicates that only 3 elements out of the 4 have been used.

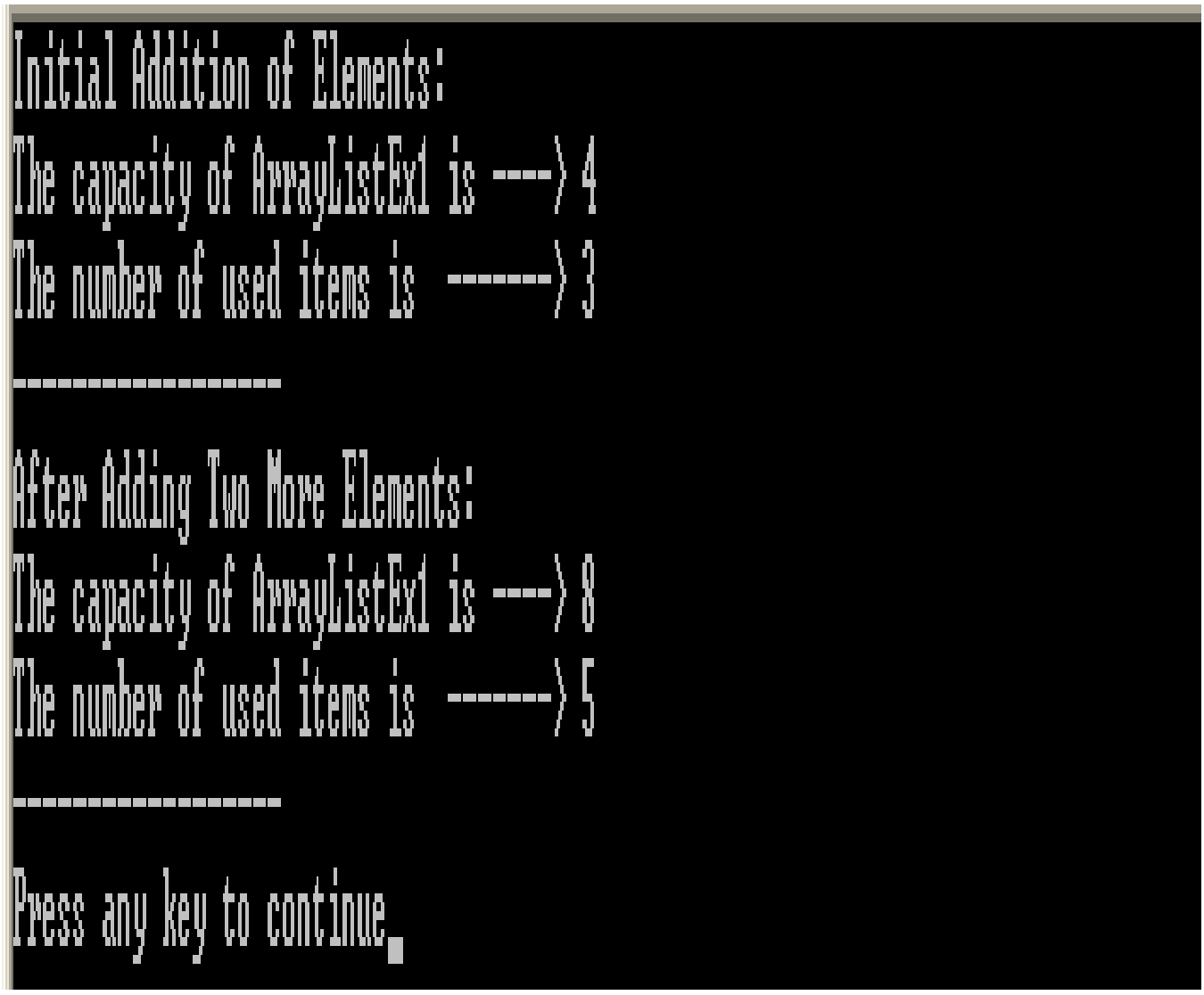
Line 18 and 19 added two more values to myArrayList. Wait a minute! Wasn't myArrayList created to hold only 4 elements initially? Yes, but adding two more values will exceed the original size of myArrayList, therefore myArrayList immediately doubled its capacity to 8 elements. this is exactly the reason for calling ArrayList a dynamic structure.

Printing the new capacity and the number of items used in myArrayList seen in line 21 through 24 will prove that the capacity is 8 and the number of the assigned items is 5.

It is interesting to see how ArrayList doubles its own capacity (size) dynamically as soon as we exceed the original size by one more element. This flexibility is very hard to obtain using array, especially during running time.

```
1          Imports System
2
3       Module Module1
4
5          Sub Main()
6
7             Dim myArrayList As New ArrayList(4)
8
9             myArrayList.Add("Bit")
10            myArrayList.Add("Byte")
11            myArrayList.Add("Kilobyte")
12
13            Console.WriteLine("Initial Addition of Elements:")
14            Console.WriteLine("The capacity of MyArrayList is ----> " & MyArrayList.Capacity)
15            Console.WriteLine("The number of used items is  -------> " & MyArrayList.Count)
16            Console.WriteLine("-------------------")
17
18            MyArrayList.Add("Megabyte")
19            MyArrayList.Add("Gigabyte")
20
21            Console.WriteLine("After Adding Two More Elements:")
22            Console.WriteLine("The capacity of MyArrayList is ----> " & MyArrayList.Capacity)
23            Console.WriteLine("The number of used items is  -------> " & MyArrayList.Count)
24            Console.WriteLine("-------------------")
25         End Sub
26
27      End Module
```

Output Screen for Example One



Example 2

This example shows selected methods used by ArrayList. The program starts by adding five elements to myArrayList. The initial capacity of myArrayList is 4, by the time the program executes line 11, the number of the elements will be doubled to 8.

Using the remove ( ) method shown in line 13, it will delete the item with the value "Ghz." Line 14 utilize the insert( ) method to insert the value "Byte" in the second position of myArrayList, since ArrayLists, similar to arrays, start with index 0.

Line 15 apply the method IndexOf ( ) to locate which entry is assigned to the value "Megabyte." The output below shows the result of using IndexOf( ) method which returns the value 3 since "Megabyte" is the element number 4 in the list. Another helpful method is Contains( ), which

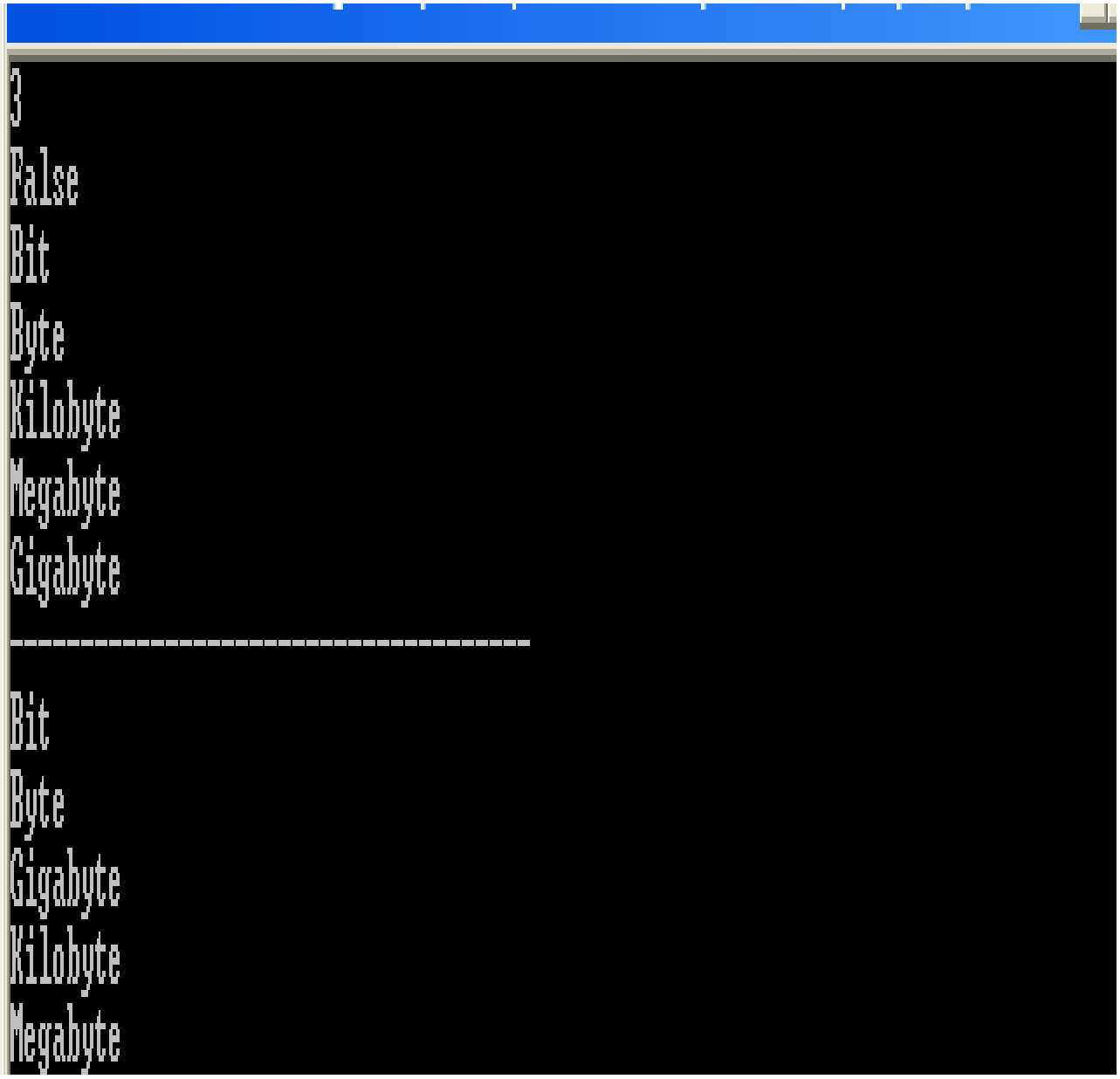
returns true if the value is found, else it will return false. From the output below, the returned value is false since the value "Terabyte" is not contained in myArrrayList.

The function printArrayList ( ) receives myArrayList and prints every elements in. This is shown below in the output. Immediately after printing myArrayList elements, the method Sort() was applied to myArrayList. myArrayList elements are sorted is ascending order as shown in the output screen output.

Other methods can be used as easily. ArrayList is a very powerful data structure. The above mentioned method can and should save programmers hours if they were to rely on using traditional arrays.

```
1       Imports System
2
3       Module Module1
4         Sub Main()
5           Dim myArrayList As New ArrayList(4)
6
7           myArrayList.Add("Bit")
8           myArrayList.Add("Kilobyte")
9           myArrayList.Add("Ghz")
10          myArrayList.Add("Megabyte")
11          myArrayList.Add("Gigabyte")
12
13          myArrayList.Remove("Ghz")
14          myArrayList.Insert(1, "Byte")
15          Console.WriteLine(myArrayList.IndexOf("Megabyte"))
16          Console.WriteLine(myArrayList.Contains("Terabyte"))
17
18
19          printArrayList(myArrayList)
20          myArrayList.Sort()
21
22          printArrayList(myArrayList)
23        End Sub
24          Console.WriteLine("-------------------------------------")
25
          Sub printArrayList(ByVal arrList As ArrayList)
26          Dim i As Integer
27          For i = 0 To arrList.Count - 1
28            Console.WriteLine(arrList.Item(i))
29          Next
30        End Sub
31
32      End Module
```

Output Screen for Example Two



Conclusion

ArrayList is a very powerful structure. It contains helpful properties (characteristics) and powerful methods (processes) that save programmers hours. An ArrayList is dynamic which allows for the expansion or shrinking of the number of its own elements. This ability itself provides programmers with the capacity to maximize their code without having to worry about redimensioning their arrays frequently, since ArrayLists have come to the rescue.

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Class on the Treadmill: Delivering Educational Video Content for the IPOD Computer and PSP

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Abstract

With the growing popularity of podcasting and the generation that multi tasks, it is inevitable that we cater to this lifestyle by offering educational content that can be viewed in a variety of ways in a variety of places. The newest version of Vegas Video makes this increasingly easy. We will demonstrate how you can take PowerPoint slides, audio files, and video files and easily put together rich content that can now be viewed on an Ipod, PSP, or any computer. This variety of output allows even more flexibility for the students. This content can be delivered via an RSS feed or just as a simple download in addition to CD or DVD.

Note: This session is a software demonstration and no paper is expected. The author will provide written material directly or via the web during the presentation.

Playing it CoOL: Developing the Center of On-line Learning (CoOL) at Miami University

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Background

Miami University likes to position itself as the Ivy League school of the midwest. Miami is steeped in tradition and offers a strong liberal education background for its undergraduates. The largest campus is located in Oxford, Ohio which is approximately 35 miles north of Cincinnati, and has approximately 15,000 undergraduates and 1,400 graduate students. These students tend to be of traditional age and entrance into the University is competitive.

Miami also has 2 regional campuses. They are located within 45 minutes of the Oxford campus. One is in Hamilton, Ohio and the other in Middletown, Ohio. The Middletown campus has just over 2,000 students and Hamilton around 2,500. These students tend to be non-traditional, and are non-resident students. These campuses have open enrollment. The interesting features of this configuration are that the campuses all reside within the same county and region, and they are for the most part financially independent.

At the regional campuses it is possible for the students to get started with the first two years of a four year degree or get a variety of two year associate degrees. Nursing, business and engineering technology offer two year associate degrees. Some students begin in an associates program and change their minds after two years. These students are also often very busy with family, work, and other obligations and often do not finish their degree in two or four years.

Why do we want to be CoOL?

The Middletown campus faced some issues that were only going to get worse rather than better. We have a shortage of parking and classroom space. We have students who miss classes that meet once per week to accommodate work schedules. We stood to lose some quality part-time teachers that had scheduling conflicts with classes. We also had trouble filling summer sections of certain courses.

We decided the solution to many of these issues was to offer more flexible courses online. This would solve space issues, scheduling conflicts, and loss of instructors. An example illustrating how right we were was when we began offering online physics in the summer. In the past we could not offer summer physics because the classes would not fill. Now we offer three sections of Miami Plan physics courses with 40-60 students. There obviously was a need.

CoOL Underground

When we began teaching online, we did so quietly and surreptitiously. In 1999 Dr. Beth Dietz-Uhler taught a Miami Plan Psychology course. She found that her drop rate from her once per week night class was much higher than for her online class. Shortly after that Physics began offering Miami Plan courses as well. The response was very positive. Physics enrollments went way up. We also discovered that many of our summer courses were being taken by Oxford campus students. We were filling a need.

CoOL Emerges

Dr. Dietz Uhler formed an ad hoc group to discuss organizing our online efforts. This group was primarily those faculty that had taught online before and some staff that supported those efforts. We called ourselves CoOL (Center of Online Learning.) In the summer of 2005 we approached Oxford IT services department for funding. They had mentioned online as a part of their strategic plan. We got funding for our first year. This included supported release time for faculty creating online courses as well as marketing and workshop money. Their only request was that we make this a three campus initiative. We agreed and CoOL got much bigger very fast. In the fall of 2005 the Council of Academic Deans (COAD) endorsed the CoOL initiative. We were official.

CoOL Vision

We established our vision and mission and here they are as they currently stand.

The Center of Online Learning is a university, statewide and national leader in developing and supporting high-quality online learning experiences while researching, identifying and disseminating "best practices" for online teaching and learning.

We understand that this is an ambitious vision but vision is just that. It is what we want to achieve in the future.

Our mission is as follows;

The mission of the Center for Online Learning is to develop and offer engaging online courses and experiences that educate and serve the needs of our learners. As such, our mission includes the following primary goals:

- *Support the development of interactive online courses that ensure high-quality educational experiences.*
- *Support the development of online courses in a way that is personally and professionally rewarding to our faculty and staff.*
- *Encourage and facilitate the development of online courses to enhance student access to a Miami University Education.*
- *Promote dialogue and conversation about the pedagogy of online learning.*
- *Expand our presence to have local, national and international dimensions.*

Our mission has two audiences, our students and our faculty. We don't want faculty to have unpleasant experiences teaching online or creating for online. We don't want them to sacrifice. And

we want them to be credited for what they accomplish. Some liken creating an online course to writing a book or articles. It is a creative and challenging endeavor. We think that this is one reason that it is crucial that this is a faculty driven center.

CoOL Structure

CoOL has a director that is a faculty member. Currently the director receives one course reduction per semester. The director is the face of CoOL and is the chair of the advisory team. As CoOL grows this position may become part or full time but the intent is that it remains a faculty based position. The coordinator runs the day to day operation of CoOL. The coordinator manages all of the course creation teams. Currently the coordinator does this job as an addition to her full time position. The advisory team is comprised of other faculty members who have taught online at Miami, a representative of IT services, a representative from the libraries, and the coordinator. This group has been meeting at least once every three weeks. They advise the coordinator and director and help with some of the start up work that is needed. They receive no compensation other than a shirt and some occasional food. Half of the advisory team will be reappointed each year.

Faculty Development

We feel that faculty development is crucial. We have done two workshops to this point. The topic of the first workshop was about what has been done so far. I guess we came out of the closet so to speak. We then did a follow up that was well attended showing how to get started if you want to teach online. We showed a planning grid that we have come up with to help faculty plan their courses. Our next step is to have a short web course on how to teach online. It will be approximately 3 weeks and be offered for the first time this summer. In the future we will have "how to's" and info on our web site including a monthly podcast with helpful information.

Student Development

We all agree that we cannot ignore the student portion of this equation. We were not as focused on this at the beginning although we see a shift toward this as more courses are developed. Andrea and Beth have developed an online section of the University and the Student. This is a one hour course that can benefit students who are taking or want to take online courses. We also are working on ways in which classes are listed. And of course there are student services that will have to be modified to accommodate online students.

Course Creation

We have adopted a team model for course creation. Each creation team consists of the following members;

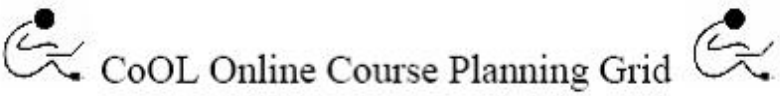
- Faculty content expert
- Instructional technologist
- Experienced online instructor
- Librarian
- Technical support personnel as needed

We are especially excited about our course creation team model. We think the team concept is crucial to a good course. The faculty member is critically involved but does not have to worry about the technology so much. The instructional Technologist can assist with both technology and pedagogy. The experienced online instructor can reassure and give good insight in what the faculty member can expect and keeps mistakes from repeating themselves. The librarian can help with resources, and copyright. If learning modules or other more advanced additions are needed, a multimedia creator can be utilized. The faculty content expert receives one course release during creation. The experienced online instructor gets $500 faculty development money. The librarian and instructional technologist do this as part of their regular duties. In this model the work falls heavily on the faculty member. We currently can support two teams each semester with a pilot running this summer.

Course Creation Planning Grid

This course creation planning grid was originally created by Jean Vanderbeek from the nursing department. She used it to organize her online course. We modified it and it is what we currently give faculty who are beginning to plan their online course. The current design is based on the Quality Matters peer review system created by the University of Maryland. We are adopting this as are quality review system and more information about Quality Matters follows. The planning grid helps a faculty member align their objectives for each of their modules with the planned activities, interactions, and assessments that helps their students attain those objectives. We did a workshop on this grid and the possibilities and ideas for completing the grid.

The grid addresses three areas for attaining the stated objectives: Resources and Materials, Learner Interaction, Assessment and Management. Resources and materials included readings, and any addition resources and materials that deliver content. This could include videos, audio files, animations etc. Learner interactions include interactions the students may have with each other, with the content and with the instructor. This can include a huge variety of things including discussion boards, short essays, blogs, wikis, and activities such as crosswords, word games, and immediate feedback quizzes. The Assessment and Management section includes tests, quizzes and long term projects that the students might be assigned.



Course Title: _____ Course Number: _____

Module Topic: _____ Module Number: _____

	Resources and Materials		Learner Interaction		Assessment and Measurement	
Objective(s) and/or Competencies	Readings (Textbook and Supplemental Readings)	Additional Resources and Materials	Learner Interaction w/ Peers and Instructor	Learner Interaction w/ Content (Activities & Short Term Projects)	Long Term Projects (Broken into Components)	Other Measur Assessme (Quizzes, Te Exams)

Quality Matters

Quality Matters is a peer review system for online courses developed by Maryland Online under a FIPSE (U.S. Department Fund For The Improvement of Postsecondary Education) grant. This peer review system is not punitive but prioritizes things that should be in a good online course. Our grid carefully aligns with this to make it easier on the instructor. A team reviews the course including one person outside of the institution. We may due to budget issues have to stay within our institution to begin with. We will be listing the courses that go through this process as CoOL Approved.

Course Content Delivery

We want our students to be able to receive content in a variety of modes. We also want to address their varied learning styles. We think that the availability of more choices will increase their likely hood of receiving the content. Let's face it. Our students come from a multitask world. They can listen to "class" and be texting on their phones at the same time. We have found that we can have faculty members create PowerPoint that are appropriate for online delivery. They can create a "script" in the notes section. They then can record audio for the PowerPoint. After that it is an easy task to produce the multiple formats. If the instructor chooses to record some video as well using a web cam or digital video camera, they can. This can be easily integrated into the multiple formats.

The formats we are considering include mp3, mov, mp4 suitable for playback on a video Ipod and Sony PSP as well as just on the computer. There are multiple ways to produce these formats. I have been using Sony's Vegas Video which has these formats already available for rendering. You can batch render to get multiple formats at once. The mp4 format is slightly different for the Ipod vs. the PSP. If the PowerPoint is saved as jpgs then it is an easy task to place it in Vegas Video. If you are interested in just audio podcasts, then a program such as Audacity which is free is what you would want to use.

It is important to include student interaction with the content which at this point cannot really be done with the Ipod or PSP format but the instructor should have some interactive exercises included within the Learning Management System (LMS). We use Blackboard. Another effective delivery format is Flash. We use Articulate to convert PowerPoint to flash based with audio. You can then incorporate interactivity directly into the content. Quizzes can be strategically placed within the presentation and you can require the students get a certain grade before proceeding. To make is simpler for the instructor, if they just give us PowerPoints with audio, we can produce any of these formats fairly simply. We can also use student workers to assist.

CoOL Problems

Our major hurdle as it has always been is budget. We need some money to run an effective program. Our first year was funded by our IT Services in Oxford. This cannot be an ongoing arrangement for a variety of reasons. The Provost of the University is very supportive of this program and we expect future funding through that office. Resources also become an issue as that relates to budget as well as hiring issues. We need to hire more personnel to ramp up our production of online courses. As the program gets bigger, the Director and Coordinator will not be able to perform other jobs. There are also institutional issues. Currently our regional campuses are open enrollment. Our Oxford campus is not. So can our students take an online course originating from Oxford? As it stands now, they cannot. They must be accepted into Oxford first. We also have scheduling, fee, proprietary and other issues to manage as well. You might say we have the cart before the horse but as long as we are facing downhill, it works ok. We have begun and will continue to tackle these issues.

CoOL Future

Our future looks bright and exciting. A steering committee of deans and the Director will be formed to assist with institutional issues and direction. We will continue to increase budget and personnel. We will need to have program, and course assessment. We have the Quality Matters to help with this but need program assessment as well. We have started this process. We also want to continue our faculty development as well as our student development. But for us…it is all CoOL

Resources

Articulate presenter. http://www.articulate.com/

CoOL web site. http://www.muohio.edu/cool/

Sony Vegas Video. http://www.sonymediasoftware.com/products/showproduct.asp?pid=965

Maryland Online - *Quality matters.* http://www.qualitymatters.org/

Designing Web Pages for Educational and Commercial Purposes

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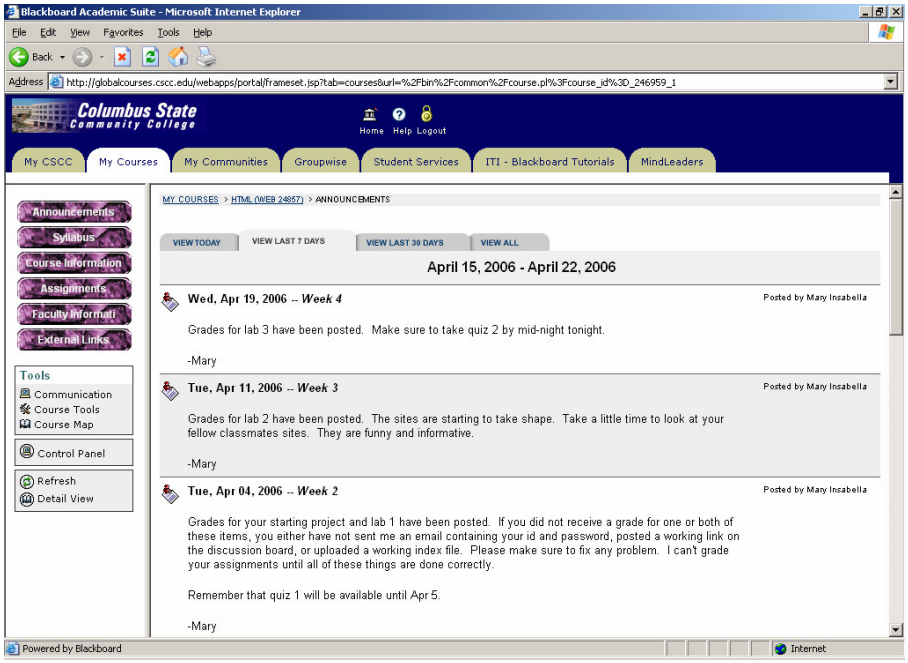
Like most of us, I spend a great deal of time on the internet. As a college faculty member, I use the internet for instruction and research. As a consumer, I use it for shopping and price comparisons. As a puzzle lover, I use it to solve crossword and sudoku puzzles and play word games. Part of my duties as an Assistant Professor at Columbus State Community College is to coordinate the Web Developer plan of study in the CIT department. So in addition to using the internet for my own devices, I am in charge of classes such as html, javaScript and Java. This paper will attempt to shed some light on the myriad of software available to assist in web develop for on-line courses, as well as what makes a good website.

EDUCATION SITES

On-line course delivery is a fait accompli. I don't know of any major two or four college who does not offer some distance based coursework. Whether or not you agree with the merits of on-line coursework, it is here and the competition for student dollars is a driving force. Blackboard seems to be the dominate software for on-line delivery. A quick google for other on-line software shows WebCT, Digital Think, AuthorWare and GeoLearning. Another quick browse through college sites shows an overwhelming use of Blackboard. We use Blackboard at my college, so I am most familiar with its tools. Below is an example of an html distance class site.



Blackboard includes common links such as syllabus, assignments, etc. It also allows you to create your own links. Students log into Blackboard and can view course material, post to discussion boards or participate in on-line chats.

Test generators

Creating quizzes and exams to be taken on-line can be done through Blackboard's tools or through third party software tools. Such tools include Respondus, Articulate, PrimeExam and QuizMaker to name a few. These tools allow you to take tests created in a word processor and upload into a web delivery format.

Screen capturers

Many on-line course sites offer video and/or audio instruction modules to enhance the web experience. Some capturing tools include Camtasia, Illuminate, Captivate and Screencast. These video presentations may record a lecture or demonstrate using a computer or calculator. While this kind of enhancement works well for users with digital connections, dial-up users find it takes quite a while to download the files.

Accessibility

Accessibility issues are another issue that must be addressed when creating education web sites. Federal guidelines such as Section 508 Standards are mandatory for federal and state websites. Voluntary standards such as Web Content Accessibility Guidelines (www.w3c.org/WAI/Resources) encourage the following actions:

- "Check the HTML[1] of all new web pages. Make sure that accessible elements are used, including alt tags, long descriptions, and captions, as needed.
- If images are used, including photos, graphics, scanned images, or image maps, make sure to include alt tags and/or long descriptions for each.
- If you use online forms and tables, make those elements accessible.
- When posting documents on the website, always provide them in HTML or a text-based format (even if you are also providing them in another format, such as Portable Document Format (PDF)). "

COMMERCIAL SITES

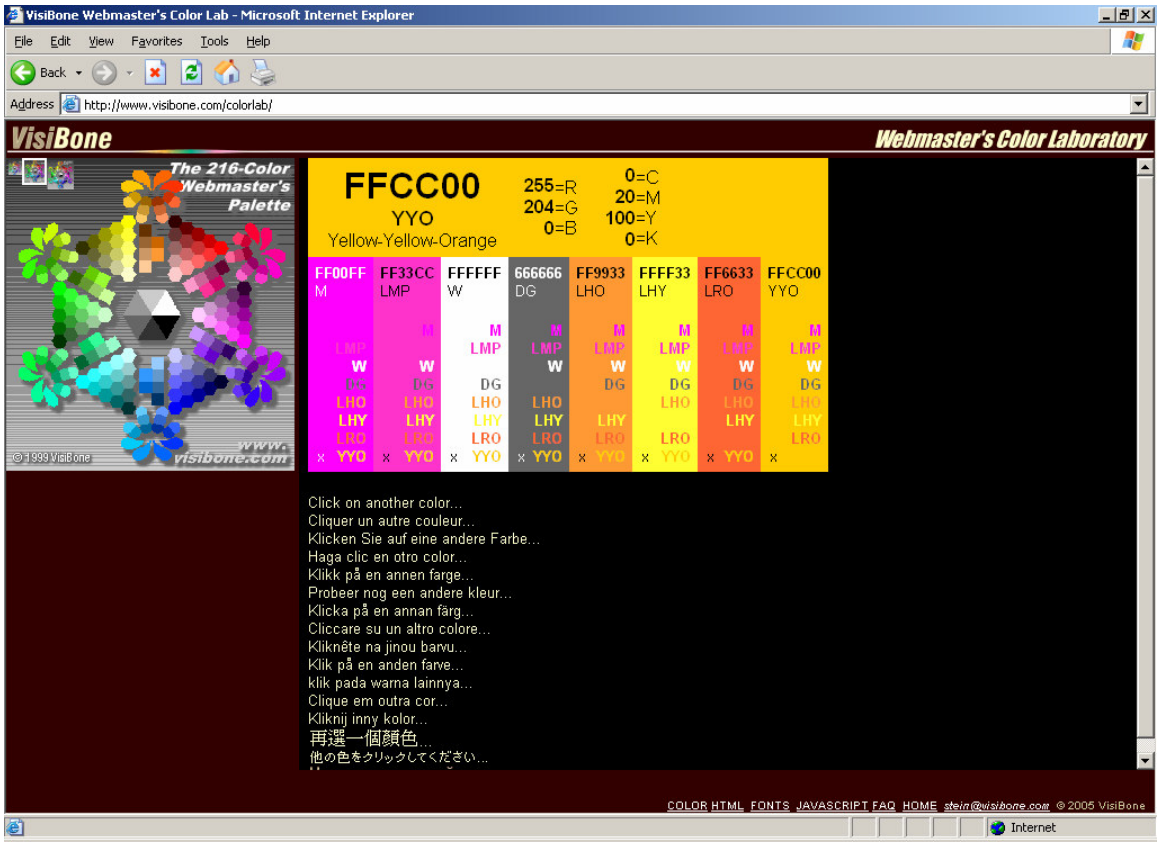
Most of websites we visit would be considered commercial in nature. Like education sites, there is a need for clarity and usability in these sites. Web site conversion refers to the likelihood that someone coming to a commercial site will actually purchase something. According to w-edge Design (http://www.w-edge.com) 98% of site visitors do not buy anything. Even people who come to a site ready to buy, only complete the transaction 30% of the time. "Most failures in getting a customer to convert (to a sale, lead, subscription, registration, etc.) stem from a perception of a lack of value, trust, confidence, security, or relevance," writes Eisenberg Bryan in *Persuasive Online Copywriting*.

When creating commercial websites, it is important to understand how people scan the site. The Stanford-Poynter Project discovered that when people view websites, their eyes to the text first,

particularly to captions and summaries. They scan graphics afterward, so copy is deemed more important than graphics. They also discovered that the center of the screen is the prime area to sell a product. The left side of the page functions well for navigation and the right side for action. Users generally ignore the bottom of the screen.

Good Site Design Practices (http://goodpractices.com) recommends simple pages that are platform-independent. These pages download faster. Customers who have to wait for a site to download will go on to another. The site also recommends using a validator to test your site's compliance with common HTML specification (w3c.com has a validation service).

Using color wisely can make the difference between someone staying with your site or leaving it abruptly. Dark backgrounds are hard on the eyes and are harder to print. Below is a screen shot of a site which allows you to experiment with color combinations, as well as giving the correct html color code.



Searching

Since many people find websites through the use of a search engine, it's important to know how they work and how to get your site to the top of the list. Search engines vary in the way their spider works, how their database is designed and the algorithms used to give relevant and timely responses to user's queries.

A search engine works by sending an automated "crawling" process, called a spider. The spider searches through internet sites and "ranks" sites based on the following content (www.searchengines.com) :
"Word frequency

- Location of search terms in the document
- Relational clustering
- The site's design
- Link popularity
- Click popularity
- "Sector" popularity
- Pay-for-placement rankings"

Metadata

The use of metadata in searching is becoming standardized in the development of Resource Description Framework (RDF), which is a declarative language which uses XML to represent metadata. According to the w3.org site:

RDF provides a framework in which independent communities can develop vocabularies that suit their specific needs and share vocabularies with other communities."

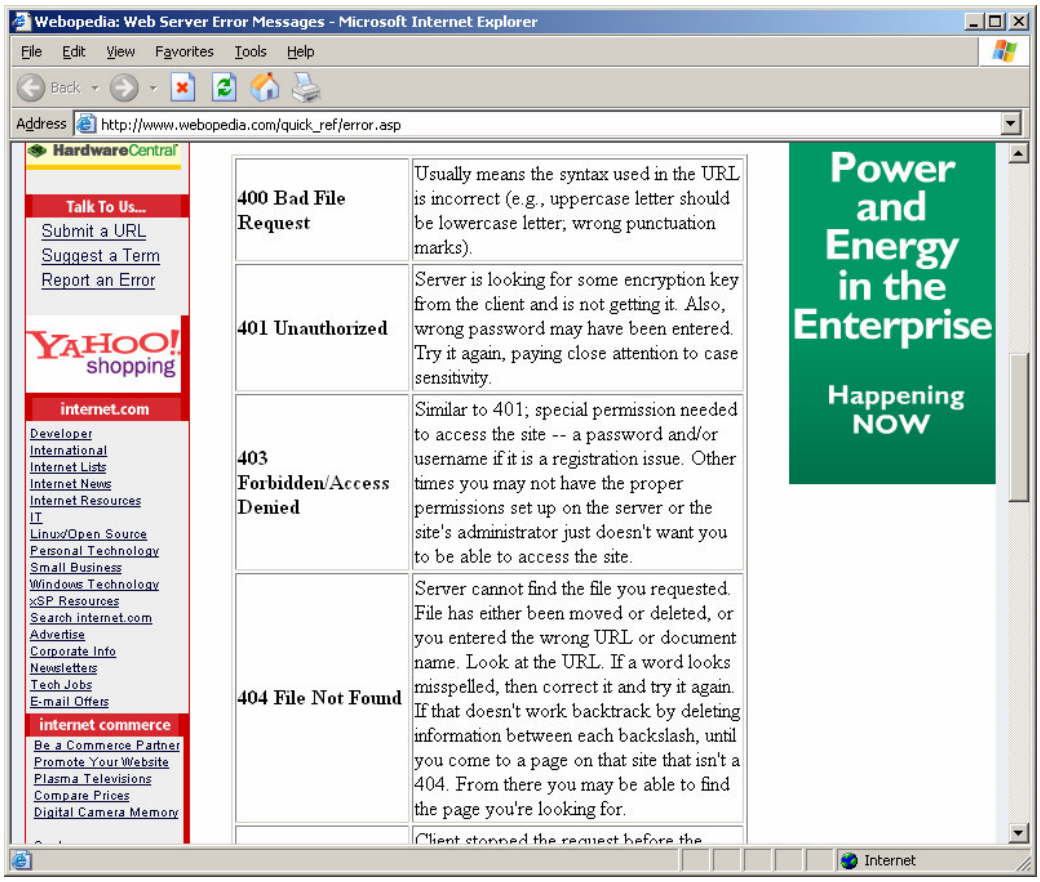
Standardizing vocabularies makes searching a database a much more precise endeavor. People using the internet for research will find their responses to be more directly on-point. The aim is to reduce the "hits" and have the hits be more on-target to the searcher's needs.

Error Messages

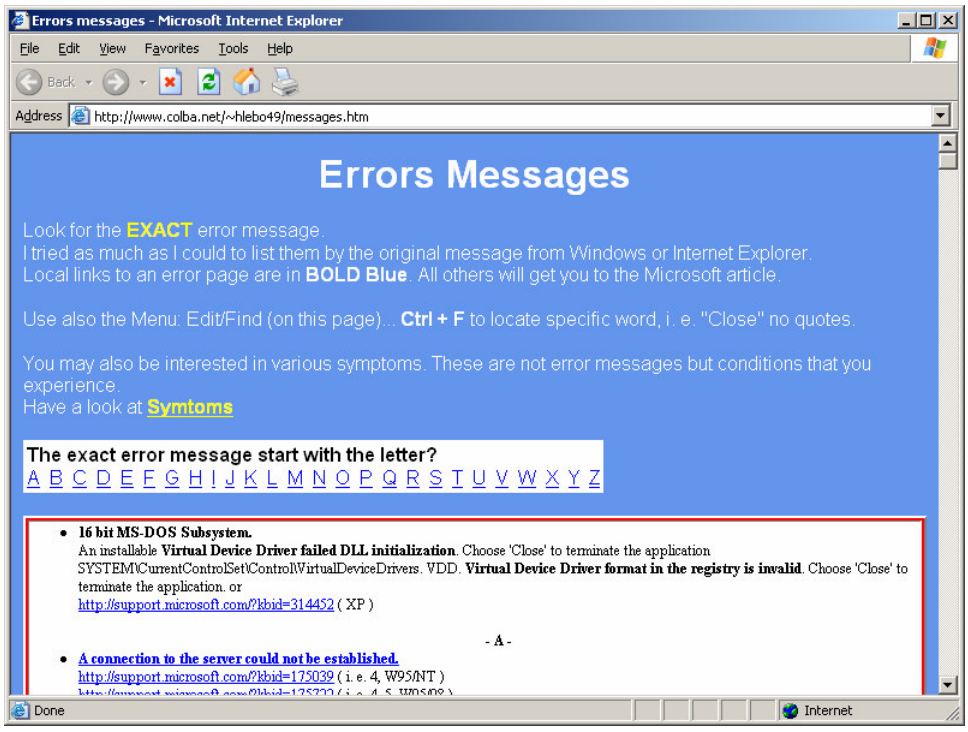
One of the most frustrating things about working with computers, in general, is dealing with error messages. Whether they are generated by your computer, network, system or website, they can be irritating up to infuriating. On the web, error messages can be hidden on an already overwhelming page. Jakob Nielsen's Alertbox (www.useit.com) recommends the following guidelines for effective error messages:

- Explicit indication that something has gone wrong.
- Human-readable language
- Polite
- Precise
- Constructive

Below is a site that shows typical error messages and how to decipher them:



Another website offers to find every error message known to man (woman):



I found a list of very humorous error message haikus at http://strangeplaces.net/weirdthings/haiku.html. I'll leave you with one that all can identify with:

Windows NT crashed.
I am the Blue Screen of Death.
No one hears your screams.

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The Tablet PC and Paperless Classrooms

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Although I still see a number of my colleagues in the copy room pounding out a ream of paper now and again, and some with regularity, the amount of paper used by the typical classroom professor has been on the decrease with the advent of the computer, networks, and the Internet. If we consider alone the amount of paper saved by the prolific use of email today, it would represent a fairly large forest. Announcements, memos, and normal institutional communication borne in the past by paper are now distributed digitally. But this type of digital communication is found out of the classroom and peripheral to instruction and learning.

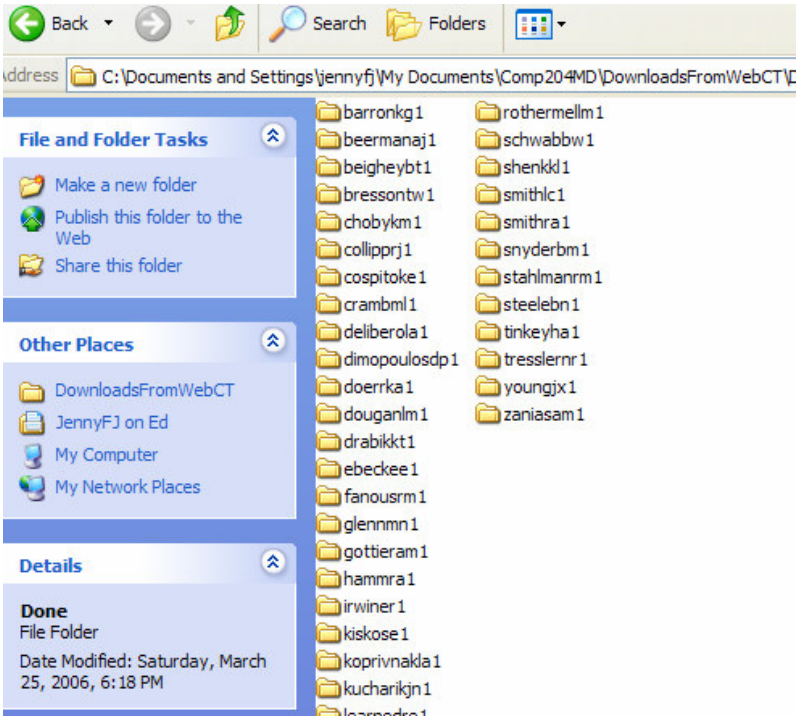
Over the past few years I find that I have transitioned to paperless (or nearly paperless) classroom with the help of a number of hardware and software systems. **What activities do we (the reader and I) share?**

My **syllabus is digital** – it's a Web page only. I distribute the URL and project it when needed. Students may have paper copy if they print it on their own, but I do not give out hardcopy, even the first day of class. This may not be unusual today in higher education.

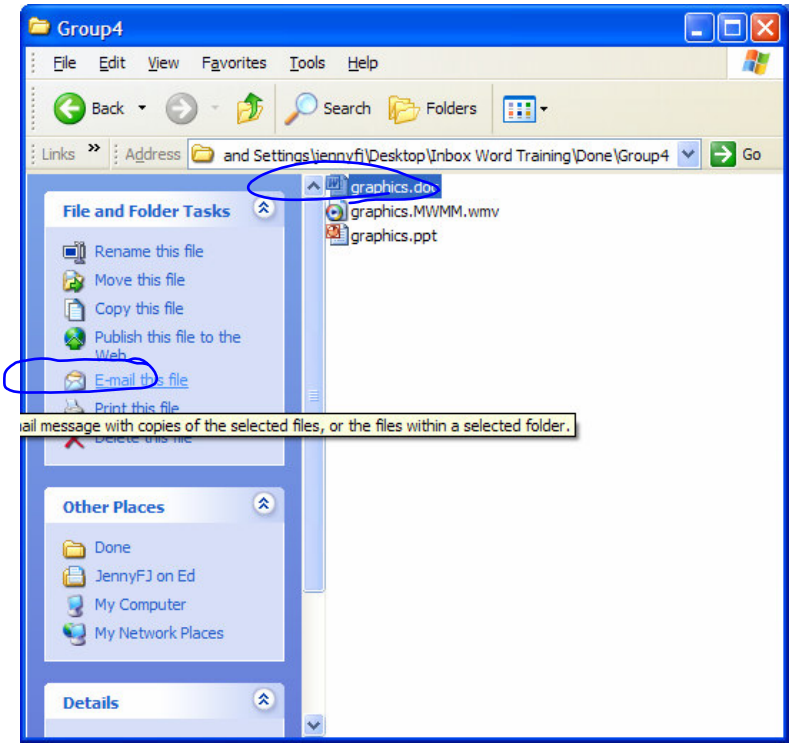
WebCT is the vehicle for the delivery of all **quizzes**, and is also used for part of **midterm** and **final exams**. Some of these assessments are proctored in class; others are completed asynchronously. This has required the construction of new quizzes and exams because of the loose security in a Web-based course management system such as WebCT, but soon I'll be able to assign quizzes and exams using a secure browser.

WebCT also supports **discussion** topics assigned asynchronously – "forced fun" as I like to call it. The discussion forums allow me to augment and the material covered in class, and also facilitates a wider range of active participants that discussion in class sometimes allows. In a half semester (by midterms) my present class logged over 250 postings in the discussion boards on a wide range of topics.

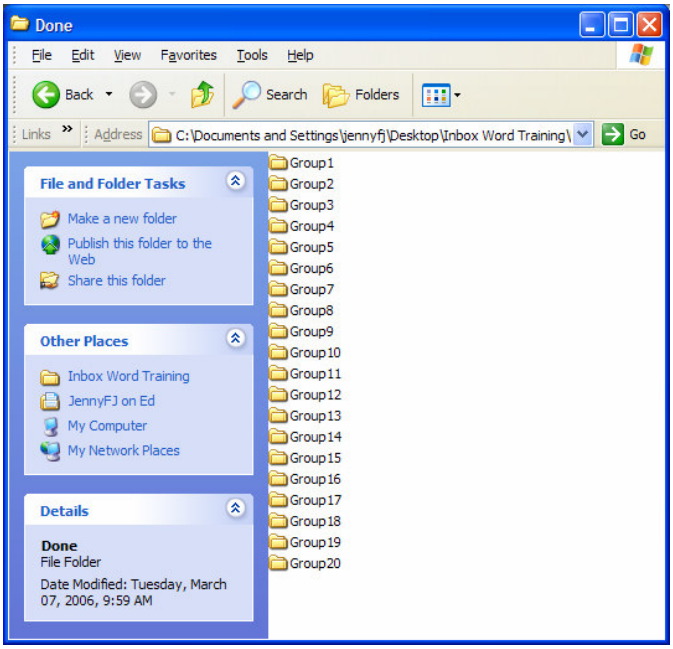
WebCT also is a great vehicle for **assignments**: making assignments including assignment descriptions, accompanying images or files, and WebCT also manages assignment submission (and resubmission, if permissible), due dates, and late assignments. Posted grades may be viewed by students in the **electronic gradebook**. WebCT allows the instructor to download an assignment for off-line grading. The contents of an unzipped assignment folder looks like this:



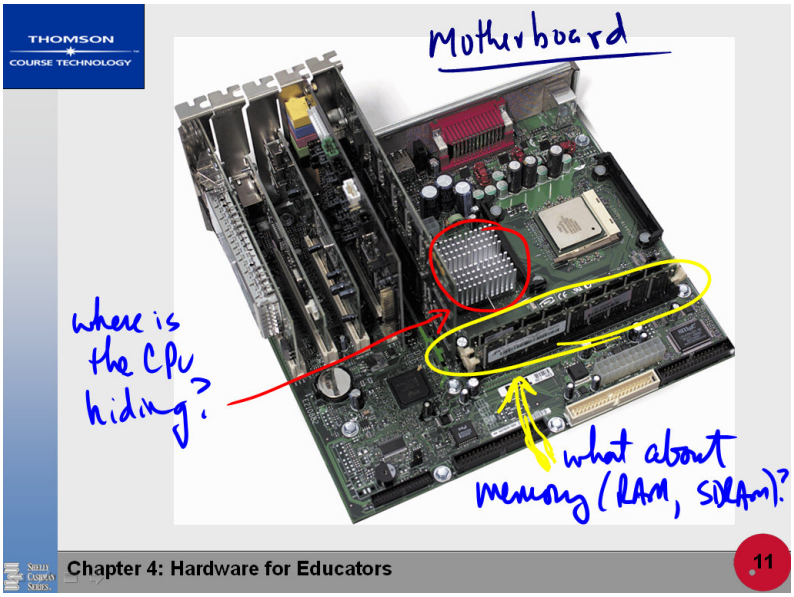
One particular advantage of grading in a file structure such as seen above is the ability to **return a scored paper electronically**. After the paper has been marked with my digital ink comments (described later in this paper), I email the paper back to the student. If I'm offline, the message resides in my Outlook Outbox until I next connect to the network.



For group projects, I like to use a **network folder** with permissions in security set such that a group representative submits their work by copying a folder into the "**Inbox**." The folder cannot be altered or viewed in any way, but it is time-stamped. Students are also unable to view the contents of another group's project. I am subsequently able to copy the "Inbox" to my desktop for grading at my earliest convenience. Here's an illustration of an "Inbox":

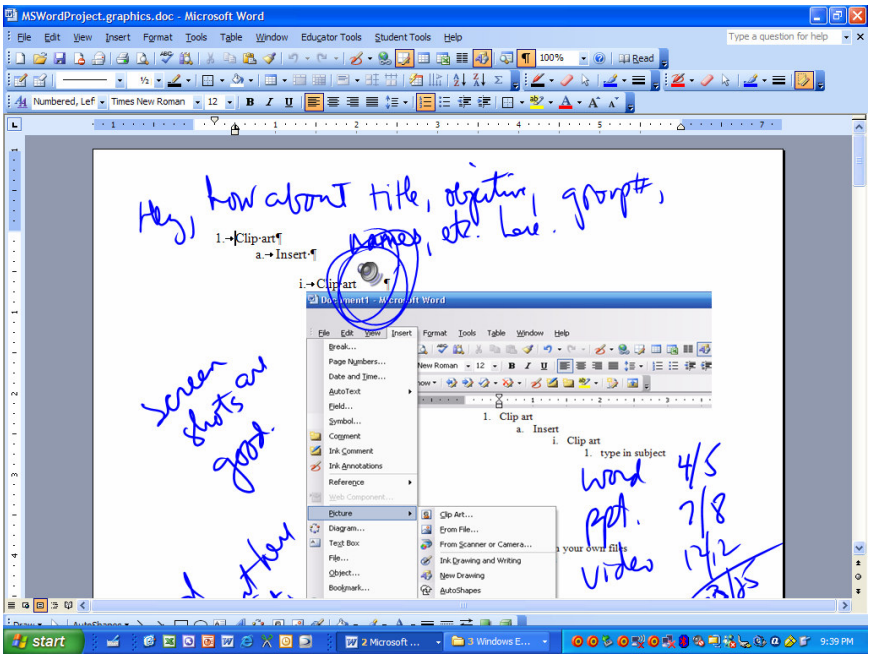


When lecturing, I often use PowerPoint as do many instructors. Many instructors may also **annotate their PowerPoint slides** using the mouse, but here the TabletPC lends greater facility and utility with its pencil-like stylus and eraser. One can write naturally, taking advantage of color on each slide as needed:

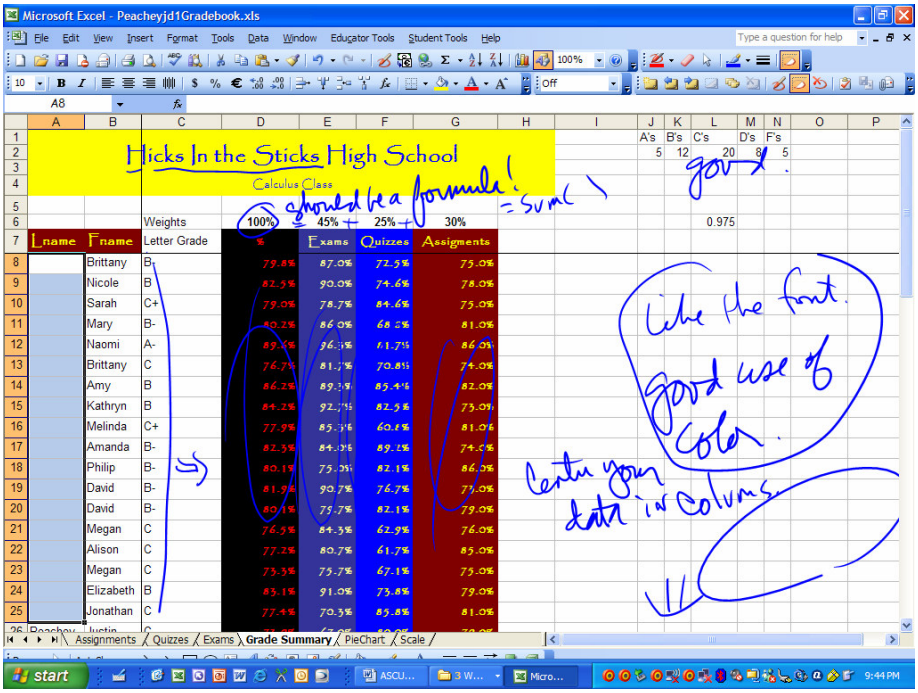


Of course other Microsoft Office applications such as **Word and Excel** support **ink annotations** as well, and here I take great advantage of the digital ink. Instead of marking a paper in tradi-

tional ink, I use the Tablet's pen, returning the document electronically. Here are two examples, one in Word, one in Excel:

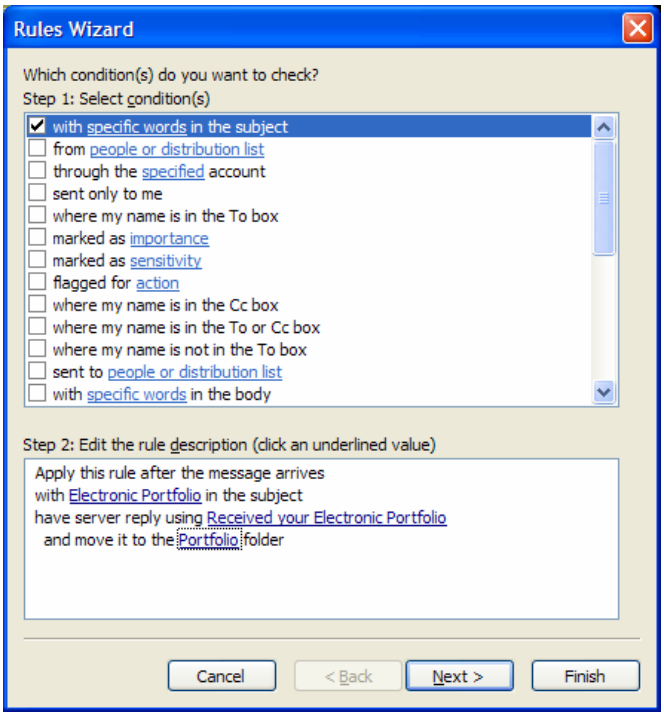


Note in the above example that I included a **sound byte** with additional comments about this document.



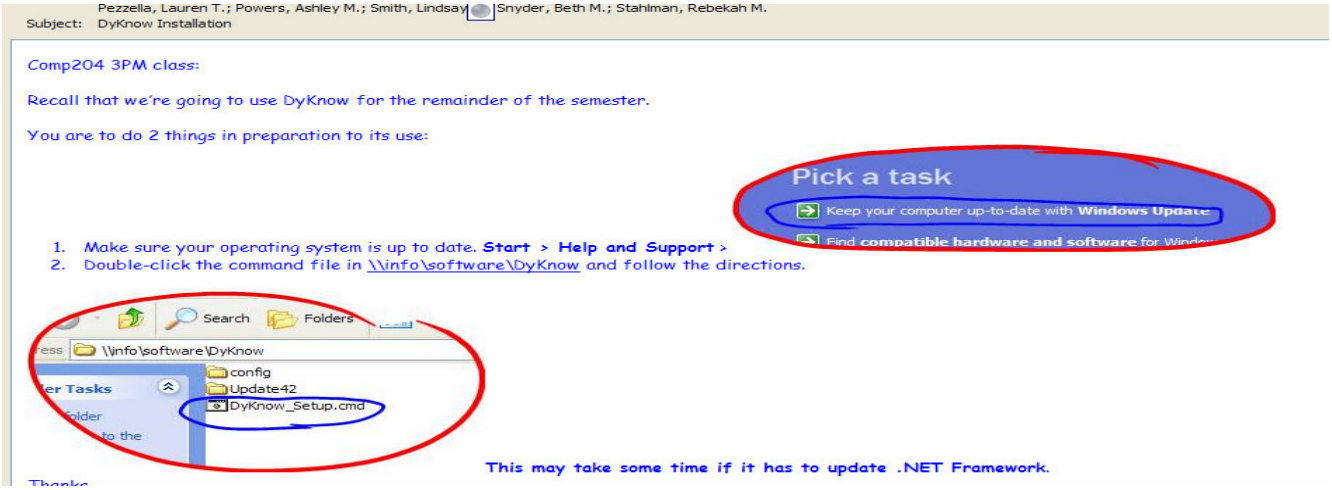
You may be wondering how a document might be "inked" if the application does not support digital ink. For example, I assign projects that required creating Web pages – we blog and create electronic portfolios. The Web pages themselves are "submitted" to me by means of an email with the target URL in the body of the message. The subject line of the email must be explicitly

specified because a rule in Outlook places the email in a folder of my choice and email a confirmation that the assignment was received:



When evaluating the Web page, I use one of the TabletPC PowerToys, the **Snippet Tool**. (http://www.microsoft.com/windowsxp/downloads/powertoys/tabletpc.mspx) The Snippet Tool allows me to capture any portion of a screen into the clipboard (or other destinations) by drawing or outlining with the stylus. Here is a sample email with a Snippet clipping of a student Web page:

The Snippet Tool is also handy for send directions or answering questions:



What's next? Currently I'm trying out three software systems: DyKnow, Ubiquitous Presenter, and Classroom Presenter. I hope to report on those in the near future.

Preparing for the Future: How we are maximizing our Technology Labs

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Introduction

In spring of 2005, the College of Arts and Sciences at Drake University recognized a problem with the student computer labs across campus. The College of Arts and Sciences Technology Planning Committee determined that there was a need to analyze the lab situation and create a clear cut path for the future. Previously, decisions for lab computer replacements were based on proposals provided by the departments. The labs that did not have a submitted proposal were not considered. The technology committee found that this was not an optimal practice as some of the worst labs were ignored due to a lack of submissions. A determination was made that it was time to analyze the College of Arts and Sciences' lab situation so a more uniform and fair distribution of technology funds could be reached.

About Us

Drake University is a private accredited institution in Des Moines, Iowa that houses six colleges and schools including Law, Pharmacy, Business, Education, Journalism and Mass Communications and Arts and Sciences. It has over 70 areas of study with both undergraduate and graduate students. The College of Arts and Sciences is the largest degree granting college with the largest campus representation of students and faculty. The College of Arts and Sciences houses seventeen different departments with over 3,000 students taking courses for 43 different bachelor degrees, 49 minors and five pre-professional interest areas. With such a wide range of learning, the college is very diverse.

History

Prior to 2005, no computer inventory was kept for the College of Arts and Sciences. The Dean's Office maintained a faculty computer inventory used to plan for faculty machine upgrades. Machines reached the labs by either being purchased with student technology fee money or by using the old faculty replacement machines that have aged at least three years. If departments wanted lab upgrades, a proposal was submitted to the College of Arts and Sciences Technology Planning Committee for review and distribution of funds. If the proposal met the guidelines for a technology fee disbursement, the committee recommended the proposal for full or partial allocation based on the amount of the proposal.

In the past, departments found space and computers to procure a lab themselves. There was no communication between other departments, nor was there any desire to collaborate computer labs. Most departments worked alone to get their computers from faculty replacement machines or other schools on campus. Faculty members were in charge of the labs, not because of want or

interest, but rather because they required them to be in functional condition for classes and no one else took responsibility. Depending on what problems occurred, the faculty lab coordinator would call the HelpDesk or the Campus Computer/Network Technician. If these two groups could not find an answer, the problem did not get solved. Outside technicians were contracted to help solve problems. Faculty members involved were not members of IT, nor did they have any idea how to adhere to university-wide standards. Many of the problems resulted from the lack of a contact in Arts and Sciences to assist with problems.

This was the situation in spring of 2005. Students were frustrated with the labs. There was failing equipment and equipment that did not even function properly when it arrived. There was software that only worked on a small number of computers and software that had not been upgraded since its initial purchase. Each department knew there were problems with the labs but there was no one to turn to in the college. These labs were a source of contention across campus. The technology planning committee determined that it was time to start evaluating all labs to determine how to fix problems. The first priority was to make an overall plan, rather than applying small fixes for larger problems. The technology committee determined that an analysis of the situation needed to be made in order to maximize the money available and its resultant effect.

Lab Analysis

Creating Inventory

By talking with the instructors, the many departmental labs hidden around campus started appearing. There were 22 Arts and Sciences computer labs. After identifying where all the labs were, an inventory was created to find the status of the equipment. Information was gathered on the number of computers, their specs and software. This information provided an understanding of the condition of the labs in age and functionality. It also helped in planning the number of computers that may potentially need to be replaced. All of the collected data was gathered into an active college-wide database for use.

Figure 1: Number of Labs and Computers by Department

Department	**Number of Labs**	**Total Computers**
Physics and Astronomy	5	39
Psychology	3	40
Biology	3	22
Math and Computer Science	2	20
Environmental Science	2	9
Open Access	2	6
Art and Design	1	30
Language Acquisition Program	1	25
Music	1	16
Theatre	1	15
Culture and Society	1	4
Total	**22**	**232**

Functional Requirements

With inventory completed, functional requirements were next determined with two questions. First, find out why the lab was created in the first place. Second, find out if it was still needed for the same purpose. In the Art & Design department, a lab was created for a functional classroom environment. In the Environmental Science department, a lab started as a place for students to run analyses on data, but transformed into a lab classroom space and computer lounge for science students. The Culture and Society department's need for computers came with the hire of three new faculty members who all wanted students to take interviews for classroom projects and make movies of their findings. Upon finding the functional requirements for the lab, several overlaps were seen and it was clear that changes needed to be made to make the labs into what the faculty required them to be to enhance student learning.

Lab Usage

A determination needed to be made about whether these labs were being utilized by students. There are many methods that could have used to provide this data. In lab environments in other colleges, a student logs in with a unique identifier to use the computers. This is not the case in Arts and Sciences. To prevent additional problems with login and rights to software, the networking staff created one login per lab. Students did not have to log in and out of the computers every time they were used. If this was possible, it could have saved time in finding lab usage. Another method of surveying the usage is using sign in sheets for each lab. Two labs attempted this technique without success. In most circumstances, one could walk in and see ten students, but not one name on the sign in sheet. Self reporting was not going to be accurate in this case.

For a more accurate result, a sampling survey was used to discover the trends in lab usage. The surveyor sampled each lab during a random time throughout a two week period to find how many students frequent them. Sampling was avoided during finals week and the first week of classes as labs are not scheduled during these times. A visit was made in the morning and in the afternoon. Every hour was targeted throughout the week to get a picture of usage. Figure 1 shows the planned visits for the two weeks in the fall and spring semester. Each round took 45 minutes to accomplish.

Figure 1: Lab Usage Survey Schedule: Fall and Spring

	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00
Mon. 11/28			10:00		12:00				
Tue. 11/29				11:00		1:00			
Wed. 11/30			10:00				2:00		
Thu. 12/1		9:00						3:00	
Fri. 12/2	8:00								4:00
Hours Visited	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00

	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00
Mon. 12/5		9:00							4:00
Tue. 12/6	8:00							3:00	
Wed. 12/7	8:00				12:00				
Thu. 12/8				11:00		1:00			
Fri. 12/9			10:00				2:00		
Hours Visited	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00

	9:00	10:00	12:00	1:00
Mon. 1/30		10:00		1:00
Tue. 1/31	9:00		12:00	

Wed. 2/1	8:00						2:00		
Thu. 2/2				11:00				3:00	
Fri. 2/3		9:00							4:00
Hours Visited	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00

Mon. 2/6	8:00						2:00		
Tue. 2/7			10:00						4:00
Wed. 2/8				11:00	12:00				
Thu. 2/9		9:00				1:00			
Fri. 2/10			10:00					3:00	
Hours Visited	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00

Class Usage

Drake University uses scheduling software for room reservations on campus. Each class or event is entered into a master schedule. From this online system, information was gathered about the number of classes scheduled in each lab for the semester and a count of the students enrolled in the class. Information regarding the number of courses scheduled for the semester, the number of students in each course and the number of times the course was scheduled throughout the week was entered into a spreadsheet for each lab. This information provided the total number of student bodies that will enter a room for the week for class computer use.

Student Interviews

A random sampling was done when conducting student interviews. Interviews were informal. All interviews took place outside of class time in the lab being discussed. Only eleven labs were discussed in student interviews. The interviews were based on predetermined questions, but there was deviation from these questions to delve further into understanding their lab requirements. A total of 40 students were interviewed using these questions as a base-line.

1. Do you use this lab outside of class?
2. How does the lab work during class?
3. What do you like about the lab?
4. What problems have you run into with the lab computers or other equipment?
5. Have you lost class time due to technology problems?
6. If you do use this lab outside of class, what do you use it for?
7. What suggestions for improvement do you have for the lab?

Students were eager to talk about the lab they were working in. Students' compliments of the labs included that labs were in a centrally located area and easy to log into. The complaints ranged from broken equipment, no system to report problems, and the lack of a projector for the instructor to use during class. Seven students mentioned their instructor losing class time due to technology failure. Most students said that if something did not work, the instructor would abandon or postpone the activity. Sixteen students shared problems about software and hardware not working. They wanted these things fixed so they did not have to wait for a working computer to become available.

Faculty Interviews

Faculty interviews were conducted with department chairs and faculty members that maintain the labs. Departments without labs were questioned on their needs for one. Questions included the following:

1. How many classes are taught in the lab?
2. Why was the lab created?
3. Does the lab meet the needs for the courses?
4. Does the lab have available open hours for students to use?
5. What is your ideal lab upgrade schedule?
6. What is your minimum lab upgrade per year?
7. What software needs does the lab have?
8. What type of computers do you want in the lab?
9. How do you typically fund your lab upgrades?
10. Are there any additional labs on the horizon?
11. Can you combine or create a dual purpose lab?
12. Do you have any ideas on how we can maximize the usage of the labs?

Faculty members were eager to share their ideas. Their frustration was apparent. Many had new ideas of what they wanted to pursue, but did not have the time, energy or resources to do anything about them. Many were frustrated with the lack of campus-wide support. They saw the way other college's had their labs working and were envious of the environment they had created for the students. Several faculty members wanted someone to come in and take control so that they would not need to worry about technology for their classes. A few departments were completely satisfied with their lab situations. They only wanted someone to serve as a consultant if help was needed.

Problem Responses

After analysis on the data, these problems were identified:

1. Multiple labs serving the same function
2. Lack of consistency between computers
3. Lack of computer organization with files and folders
4. Inability to share files with students or other faculty members
5. Problem reporting
6. Lab Preparation Time
7. Lack of computer upgrades

The following approaches were determined as responses to the problems. The lack of consistency between computers, disorganization, the inability to share files and lab preparation problems could be solved by purchasing a server. By developing a problem reporting method, students would have a means to communicate problems to the appropriate person. By using combined buying power and creating a lab upgrade schedule, lab upgrades could be done more frequently. Using these methods, a plan was set in motion to begin maximizing the technology potential of the Arts and Sciences' labs.

Server

The first response for improving labs was to purchase a Windows 2003 Server. This helped maximize several aspects of the computers labs. It provided file share and imaging space. File share space will be available for individuals and groups that need to share information in an efficient manner. Organization of files and folders will no longer be an issue as all items will be saved to the student's storage space. Centralized data imaging will be done for quick restores when problems arise. This will help minimize maintenance of the labs and reduce the amount of technician time in front of the computer. Creating one image will also provide greater consistency between the computers and a quicker turnaround time in lab preparation. To make such a large purchase the support of the Dean of Arts and Sciences was needed. The dean supported the server and the technology committee arranged to purchase it with technology fees during the spring semester of 2006.

Problem Reporting

The next issue to address was creating a lab problem reporting system. There are now signs posted in all labs with instructions on whom to email. Once this person receives the email, they will determine where the problem can be best handled. The current avenues for support are the campus-wide computer technician for hardware, the faculty lab coordinator for software or a building manager for room issues. Currently, problems are being emailed and the method provides the student with a procedure to follow.

Buying Power

Previously, computers were purchased year round when money became available. Departments would often purchase computers whenever need appeared and then pick the cheapest ones available. When these low quality machines resulted in problems after two years, they would purchase additional low end computers. Arts and Sciences was throwing money away by not using the buying power they had. Drake's primary purchasing agents are through Dell and Apple. Discussions with vendors began about other methods that could be used to harness the college's buying power more efficiently.

The college also looked into leasing machines from Apple using a fair market lease or a dollar buyout lease. Machines were discounted, which allowed for replacement of one-fourth of the equipment every year based on cost projections. Leasing also provided the value of having a protection plan on the machines for computer maintenance. Prior computers did not have the protection plan and several of them have needed costly repairs that could not be done because no funds were available for maintenance. After concerns from other departments on campus, this option was abandoned and focus came back to purchasing machines.

After speaking with an account representative, Drake's vendors agreed to provide unit discounts based on volume purchases. All purchases come through the budget director in Arts and Sciences. Purchasing was delayed until enough systems were ordered to receive a price break. For the 2005 technology fee purchase, all computers were bundled into one purchase and thus $1,100 was saved by having a bulk order. Over the summer, technicians from two colleges came together and saved $3000 for faculty computers in Arts and Sciences alone.

Combining Labs

The numbers from the student lab usage survey were computed to find out which labs had the largest student volume. Also computed was the number of classes scheduled and number of students in the class to determine higher usage labs. These figures provided a look at what labs may not warrant upgrades based upon the usage. The functional requirements warranted lab space, but there were spaces where labs could be combined. Combining labs allowed for the functional requirements to still be met but save money by not duplicated machines.

A recommendation was made that three Biology labs with 22 desktop computers be combined into one mobile lab with twelve laptop computers. The mobile lab will provide flexibility between rooms and more lab space as counters are not covered with permanent desktop computers. It was also suggested that Biology partner with Environmental Science for an open lab. Biology and ENSP were eager to do this as it gave the benefits of upgraded machines and provided one location for science students to collaborate.

Also recommended was making four of the physics labs into a mobile station with Dells and Apples. Physics has five computer labs at this time that have sprung up out of faculty replacement and other college's older machines. The recommendation was keeping one open access PC lab and combining four labs into one or two mobile carts. The four labs currently have sixteen Macs and thirteen PCs. The recommended mobile lab would have nine Macs laptops and nine PCs laptops for the cart. A determination has not been made on whether the department will accept the proposed plan. Until a decision is made, technology fee monies are only supporting the one open access lab.

Another recommendation was made to combine two Psychology labs into one lab. There is currently scheduling problems that are not allowing this to happen. One lab is more highly utilized than the other, making it difficult to fit additional class periods into the lab. If this combining of the labs occur, this reduces the two labs down from 34 computers to one lab with 23 computers.

Upgrade Schedule

Information gathered during the analysis phase came together to create an upgrade schedule. All the information from the faculty interviews on the ideal hardware, number of computers and software was entered into a spreadsheet. The spreadsheet was set up so that all the labs were listed on the left hand side and the years were listed across, with the total number of computers at the end. Figure two illustrates the ideal replacement schedule.

Figure 2: Ideal Replacement Schedule

	2006	**2007**	**2008**	**2009**	**2010**	***Total***	
Art and Design	8	8	8	8	8	*32*	One fourth replacement every year with total lab replacement after four years.
Language Acquisition Program	6	6	6	6	6	*25*	One fourth replacement every year with total lab replacement after four years.
Psychology	0	11	11	1	0	*23*	Half lab replacement over two years with total lab replacement after four years.
Music	16	0	0	0	16	*16*	New lab every four years

Theatre	5	0	0	5	5	*15*	One third replacement every year with total lab replacement after five years.
Biology Cart	0	6	6	0	0	*12*	Half lab replacement over two years with total lab replacement after four years.
Culture and Society	4	0	0	0	4	*4*	New lab every four years
Computer Science	0	0	0	0	0	*10*	No Upgrade Plan for Tech Fees
Math	0	0	0	0	0	*10*	No Upgrade Plan for Tech Fees
Physics and Astronomy Open Access	3	3	3	3	3	*9*	One third replacement every year with total lab replacement after three years.
Biology and Env. Science Open Access	8	0	0	0	8	*8*	New lab every four years
Physics and Astronomy Cart	0	9	9	0	0	*18*	Half lab replacement over two years with total lab replacement after four years.
Total Per Year	50	43	43	23	50	*182*	

After the ideal upgrade schedule was created, the next step was looking at the cost. First, a standard machine was determined for each lab with a generic price point. Focus was primarily on the costs of upgrading the hardware, as most software programs utilized by the college are not costly, aside from Arts and Design software. Each year was multiplied out by the price point and added up for a total. In previous years, the College of Arts and Sciences Technology Committee devised a formula for how to distribute money for projects. Of the money allotted, the committee determined that one-third would go towards lab upgrades, one-third would go towards classrooms and one-third would go towards new projects. Any funds that would not be used in a category would go towards lab upgrades. Using projected figures based upon allotments over the last several years, a number was devised that was a good estimate for basing figures. This estimated figure was used as the planned dollar amount for each year's upgrades. Years that totaled over the projected figure of technology fee allotment were revised. The goal was to get each year close to the baseline figure allotted. Figure three shows the lab upgrade as the end result.

Figure 3: Final Lab Upgrade Schedule

	2006	**2007**	**2008**	**2009**	**2010**
Art and Design	8	8	8	8	8
Language Acquisition Program	6	6	6	0	6
Psychology	0	8	8	6	0
Music	8	8	0	0	8
Theatre	5	0	0	5	5
Biology Cart	0	4	4	4	0
Culture and Society	4	0	0	0	4

Computer Science	0	0	0	0	0
Math	0	0	0	0	0
Physics and Astronomy Open Access Lab	3	3	3	3	3
Biology and Env. Science Open Access Lab	8	0	0	0	8
Physics and Astronomy Cart	0	0	9	9	0
Total Per Year	**42**	**37**	**38**	**35**	**42**

Acceptance

After the lab upgrade schedule was determined, the schedule was presented to the College technology committee. The committee accepted the plan and a goal was set of using it for lab purchasing in 2006.

Results

The server was purchased with technology fee money for 2006. Currently, it is being configured for campus use. The anticipated date for imaging space use is June 1, 2006. Storage space for groups is anticipated for a go-live date in fall of 2006 and individual storage space by January 2007.

An online problem reporting form has been created. It is currently under development and testing. The new form will determine where the email notification is sent based on responses from the user. The determination of all contacts for each lab has yet to be decided. Plans exist to make the form a standard link on all computer lab desktop machines. The form is planned for a go-live date of fall 2006 with the links to it appearing on the desktop of computers as all labs are set up over the summer.

Technology fee purchases in 2006 brought coordination between three different colleges and saved Arts and Sciences $4,600 by combining the college orders together. Several different computer configurations were agreed upon and ordered in bulk. Arts and Sciences ended up with higher end machines than planned and more money to put towards other projects.

Several changes were made to the initial upgrade plan. The largest and mostly costly lab for the college did not want upgrades this year, but wanted software upgrades instead. Overall, purchasing was successful in what the plan had set out to do. Unfortunately, this year technology fee allocation was less than speculated; therefore the upgrade plan needed modification. The committee decided to postpone the music lab from being upgraded this year and push it to next summer. A small amount of funding is generally available to be used for summer projects. The committee determined that if money became available, it would be used towards this lab to stay on track with the original lab upgrade schedule for the next fiscal year.

Figure 4: Planned versus actual lab upgrades for 2006

	2006	Actual 2006
Art and Design	0	0
Language Acquisition Program	6	5
Psychology	0	0
Music	16	0
Theatre	5	5
Biology Cart	0	0
Culture and Society	4	4
Computer Science	0	0
Math	0	0
Physics and Astronomy Open Access Lab	3	3
Biology and Env. Science Open Access Lab	8	8
Physics and Astronomy Cart	0	0
Total Per Year	42	25

Future Plans

One new initiative will be introduced to the college for upgrades. Three purchasing dates will be allowed for computer purchases in the College of Arts & Sciences. The proposed windows are June/July for faculty purchases, December for miscellaneous purchases and March/April for technology fee purchases. All other purchases initiated outside of these windows will wait until the next window. There is interest in making this campus-wide to save additional money, but nothing has been initiated. As of now, Arts and Sciences' purchasing dates will be shared with the rest of campus in an effort to partner on purchases.

The college is also interested in creating a student satisfaction survey for the College. This may entail academic related questions, but would also highlight a portion on technology satisfaction. It is often difficult to get to students to voice their likes and dislikes of labs and a survey would be beneficial in gathering feedback. There is much optimism about the survey as a way to receive data much like the student interviews, only over a larger number of people.

Conclusion

This is the first year that the College of Arts and Sciences has done any type of technology planning. Labs are now being questioned on the basis of overall need rather than being created on one need. The assistance provided to the labs this year demonstrates the college's support for the labs and a commitment to improving the student experience. Each year will bring on different challenges, different needs and the need to be optimal in the approach since there are so many different users to service. The College of Arts and Sciences is working to maximize the fullest potential the labs have through planning and organizing in an effort to make every Drake student's lab experience an exceptional learning environment that they need for success.

Students' Performance and the Effect of Blackboard on Introductory Physics Courses

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Abstract:

We have collected data on students' performance and their weekly homework activities for the past eight years in several classes. Specifically, we have considered the first algebra-based introductory physics course. We have data on weekly activities of students since 1997. Every week, homework assignments have been given to students in this class and later collected and graded. Basically, we have kept the same office hours for students that were seeking assistance. Because of various reasons, we see only a certain percentage of students looking for help during our regular office hours. This year for the first time, we used Blackboard to accomplish the same task. As a result, we have data to compare the effect of one of the electronic medium, i.e. Blackboard, to the usual way that this program was conducted in the past. Using the communication capabilities in Blackboard, we emailed the students the list of problems and their due date every Thursday and also made it available in the announcement section of Backboard.

Introduction:

Solving problems that involve applying the principle of physics are very important for understanding the physical concepts. In addition, they are a good way of gaining problem solving techniques. Textbooks in physics typically have many conceptual and analytical/numerical problems at the end of each chapter. We have always included weekly homework assignments as an integral part of our courses. We believe students will gain many valuable experiences from doing weekly assignments which goes beyond just understanding how the physical concept applies to real world problems. Handling assignments also teaches the student time management, understanding deadlines, responsibilities, and mathematical skills.

The Physics 130 and 132 sequences are our algebra-based introductory physics courses. These two classes are required for all students in the College of Science, Engineering and Technology except students majoring in Engineering or Physics. Our majors take the calculus-based sequence of the same courses. For this study, we have focused our attention only on Physics 130 which is basically classical mechanics.

The lecture part of Physics 130 is three hours and the laboratory is two hours per week. A typical Physics 130 class has an average of 60 students. Often we have more than one section of this course offered in the Fall semester. Parallel sections are taught by different instructors. There is not an obvious coordination among faculty teaching different Physics 130 sections; although we do use the same textbook and basically cover the same amount of materials in our classes. We usually introduce and incorporate many examples in our lecture classes. Moreover, students are required to concurrently take the related laboratory class (Physics 131) which is coordinated closely with the lectures. Every week between eight to ten problems are assigned as homework.

Students have one week to complete the assignment. On their due date, the assignments are collected and then graded. Although we have collected data on weekly activities of students since 1995, for comparison, we have used only the data from Fall 2001, Fall 2002, Fall 2003, and Fall 2005. I did not teach Physics 130 course in the Fall of 2004. In my Physics 130 classes, homework assignments average counts as 20% of a student's overall grade.

Assignments:

Every Friday, eight to ten problems from the end of the chapter homework is assigned and are due on the following Friday. Before utilization of the Blackboard, students have only access to answers of odd-numbered homework assignments which are typically shown at the end of their textbooks. And if anyone was absent on Friday, would not have found out about the assignment until much later time. A Teaching Assistant usually grades homework assignments and returns them to me where the results are kept in a spreadsheet. A typical semester usually involves between eleven to fourteen sets of homework assignments.

Analysis and Comparisons:

In Fall of 2001, I had 63 students that completed the course. The students whom dropped or audited the class are not considered. During the semester, a total of fourteen homework sets were assigned. However, the last set was not graded. In Figure 1, the average homework grade of all students for each week throughout the semester is depicted. On the legend, Fall of 2001 is referred to as Series 1.

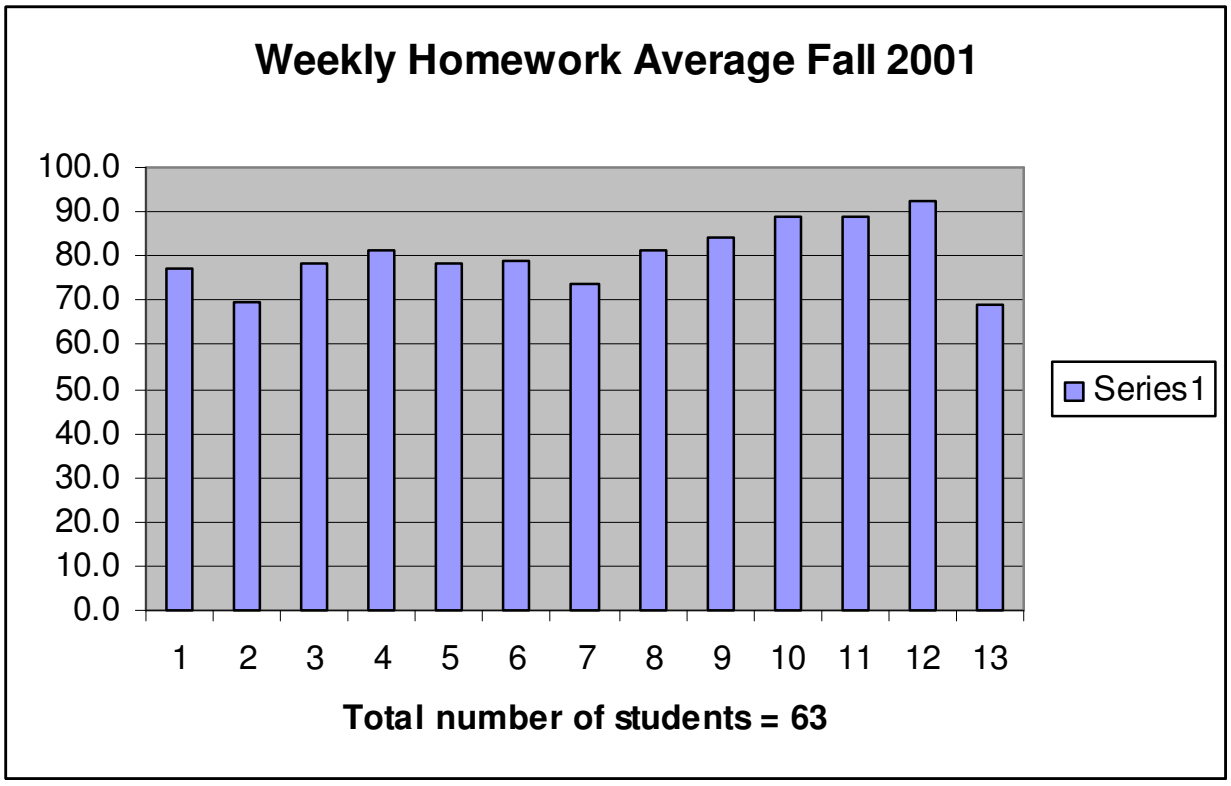

Figure 1

Seventy-nine students completed my Physics 130 section in Fall of 2002. In Figure 2, the average homework grade of all students for each week throughout the semester is depicted. On the legend, Fall of 2002 is referred to as Series 1.

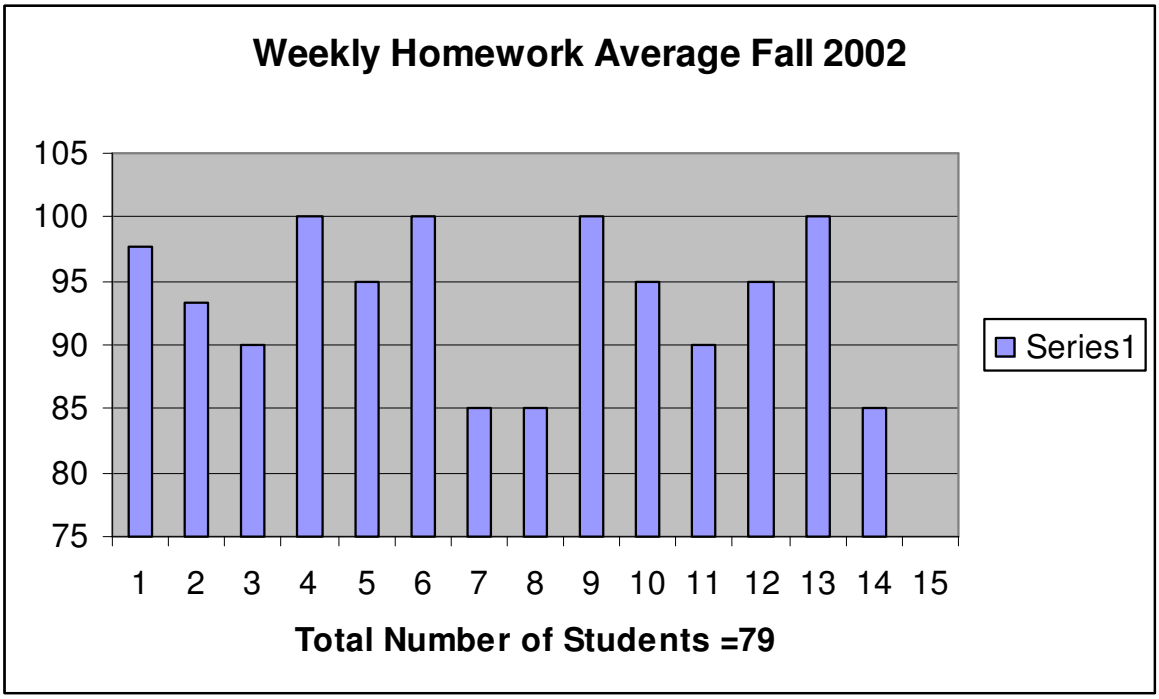

Figure 2

A total number of 74 students completed Physics 130 in Fall of 2003. In Figure 3, the average homework grade of all students for each week throughout the semester is shown. On the legend, Fall of 2003 is referred to as Series 1.

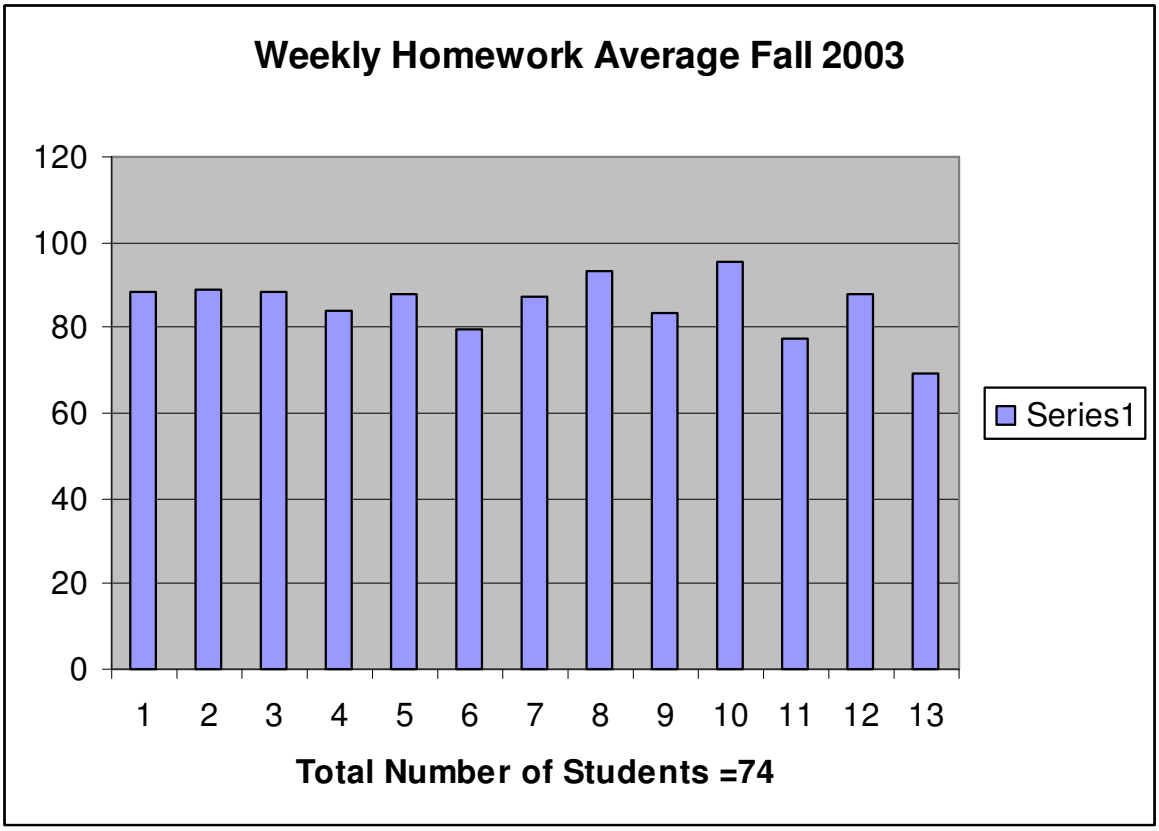

Figure 3

Although, Blackboard was utilized in our other classes before, in Fall 2005, for the first time, I used the Blackboard for posting assignments and communicating with students. Just like previous years, every Friday a new set of homework assignments were posted along with their due date and answers to even-number problems. In Figure 4, the average homework grade of all students for each week throughout the semester is depicted. On the legend, Fall of 2004 is referred to as Series 1.

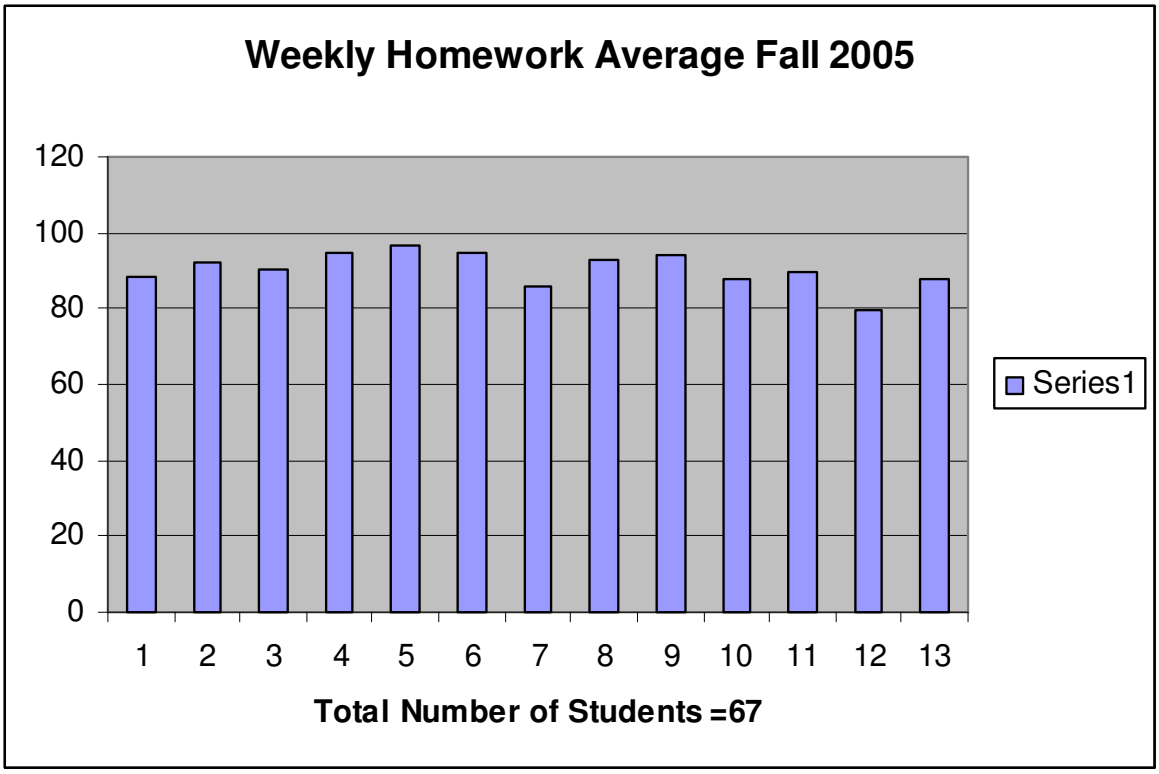

Figure 4

Prior to the Fall of 2005, some students would have checked their results of the assignments by showing up during office hours. One obvious advantage of the Blackboard is that now all the students have access to the correct answers to all homework assignments so they can compare their results. The data we have shown, that overall, students have performed better than average in the last three years. Moreover, the percent of students finishing their assignments was highest among all four years considered here. In Figure 5, the average homework grade of all students for each week throughout four semesters is depicted. On the legend, Fall of 2001 is referred to as Series 1, Fall of 2002 is Series 2, Fall of 2003 is Series 3, and Fall of 2005 is Series 4 respectively.

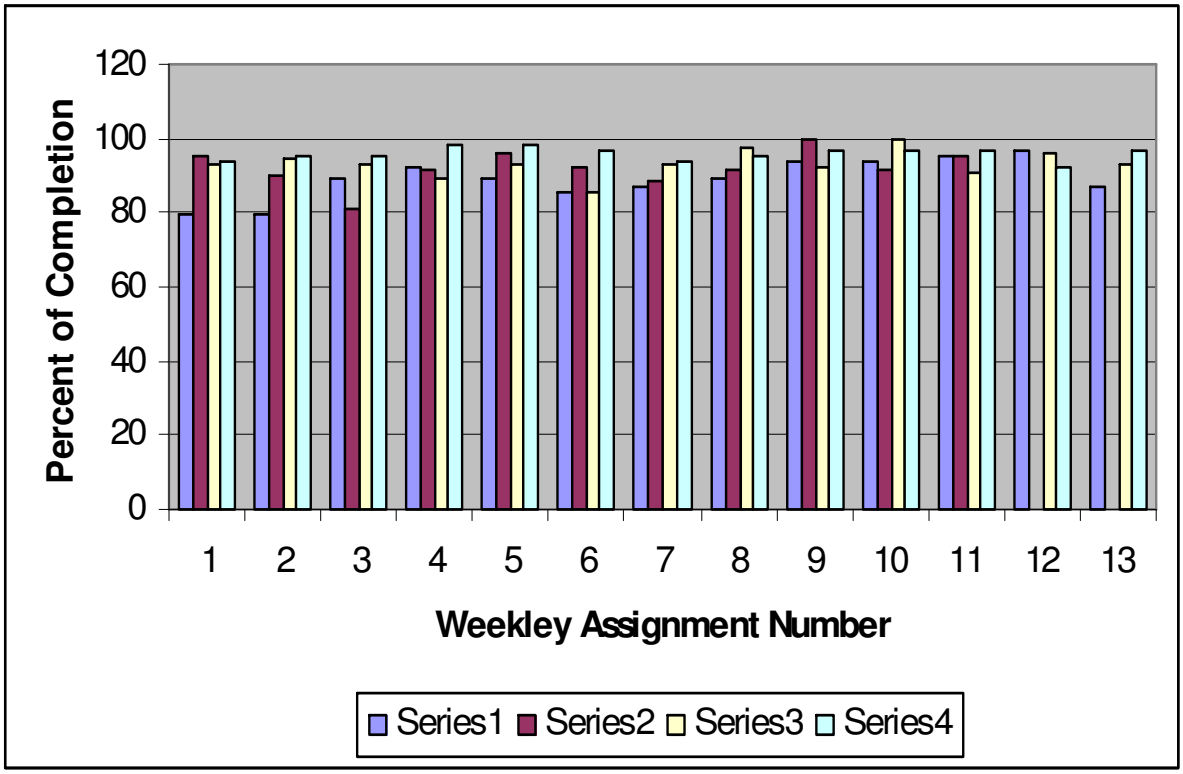

Figure 5

The overall average of homework averages of each semester (Series 1) and percent of overall completion for all students in each semester is shown in Figure 6.

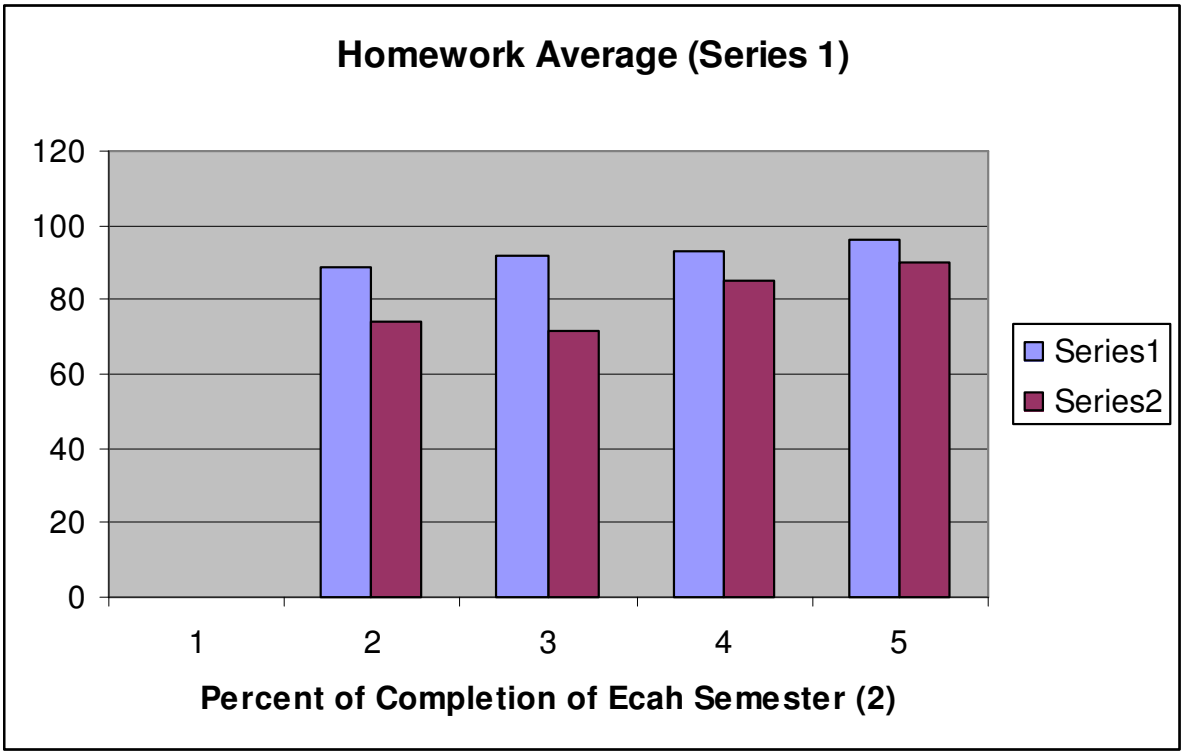

Figure 6

I will continue to use Blackboard in my Physics 130 class and believe that the least advantage of employing it is the convenience and access that it provides for students. At the end, the outcome of each class still depends on quality of instruction and how much time and effort individual students are ready to invest. However, at the age that there are so many different things competing for student's time and attentions, any thing that can help students to focus and facilitate their learning will be very helpful.

Using a Network Admission Control System to Secure Your Network

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Introduction

As users become more mobile on more powerful machines that attach to faster networks it makes it harder to keep an organizations' network and data secure and operational. This trend has been occurring since wireless networks and wireless devices have become more affordable. We can assume that this trend will continue in the years to come, probably at even a faster rate than in the past. By utilizing a network admission control (NAC) system, we can require that the devices that connect to the network are secure to a level that is acceptable by that organization.

Cisco.com defines a network admission control system as a system that "allows noncompliant devices to be denied access, placed in a quarantined area, or given restricted access to computing resources, thus keeping insecure nodes from infecting the network." If a device is deemed compliant then the computer is allowed onto the network just like when they are not checked by a NAC. This type of system pushes security to the connecting device, not on the network.

To fully gain all the capabilities of a NAC you will need to install a piece of software, known as an agent, to the connecting device. This allows the network and system administrators to check for very specific items on the desktop, be it a registry key, or a piece of software is running, etc. You can use a NAC without installing the agent; this still gives you the option to put a user into a role that has ACL's attached to that role. With Cisco's Clean Access system, you can use Nessus, a vulnerability checking software, to check for unsecured systems. This could lead to many false positives or may not be an option at all since most devices now have a firewall installed, which disables these types of checks.

We are going to specifically look at Cisco's Clean Access. Cisco bought out Perfigo to acquire this technology. Franklin College purchased the software from Perfigo and we have not seen a significant change in the product since Cisco has taken over the development. We will also discuss a web site that has been developed by Franklin College to work in conjunction with Clean Access to provide users documentation on how to fix their computer when it is in quarantine.

Cisco Clean Access Components

The Cisco Clean Access consists of three different components. The Clean Access Server (CAS), the Clean Access Manager (CAM), the Clean Access Agent (CAA). The agent is an optional piece but is strongly recommended to get the full functionality. With just the Clean Access Server and the Clean Access Manager, you will be able to use ACL's based on roles, but

you will not be able to check a device for installed applications or running applications to name a few.

The Clean Access Manager is the front-end for the system's administrators. This is where they set up the Clean Access Servers, configure user roles, set up the default web page for users to log on to, and view which users are logged onto the system. The web interface is not very intuitive at first, and it does take some time to figure out where everything is since there are so many different items that can be configured.

The Manager gives you the ability to see all users that are currently logged on to the NAC based on role. For each user you can view the IP address, MAC, and OS of the device that they have connected to the system, as well as when they logged on. If you have implemented new checks you can kick all users or specific users off the network very easily. If you are using the agent then you can also see what requirement a device does not meet. If you start to get a lot of calls with people needing help on how to get past this requirement, you should look at your help documentation to see if you can make it more descriptive.

The Clean Access Server is where all the enforcement is done. Depending on how your network is set up you may need more than one CAS. Here at Franklin College since we have two core routers, we had to purchase two CAS's. These servers are installed between the router and users. All traffic from networks managed by Clean Access is routed through the CAS. These devices can be the DHCP server for all devices managed by Clean Access.

To enforce Clean Access on specific virtual local area network (VLAN) you enter the VLAN(s) into the specific Clean Access Server that you want to manage that traffic. Everything that is a part of that VLAN is then considered untrusted. The Microsoft Encyclopedia of Networking defines a virtual LAN as, "A network technology that allows networks to be segmented logically without having to be physically rewired." You then must change your gateway address on your routers to point to the trusted network interface on the CAS. This forces all traffic from that VLAN to be routed though and managed by the Clean Access system.

The Clean Access Agent is a small piece of software that is installed on most devices that will connect to the network. This software works on Windows 98, ME, 2000, and XP. This piece of software is where the end-users log on to get onto the network. It then communicates with the CAS to determine what role and requirements this user must meet. It then begins to check to determine if the users' computer meets the requirements by checking if applications are running, if a file exists, or if a registry key exists, etc. If the computer does not meet a requirement, then the computer is put into quarantine. Once in quarantine the user is given either a link or a file to allow them to meet the requirements. They are not able to go past this point until the requirement is resolved. Once all the requirements are met, the user is allowed onto the network. If there are any ACL's for the role that the user is assigned to, the user will be limited by them, but that is the only thing based on the Clean Access system.

Why Franklin College Implemented Clean Access

Franklin College has been requiring that students install a managed version of Symantec Antivirus. Initially, this was done by sending all students an email with the link to install it included and trust that they installed the software. We soon discovered that this method was not effective; our network was being slowed to a crawl because student computers were still being infected.
We then implemented the NetReg system (http://www.netreg.org) that was developed at Southwestern University. That system allowed us to makes sure that all student machines had to register before it was allowed onto the network. This solved a lot of our virus issues since during the registration process we had students install Symantec. Yet, we still had to manually verify that all students had Symantec installed. Toward the end of the school year we were planning a large network upgrade and heard about Perfigo, now Cisco Clean Access. After some research and talking to other colleges using this system, we determined that this would help solve these issues.

How Franklin College implemented Clean Access

Since we already had our network setup with VLANs for our student switch ports and different VLANs for our faculty and staff ports, moving to Clean Access was easier to move to without major network changes. However, adding the NAC to our network was still a major network change since it is a completely different way of thinking about the network.

We setup a test VLAN in our offices with every type of computer that we thought we would see on our network. This lab had at least one machine with the following operating systems: Windows 95, 98, ME, NT, 2000, and XP as well as Mac OSX and a wireless access point. We included a wireless access point so that we could test to see how wireless devices would connect to the network behind the NAC.

Next we change the gateway of this VLAN to the trusted network card of the CAS and added that VLAN to the Clean Access Server. We then needed to setup the roles that we used. We determined that we only needed three roles for users: a student role, a role for faculty and staff, and a role for guests to the campus. To do this we had to add an authentication server, so the system could authenticate users and then add mapping rules to an LDAP attribute for each role. Since we have a different information store in Microsoft Exchange, we mapped the homeMDB attribute to determine the roles.

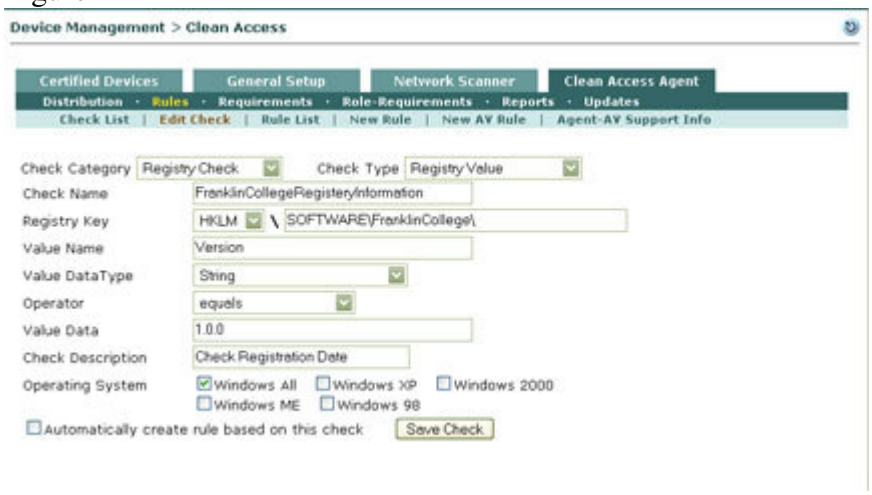
We then setup different log on pages for each of these operating systems. This allowed us to give a specific message to Windows 95, 98, ME, and NT machines since we do not allow them on our network. This page informs the users that they need to upgrade their machine to a required operating system. For Windows 2000 and XP machines the users get a logon page (see Figure 1), once they logon to this page it requires the users to download the Clean Access Agent. MAC OSX computers are not required to download the agent since it does not run on that operating system. So once they logon they are allowed to access the network.

Figure 1.

After we determined that this worked and that Windows users could log on using Clean Access, we needed to setup what requirements to check for on the Windows machines. This part can get very confusing and requires a lot of testing so below I'm going to explain each part in detail. The Cisco Clean Access system comes with several checks, rules, and requirements already created that you can use out of the box. Most of these are to check for certain Windows updates.

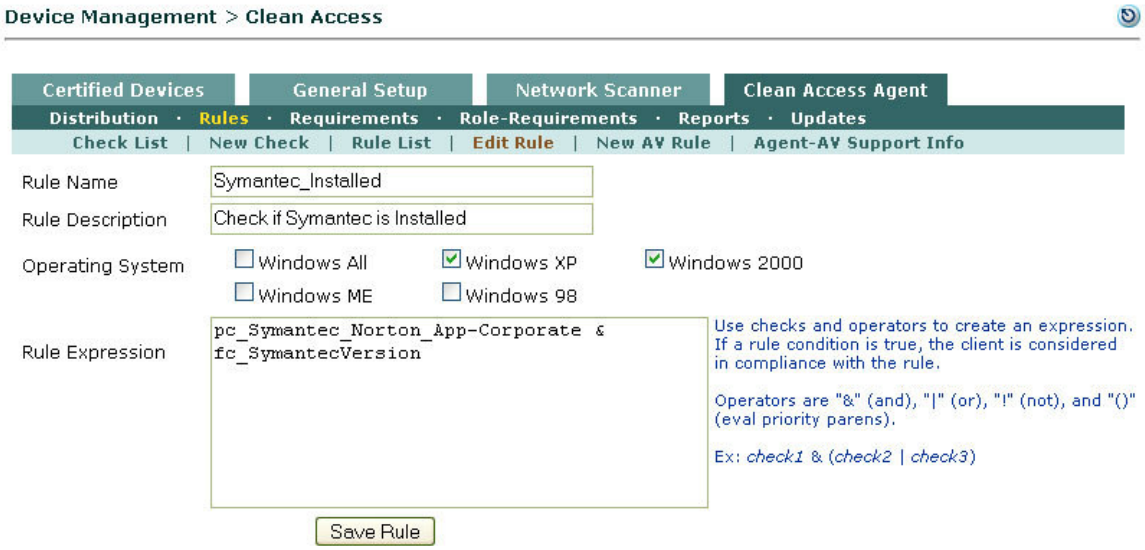
There are four different categories for a check. The first category is a registry check. With the registry checks you can check if a registry key exists or you can check for a specific value of the registry key (Figure 2). The second category is a file check. You can check if a file exists, or you can check the file for its file version or date, either creation or modification date. A Service check is the third category, and with this category you can check to see if the service is running or not. The last check is an application check. This check is a lot like the service check but it checks if an application is running or not.

Figure 2



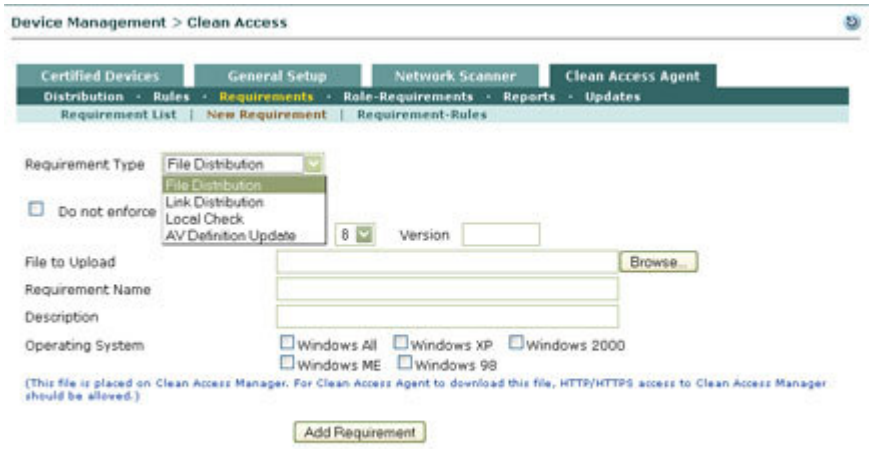
A rule is a way to group related checks (Figure 3). If you have only one check that you need to look at, then the rule might have only one check but it can have more than one. You specify which operating systems that the rule is for and then using operators ("&" (and), "|" (or), and "!" (not)), you add what checks you would like that rule to check for.

Figure 3



Next we need to create a requirement (Figure 4). A requirement will have one or many rules associated to it. You can set the requirement to succeed only if all rules are met, any rules are met, or no rules are met. Within the requirement you give the user a way to resolve the issue that they have not met. For example, if students do not meet our registration check, they are displayed a link which will take them to a registration page. You can use either distribute a file, a link, or an antivirus definition update. We have found that it is best to give the user a link and give them step by step instructions on how to resolve their device's issue. Now that we have a requirement created, we need set what roles will have to meet this requirement before they are allowed onto the network.

Figure 4



This school year we implemented Clean Access in all of the residence halls as well as on our wireless network. After thorough testing we determined that only student computers need to be checked and that less is actually more when it comes to requirements. We knew that we needed to guarantee that Symantec Antivirus was installed and up to date. We also need students to reg-

ister with us for two reasons. When they register they accept our acceptable use policy and we use this information to bill them for network access. We tested several other requirements such as, making sure that Windows Update is turned on and running, as well as checking for other versions of antivirus software.

After setting up all of this and checking that the checks work, we found one problem where Cisco Clean Access was lacking. How do we provide the user with detailed instructions and files to fix their computer to meet our requirements? Without a vehicle to do this our support calls would go up and we would still have to work on most of the students' computers. We determined that the best way to do this was to create a web application. This application is on a dedicated server since we do not want untrusted devices touching the network. This application had to be easy to use so that if we had a virus outbreak we could quickly put up documentation and files for the user to use to clean their computers.

This web application that we call Enforcer, allows for any member of our IT staff to provide help documentation for the users. They enter the information; it can be text, a file, a link, or images and give them priorities in a form. The information is displayed on the web page based on the priority the item was given. We then take the web address of this page and add it to the requirement. When a user does not meet a requirement they are presented a link to the documentation and they have all the information that they need to fix their computer.

The next part that we needed to figure out was when a student registered their computer with IT Services we needed to record their MAC address. We record this in case we ever have a need to investigate what a user was doing from a specific computer. Unfortunately there is no way to pull this information via an Internet browser, so we had to come up with another way.

We are able to pull the user's username and IP address from their browser. Since Clean Access runs on Linux we knew that it was using ISC's DHCP server (http://www.isc.org). This stores the MAC address for every IP address that it hands out to a device. We then created a cron job (scheduled task) that runs a script that copies file that contains all of the IP address leases to a new file. Then that file is sent to the Enforcer server. This script is run on both of our Clean Access Server once a minute. The registration page then checks these files for the IP address that we received from the browser to get the MAC address.

The student then enters in their student ID number and states that they accept the Franklin College Acceptable Use Policy. The system then creates a file that the user runs that enters information into their computers registry.

Conclusion

Cisco's Clean Access system is a very powerful and robust system, that has unlimited possibilities. What is does best is check that applications that you require a user to be running to gain access to your organization's network, or to check for unauthorized applications such as peer-to-peer file sharing software. This system does require a lot of planning and testing. You can not just put it on the network and expect it to be up and running in a day. We spent around 8 months testing and developing the help document system.

References:

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Simplifying Your IT Helpdesk with Request Tracker

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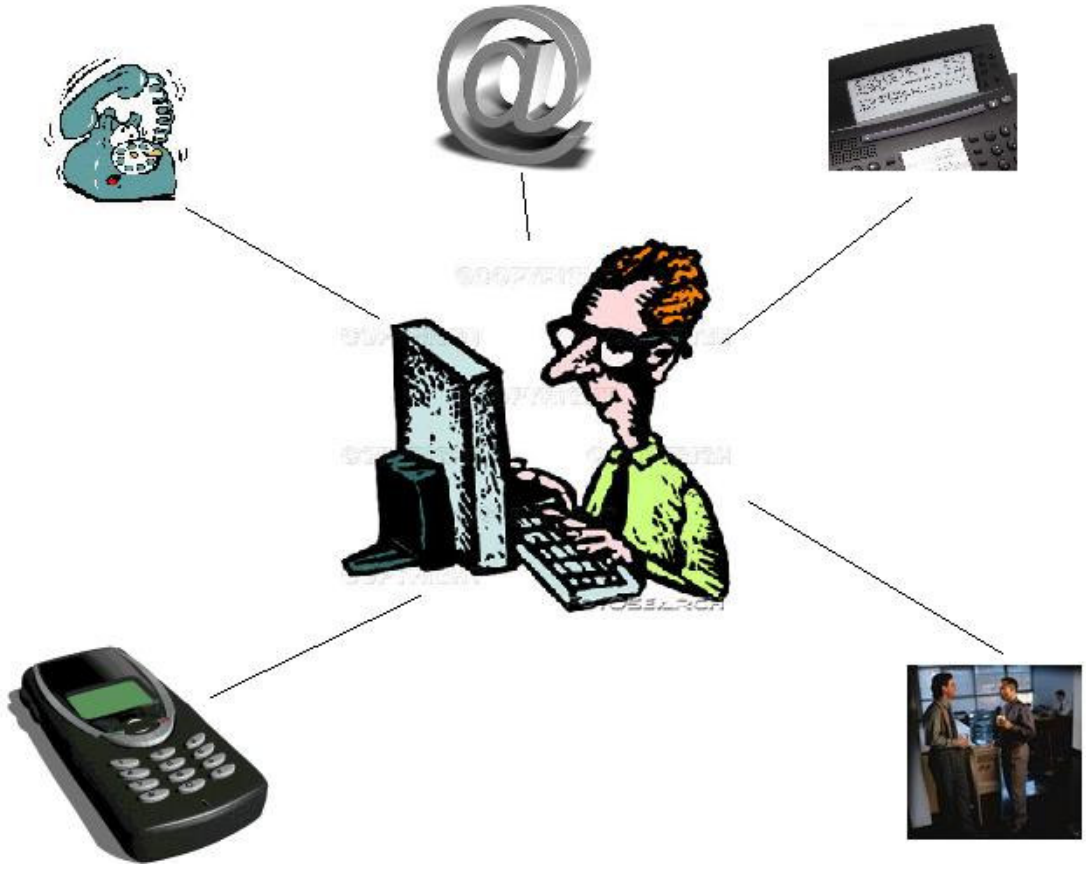
Abstract

Today's IT Worker receives work requests from a variety of sources; cell phones, desk phones, email, voicemail, even verbal communication at the office water cooler. Tracking, prioritizing and resolving helpdesk requests can become a nightmare without a central point of reference for all requests. Request Tracker (RT), an open source, cross-platform ticketing system provides centralized management of work requests using the familiar interfaces of email and the web. This session will share our experience in switching to RT for helpdesk management and will demonstrate the capabilities RT.

* RT is a product of Best Practical Solutions http://www.bestpractical.com/rt



Helpdesk Requests arrive from a variety of sources.

In order to become efficient, IT Helpdesks need a central place to store all requests so that they can easily be evaluated, prioritized, updated and tracked.

What we needed in a Helpdesk Package:

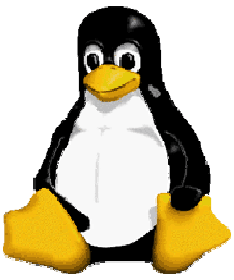
- Provide a central place to detail all work request
- Flexible work flow and customizations
- Available wherever a user or helpdesk staff may be (web based)
- Reliable (You can't submit work requests saying the work request system is down)
- Simple for end users to utilize
- Cheap or free
- Reporting features
- Integrates well with existing network architecture

What RT provides:

- Work requests and metadata are stored in an SQL database
- Open-Source software means customization possibilities are numerous
- Web based interface is accessible from any web browser (IE, Firefox, etc)
- LAMP architecture provides a reliable, fast solution that "just works" once it's up and running
- End User interface can be %100 email based, an application even the least techie users know
- Free to use and modify
- Basic search and reporting features, SQL backend makes further reporting options available
- User accounts are autocreated once they submit a request. Accounts can be restricted or tied to an LDAP server. RT works with most existing email servers, especially well with open source servers like Sendmail, Postfix and Courier-MTA

RT is based on the L.A.M.P. Platform:

Linux Operating System

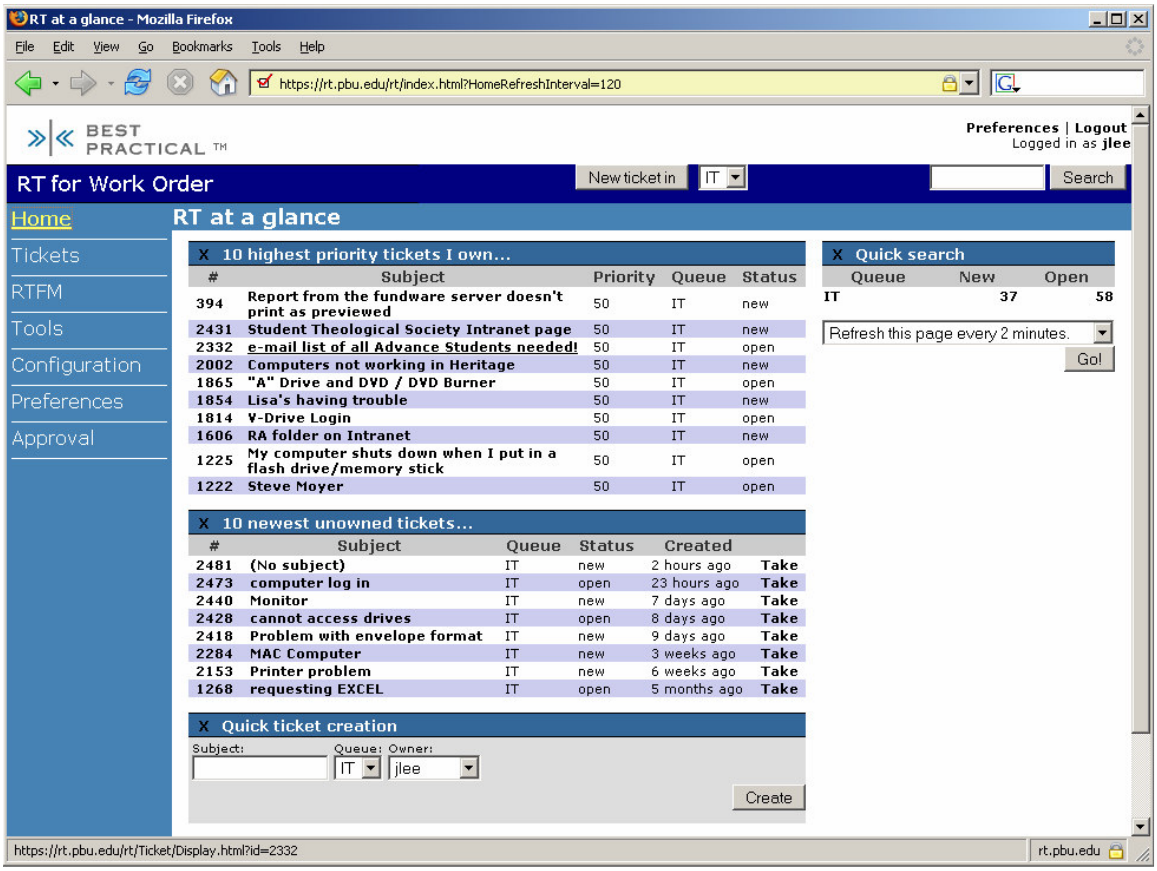


Apache Web Server

MySQL database server

Perl Scripting Language

Since RT is built upon free and open source software, it is easy to build and maintain a reliable and highly customizable system. While LAMP is the recommended platform for RT, some of these options can be swapped for alternatives, for example, a Windows machine can be used in place of Linux for the Operating System or Oracle can be used in place of MySQL for the database server. This gives the administrator a great deal of freedom and choice in putting together a platform to run RT.



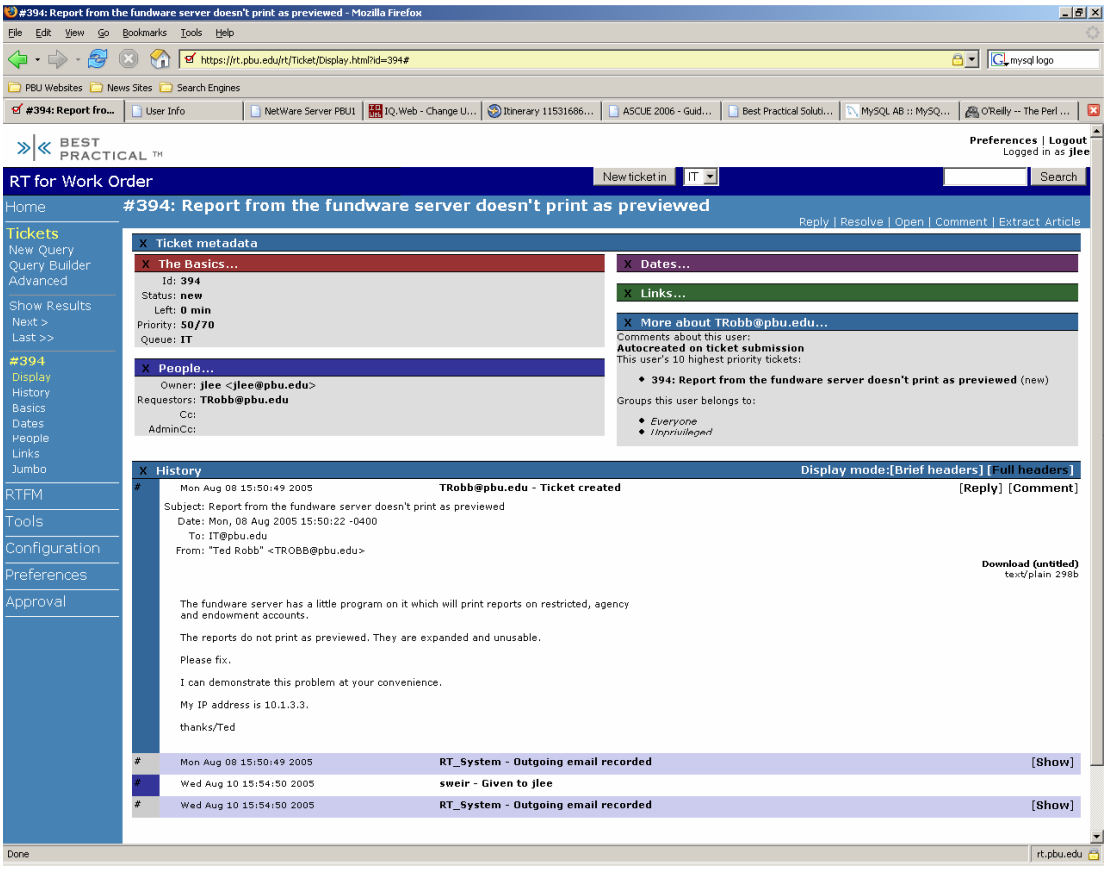
RT's Default Homepage

To the left:
Home – You are here
Tickets – Search for existing tickets using an SQL like syntax
RTFM – "RT Faq Manager" Addon module to RT for knowledgebase
Tools – Additional Features
Configuration – Customize RT Actions, responses, users, etc
Preferences – User settings (name, email, etc)

10 Highest Priority Tickets I own – provides a quick summary of tickets you have taken or been assigned.

10 Newest Unowned tickets – see what new helpdesk requests are coming in

Quick Search – Overview of New (no helpdesk response yet) tickets and open (not resolved yet) tickets



Viewing A Ticket:

The Basics – Ticket #, Status, Priority and Subject
People – Who created the ticket, Who owns the ticket and Who's watching the ticket
Dates – Creation, Start and Finish dates of ticket
Links – Ticket association with other tickets (depends on, merge 2 tickets, etc)
More about requestor – Shows other tickets user has previously submitted for quick Reference.
Ticket History – Shows initial request of user and any further correspondence. Email replies are automatically appended to history, Helpdesk staff can reply to user or they can comment on the ticket, comments are not seen by the end user.

The Good, the Bad and the Ugly, our experience using RT for one year:

The Good:

- Most end users found that submitting work orders via email was easier than using a special application.
- Web based interface for helpdesk staff allowed them to check work orders from kiosk machines, end user workstations, Linux and Macs
- Fast performance meant some work orders were resolved within minutes of request
- SQL backend offers more powerful search capabilities

The Bad:

- End users couldn't track work order or find out history of work order if they deleted work order emails (need to open web interface to end users)
- Perl based installation can be difficult to install, and upgrade, generally stable if you don't touch anything though.
- RTFM knowledgebase module needs a lot of work
- Searching for tickets can be complicated

The Ugly:

- Web Interface could use some cleanup; need to be able to hide non-relevant data. For example, we don't use priority field or links that much
- Emails can get very long and difficult to follow when users quote text in replies

Best Practices and Exemplary Application of Technology in Higher Education

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Overview

Delta State University is a regional institution providing educational opportunities for a population that has been traditionally underserved. The poverty level of communities in the region has risen in the last ten years while the general population has declined in the small towns and communities that make up the Mississippi Delta. These factors have meant the tax base for schools of the region has diminished significantly creating a climate that limits access to technology in area schools and communities.

The Center for Teaching and Learning (CTL) located in the College of Education at Delta State was envisioned in the 1999-2000 school year as a catalyst for systemic change across the college and region as related to technology and its place in the education of the P-12 community. The mission of the CTL is to create a resource-rich culture of teaching and learning with full staff capabilities to support technology utilization in a variety of settings for DSU faculty and students, the P-12 schools and the community at large. The Center is committed to promoting an infusion of varying levels of technological practices into curriculum through its innovative structures as well as through the more traditional avenue of computer labs, hardware, software, and other resources. The physical layout of the CTL was designed to offer opportunities for high levels of student engagement with peers, faculty, staff, and technology resources.

The Center's goals include: 1) implementing appropriate standards for technology and high quality educator preparation programs across the graduate and undergraduate curricula, 2) providing access to technology for students and faculty in a variety of settings within the college, 3) providing access to state-of-the-art, technologically resource-rich environments for PK-12 partner schools and the greater community, 4) supporting web-based teaching and learning components, and 5) expanding e-learning capabilities to meet regional needs.

Staff

The staff of the CTL provides on-going, on-site training and technical support for the greater DSU community. The Technology Coordinator for the College, the CTL Director and the Computer Technical Specialist provide a full range of services for all CTL users. Individual and small group training sessions for faculty, students, and community participants, as well as topical seminars, are regularly offered to meet individual needs and to assist in the full implementation of all technology initiatives. These staff members also develop training products and processes and oversee the student technology support system developed for the Center.

Student Support System

Student staff members in the Center for Teaching and Learning (CTL) have been a vital and valuable component of the Center's success. The student staff members provide individual and small group training and support for a wide range of technological applications including WebCT and the full complement of Microsoft Office programs. In an effort to provide more technical support to students, faculty, and the community, Tech Fellows have been added to the CTL staff to augment the graduate assistants and other student workers. While all student staff members provide regular assistance to those using the CTL, the Tech Fellows are student workers who have been specifically trained to provide assistance with the most intense and sophisticated offerings of the Center. The student members of the CTL staff are not only providing a valuable service but are enhancing their own capabilities in demonstrating leadership in technological advancement.

Major Initiatives of the Center for Teaching and Learning

The E-Learning Program

The Delta State University E-Learning Pilot Program was implemented in the 2004-05 school year as a new initiative of the Center for Teaching and Learning. The pilot allowed the university to identify the most efficient means for developing a full-scale e-learning program for Delta schools. After a needs assessment was conducted with area school districts, it was determined that Spanish language classes were the courses to be included in the pilot. During the pilot year, a certified Spanish teacher appropriately trained in distance learning techniques taught classes to 60+ students via an interactive video system. Because the pilot year proved to be very successful, additional funding to continue the program was sought and provided from the State Board of the Institutions of Higher Learning and the Mississippi Department of Education.

The Technology Coordinator for the College of Education provides oversight for the E-Learning Program with the involvement of the Executive Director of the Delta Area Association for the Improvement of Schools (DAAIS) and the Dean of the College of Education. The staff of the Center for Teaching and Learning supports the technical aspects of the program. Mississippi Public Broadcasting serves as the bridge to allow for connectivity between the school districts and the university while Delta State University provides financial and managerial oversight for the program.

Participating school districts have provided appropriate classroom space and on-site equipment including computer access for students. Additionally, districts have purchased textbooks and workbooks, provided a classroom facilitator, and made technical support available as needed.

Qualitative data obtained through multiple school site visits, email correspondence and written feedback from students and school personnel formed the basis of the evaluation of the pilot program. All evaluative information indicated a very high degree of satisfaction with the e-learning pilot. Additional evaluation strategies will be employed at the end of the 2005-06 school year and will focus on student/teacher success, technology effectiveness, and efficiency of program operations. Evaluation results will be used in planning subsequent years of the E-Learning Program.

The major components of the E-Learning Program include the following:

- Two interactive video studios used to broadcast classes to area schools;
- Fully certified faculty providing instruction in advanced courses;
- Appropriate staff to ensure efficient operation and sufficient technology support;

- State-of-the-art equipment for operations and broadcasts;
- Training for Center faculty/staff and district personnel; and
- Collaborative structures to foster strong communication among districts, university personnel, and Center staff.

Five area high schools with a total of 205 students are currently enrolled in e-learning classes of Spanish I and Spanish II for the 2005-06 school year. Plans are to expand the program for the spring 2006 semester to include additional faculty to teach advanced placement classes in the sciences and mathematics and to offer enrichment activities in the arts as an after-school component.

Mississippi Teacher Fellowship Program

In a collaborative effort with the Mississippi Teacher Fellowship Program (MTFP) and the University of Mississippi, the Coordinator of Technology for the College of Education at Delta State University conducts technology training each year for the new fellows selected for the MTFP. With a program designed to encourage graduates of teacher education programs to stay in Mississippi and teach, MTFP pays for these graduates to earn advanced degrees. Along with tuition and stipends for books, each fellow is given a laptop computer. Delta State University's Technology Coordinator provides training for the new fellows and mentors in the group throughout their first year of teaching. Mentoring involves contact through meetings, email, and facilitated regular chat sessions. The mentoring process not only builds capability in using technology but also enhances the support system for the fellows in the program.

TEK PAKS

Although teacher candidates have the responsibility of including technology in their field experience lesson presentations, many Delta area schools do not provide the technology needed for teacher candidates to be successful in this aspect of their teaching. The Office of Field Experiences and the Center for Teaching and Learning have equipped TEK PAKS for student to check out and use during their field experiences. Each TEK PAK includes a digital still camera, a digital movie camera, a laptop computer, and an LCD projector to provide teacher candidates with the most up-to-date technology tools needed for the immersion of technology into their lessons. Additionally, teacher candidates are provided with appropriate training and support to allow them to be successful in their technology implementation.

Resource Training Site

It is fully recognized that simply "having" technology is not the same as "using" technology. With this in mind, the CTL has positioned itself to serve as a resource to university faculty and students, teachers and administrators in the PK-12 schools, and other community entities in developing an appropriate level of confidence in the use of a variety of technological tools.

College of Education faculty ensure that all teacher education students are aware of the expectations of their program in building the capacity to positively impact technology use in their schools. Class training, small group sessions, individual tutoring, and tutorial software are all provided to students to assist in their development in effective technology use. Faculty training sessions and individual assistance is also provided in the CTL Faculty Development area. This

section of the CTL allows faculty privacy for tutoring sessions when developing their technology skills.

The College of Education at DSU partners with the Delta Area Association for the Improvement of Schools (DAAIS) in working toward meeting the needs of the PK-12 community. The consortium is composed of 30+ school district members as well as a local community college and is housed in the College of Education. This physical proximity allows appropriate planning and collaboration to take place with member schools. Training sessions within the Center for Teaching and Learning, on-site training provided at individual schools, and individual and small group assistance are all regular features of the work of the CTL with our partner schools.

Additionally, the CTL is available to community entities for training sessions as needed. Because the training facilities are state-of-the-art, they provide community members with an excellent location at which to meet their training needs.

Demystifying technology and focusing on its applicability to improve the quality of life and services in the Delta region have served as the two focal points for all CTL endeavors.

Site-Based Support

The staff of the CTL is available to serve as on-site facilitators and/or consultants for the PK-12 schools of the Delta. Workshop offerings at schools have ranged from the use of PowerPoint as a presentation tool to using technology as a means of mentoring new teachers. Requests for on-site support are received by the DAAIS Consortium office and coordinated by them through the CTL to ensure an appropriate "match" with the needs of the district/school needing assistance.

The Portable Lab

A portable lab with wireless connectivity and 20 state of the art lap top computers is available to faculty for use in their classrooms. Each lap top is equipped with all software applications available to students and faculty in the Center for Teaching and Learning training lab. The increasing use of technology by all programs in the College of Education has been evidenced by the large number of reservation requests for the training lab. The portable lab offers faculty members an alternate solution for technology use when the CTL training lab is not available.

Mini-Labs

Mini-Labs containing program-specific software and 5-8 computers have been provided through the CTL for several programs within the college. These labs allow faculty close proximity to computer use for research activities with their students. The labs provide an invaluable service in promoting student research activities in a user-friendly environment and support the belief that research can inform practice.

Technology Model Classrooms/Smart Carts

Two model classrooms have been developed within the College of Education to allow faculty to model "best practices" in the use of technology. Each classroom is equipped with a ceiling-mounted LCD projection system, a document camera, and a Sympodium to be utilized for presentations by faculty and students, instruction using Internet access, and lesson development activities. Additionally, SMART carts are also available in the College for use in those classrooms that have not yet been equipped as Model Classrooms.

Technology Assessment for Teacher Candidates

The College of Education at Delta State University has created a Technology Assessment for Teacher Candidates. Using a technology model created through a PT^3 grant at the University of Southern Mississippi as a model, the College of Education Technology Assessment consists of four modules, each of which assesses basic computer skills in the areas of word processing, multimedia presentations, telecommunications, and databases/spreadsheets. Students complete each module on the computer, banking each portion successfully completed and receiving the opportunity for instruction on portions needing remediation and reassessment. The successful completion of this assessment is a requirement for admission to Teacher Education.

The Learning Curve

An increasing number of students come to Delta State University with deficiencies in one or more areas of basic skills. In an effort to assist these students, the College of Education has created *The Learning Curve*, a lab within a lab in The Center for Teaching and Learning. *The Learning Curve* provides computer-assisted instruction and technology support to students under the tutelage of the Tech Fellows. Faculty members send students to the CTL using referral forms noting areas in which student need improvement. Students receive instruction in generating programs and sites to help with their remedial areas. Successful remediation and assessment will be reported to the appropriate faculty member(s) and tracked by the CTL.

TaskStream Tools of Engagement

The College of Education has adopted the use of TaskStream for programs involved in the preparation of teacher candidates. TaskStream provides an array of web-based tools for teacher education programs. Faculty and administrators manage and distribute course materials, review student work and track student progress, create portfolio templates and assess student portfolios online, develop curriculum easily referencing state and national standards, and prepare assessment rubrics. TaskStream's reporting tools aggregate and disaggregate data for accreditation support.

Students submit work for review and evaluation, receive feedback from instructors and peers, and author standards-based lessons and units. TaskStream's Web Folio Builder makes it easy for students to create, organize, and share electronic portfolios that demonstrate standards compliance for certification. Instructors create online programs through which they distribute course materials and review students work. College of Education students access these class resources and submit work to their instructors online. Email and instant messaging systems facilitate collaboration, and faculty members establish discussion groups and post announcements for their classes to support multiple modes of communication.

Outcomes

The success of the Center for Teaching and Learning can be seen in the increased number of students, faculty, and school districts making use of the services. As an example, data collected in student use since the CLT opened shows a dramatic increase as noted below:

Student Lab Use

1. 2011
1. 7416

2001-2002 8623
2002-2003 15508
2003-2004 16011
2004-2005 16876

Training lab data was only collecting since 2003 but shows an increase of almost 2000 participants.

Training Lab Use

2003-2004 5374
2004-2005 7111

Additionally, the E-Learning Program grew from 2 schools with 60 students in 2004-2005 school year to 5 schools with over 200 students in the fall semester of 2005. Several additional school sites have indicated a desire to be part of the e-learning program as it expands during the spring of 2006.

Qualitative data has also been collected through faculty and student surveys, informal feedback via conferences and email, and formal feedback sessions with division and school district representatives, structured interviews by external evaluators, and written letters of thanks and support. All data collected has indicated a highly positive rate of approval for activities of the Center for Teaching and Learning,. Annual evaluation of all components of the CTL allows decisions to be made to both sustain successful programs and to enhance programmatic offerings.

Sustainability

The administration of Delta State University has regularly demonstrated its commitment to sustaining all activities and initiatives of the Center for Teaching and Learning. While grant monies have allowed the development of the CTL's programmatic offerings, all can be sustained with funding from other sources. Faculty, staff, students, and the Office of Institutional Technology also have indicated their support of the initiatives of the Center for Teaching and Learning.

Using Audacity: A Cross-Platform Freeware Sound Editing Program

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About this Presentation: Audacity is a free audio editor for your computer. It is available for both Macintosh and Windows operating systems. You can record sounds, play sounds, import and export WAV, AIFF, and MP3 files, and more. Use it to edit your sounds using Cut, Copy and Paste (with unlimited Undo), mix tracks together, or apply effects to your recordings. It also has a built-in amplitude envelope editor, a customizable spectrogram mode and a frequency analysis window for audio analysis applications. Built-in effects include Echo, Change Tempo, and Noise Removal, and it also supports VST and LADSPA plug-in effects.

References: This presentation is based on the unabridged tutorial, developed by Tom Marcais, and available at:

http://www.ac.sbc.edu/documentation/training/Audacity.pdf

Downloading & Installing Audacity: To install Audacity on your computer, open any Internet Browser (Internet Explorer, Netscape, Safari, etc…) and go to the following address:

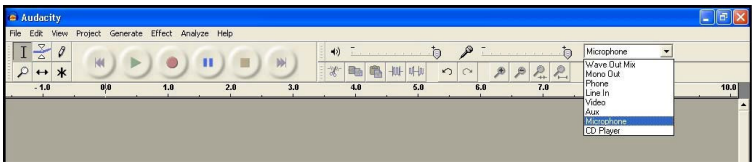
http://audacity.sourceforge.net/

This will take you to the Audacity home page. Links for downloading the necessary files are available on the left-hand side of the page.

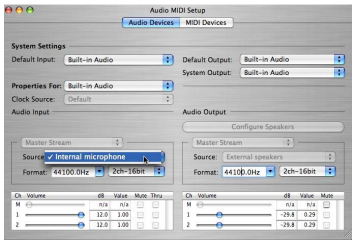
Using Audacity: Audacity is a very powerful and complex audio editing program. Rather than try to explain what each and every control & feature in Audacity does… this presentation will focus on some of the more common types of projects you can accomplish with Audacity.

Project 1: Recording a Spoken Narrative: One of the useful things to do with Audacity is to record a spoken narrative. Audacity can be an excellent tool in recording the spoken voice. For most people it is very difficult to read more than a minute worth of text without needing to edit out mistakes. (Just think of how many times you had to re-record your answering machine message!) Recording your voice does require that your computer have either a built-in or external microphone. Most current Macintosh computer models (iMac's, iBooks, Powerbooks, etc…) have a built-in microphone. Most Windows computer users will need to purchase an external microphone.

Setting the Input Source: To record your voice, first open **Audacity** on your computer. Next, we need to tell Audacity that we will be recording from a microphone. On a Windows computer, choose **Microphone** from the drop-down menu of input sources in the upper-right hand corner of the Audacity Window.



To set the input source for a Macintosh OSX computer, open the program **Audio MIDI Setup** (located in the **Hard Drive -> Applications -> Utilities** folder). In the **Audio Input** section, set the **Source** drop down menu to **Internal Microphone** (unless you're using an external microphone, in which case an option for that should appear)



Audio Control Buttons: Now that you have selected your microphone for the input source, it is time to learn about the **Audio Control Buttons**. These buttons are located at the top of the screen, and are grouped together for ease of use.

These buttons work very similarly to controls found on standard VCR and DVD players. A detailed description of each button is as follows:

Skip to Start - moves the cursor to time 0.

Play - starts playing audio at the cursor position. If some audio is selected, only the selection is played.

Loop - if you hold down the **Shift** key, the Play button changes to a Loop button, which lets you keep playing the selection over and over again.

Record - starts recording a new audio track. The new track will begin at the current cursor position.

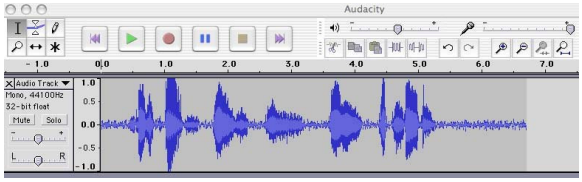
Pause - temporarily stops playback or recording until you press pause again.

Stop - stops recording or playing.

Skip to End - moves the cursor to the end of the last track.

Recording and Playback

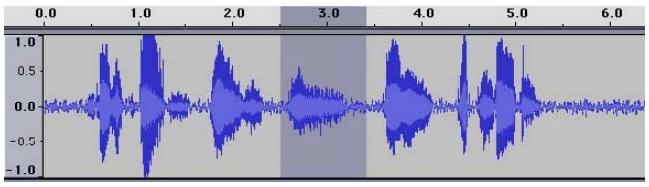
Now, we're ready to start recording our voice. Press the **Record** button, wait a second, and then slowly speak the words: "**This class is… um… very exciting**!" When finished, press the **Stop** button to end the recording. You should see a track appear, similar to the one pictured below (everybody's spoken voice will appear slightly different).



To hear your recording, press the **Skip to Start** button and then press the **Play** button. As you listen to it, notice that a vertical line moves along the track as the voice is played. This line follows the waveform as the voice is spoken so that you can identify which words each part of the waveform represent. So now, we know which word each one of the spikes represents.

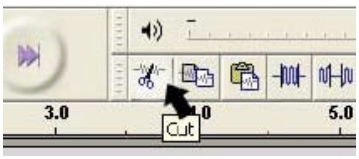
Editing - Cutting

Now that we've recorded our voice, it's time to make some edits. First of all, we need to remove the word "Um" from our recording. To do this, you'll need to click on the **Selection Tool** in the toolbar.



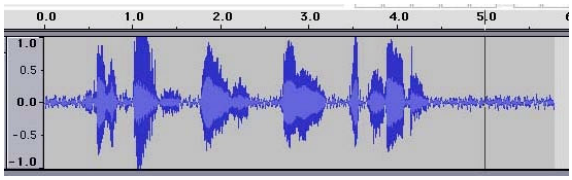
Then, use your mouse to click in the spot in front of the spike in the waveform that represents the word "Um". Keep your mouse button held down, and drag your mouse to the end of that spike. You should notice that it will darken the area of this selection. Now when you press the **Play** button, all you should here is the word "Um".

To get rid of this part of our recording, we use the **Cut** tool. Just press the **Cut** tool in the toolbar and our selection will be deleted.

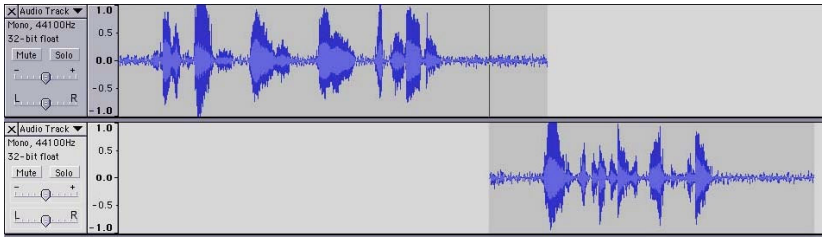


Editing – Recording Additional Narration

You may wish to record more narration after you've already completed your first recording. Each time you start and stop recording, Audacity will add a new track to your project. The new track will begin wherever you click in the waveform with the selection tool. Let's use the selection tool and click after the end of our "exciting" spike. You should see a vertical line appear where you clicked.

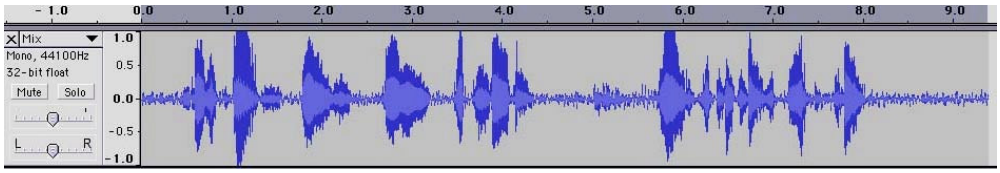


Now, press the **Record** button, wait a second, and then slowly speak the words: "**And the teacher's great too**!" When finished, press the **Stop** button to end the recording. You should see another track appear, underneath our original track, similar to the one pictured below (everybody's spoken voice will appear slightly different).



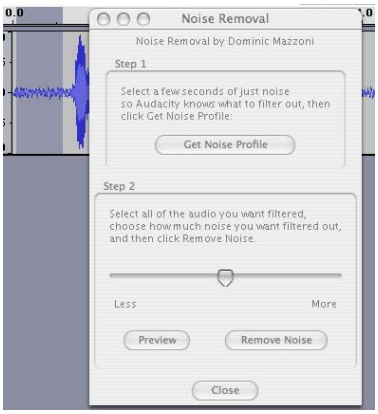
Combining Tracks

When you have two or more tracks, like these ones, that start and stop before the next one begins… it is usually easier to work with them if you combine them into one single track. Combining tracks is called mixing. To mix these tracks together, first choose **Edit -> Select… -> All** from the menu bar. Then, choose **Project - > Quick Mix** from the menu bar. The two tracks will in essence be placed on top of each other, creating one single track.

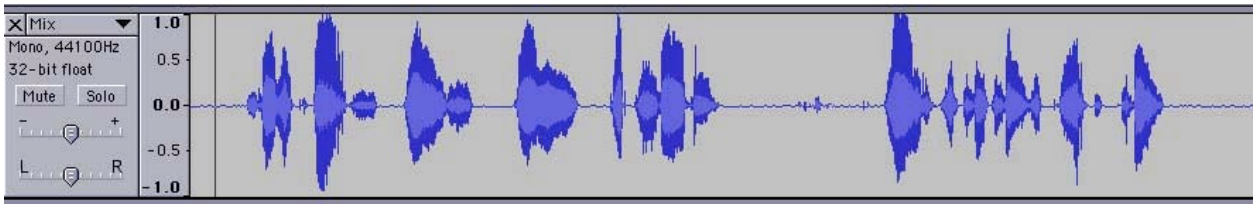


Removing White Noise

Take a moment, and sit perfectly still. Listen to your environment around you. Is it silence? Most likely… it's not. You can probably pick out the hum of your computer fan, maybe the drone of the air conditioner. These are all background noises that we are so accustomed to, that we just tune them out. However, our microphone does not have that luxury. It will record not only our voice, but these background noises as well. In the recording industry, these sounds are called "white noise". The nice thing is that Audacity makes it easy to remove the majority of the white noise from your recordings.

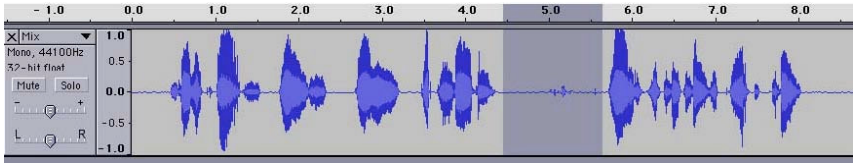


Look at the waveform we just mixed. Any place that we don't have a spike for our words… you'll notice that the waveform looks like a bunch of tiny little spikes. If that were absolute silence, the waveform would simply be a straight line. We can use an effect to fix that. First, use your selection tool to select a portion of the small spikes. Now, from the menu bar, choose **Effect -> Noise Removal**. The **Noise Removal** dialog box will appear. Go ahead and click on the **Get Noise Profile** button. The dialog box will disappear. Now, from the menu bar choose **Edit -> Select… -> All** so that our entire track is selected. Finally, go back to the menu bar and choose **Effect -> Noise Removal** again. In the **Step 2** section, adjust the Slider between the Less and More values. Press the **Preview** button to hear how it will sound. If your voice starts to sound distorted… move the slider more toward the **Less** side. If you can hear background noise (and your voice isn't distorted) move the slider toward the **More** side. When you have set the slider to an ideal position, press the **Remove Noise** button. The effect filter will run, and your background noise will be removed. You should now be left with a track that looks similar to the following image. (notice how the small spikes now are closer to a straight line)



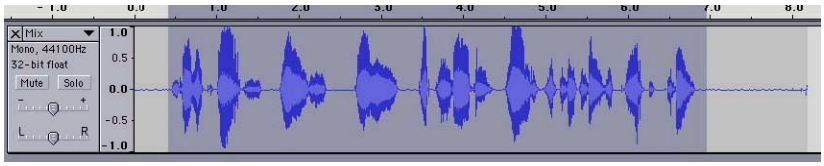
More Cutting & Trimming

Now it's time to polish our recording by getting rid of the silences at the beginning, middle and end of our project. First, let's delete the silence between the phrases "this class is very exciting" and "and the teacher's great too!" To do this, use the selection tool to select the area between the phrases (it should look mostly like a straight line).

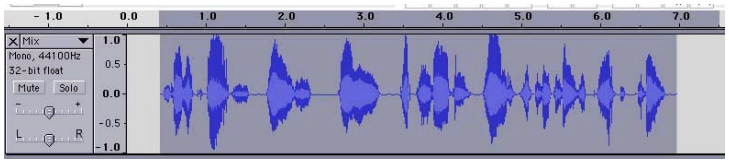


Then, choose **Edit -> Cut** from the menu bar. The area you selected will be removed from the project.

Now, we're ready to **Trim** the recording. Trimming is a process of getting rid of material at the beginning and end of a recording. Use your cursor to select all the spikes that represent the spoken words. Do not select the silent sections at the beginning and end.

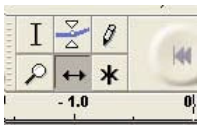


From the menu bar, choose **Edit -> Trim**. This command will keep only the area that you had selected, and will delete the rest. You should be left with something similar to the following picture:

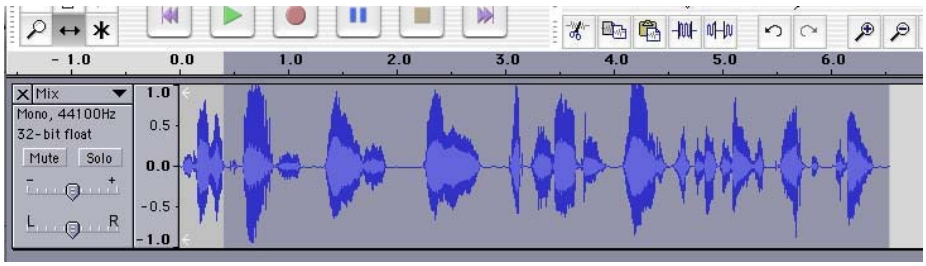


Using the Time Shift Tool

You'll notice that since we trimmed the project, the audio no longer starts right at the 0:00 setting in the time line. We can move the recording to the 0:00 setting by using the **Time Shift Tool**. Choose the **Time Shift Tool** in the toolbar (looks like a double-headed arrow).



You can use the **Time Shift Tool** to move Audio from one time setting to another. Click on the waveform with your mouse, and while you hold the mouse button down, drag the waveform to the left. You should be able to position the waveform right at the 0:00 setting.



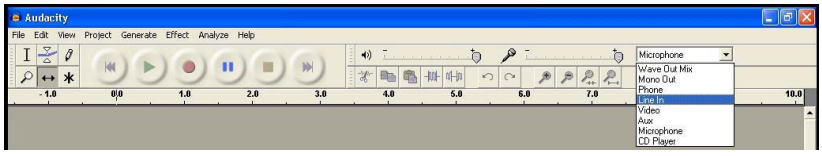
Saving the project: We are now ready to save our project. There are two main ways to save files in Audacity. If you are planning on returning to your project for further editing, you should go to the menu bar and choose **File -> Save Project**. A dialog box will appear allowing you to name the file, and choose the location where it will be saved on your computer. This will save the project as an **Audacity** file type (.aup), so that you save everything you're working on exactly as it appears on the screen. This is great for when you want to continue working with a file in the editing process.

However, most other programs cannot open native Audacity files. That's why, when you're done with editing your project, you should **Export** it so that other programs can open the file. My preferred format to export it to is MP3, because most computer audio programs can easily handle this format. To export your file as an MP3 file, choose **File -> Export as MP3…** from the menu bar. Again, a dialog box will appear allowing you to name the file, and choose the location where it will be saved on your computer. You'll now be able to open and use this file in most programs that support audio files (PowerPoint, iTunes, etc…).

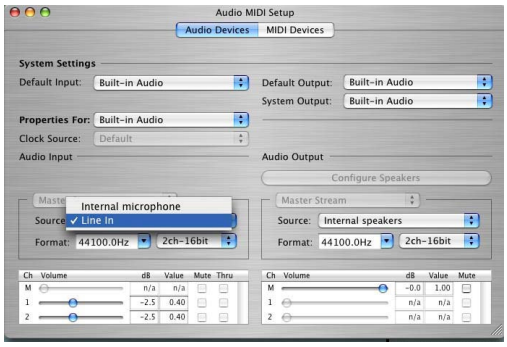
Project 2: Transfer Tape/LP to CD

Audacity can also be used to help you transfer audiocassette tapes and record LPs onto a CD. In order to use Audacity for this purpose, you will need a player for your source material (a tape deck, phonograph, etc) that has Line Out jacks, a Computer that has Line In inputs, cables that go from the player to your computer, and a software program that burns audio CD's from MP3 files. Just connect the cables from the Line Out jacks on your player to the Line In jacks on your computer, and let Audacity handle the rest.

Setting the Input Source : To begin your transfer, first open **Audacity** on your computer. Next, we need to tell Audacity that we will be recording from our Line in port. On a Windows computer, choose **Line In** from the drop-down menu of input sources in the upper-right hand corner of the Audacity Window.



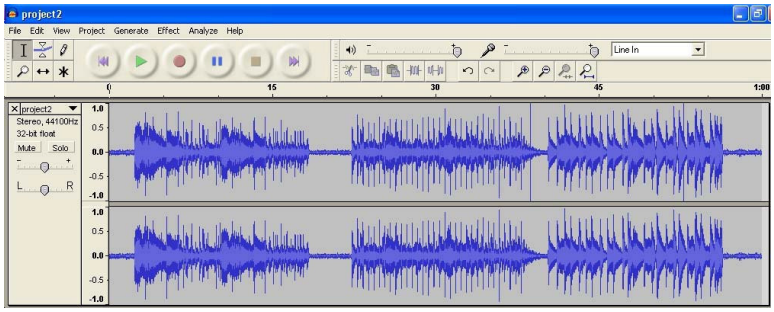
To set the input source for a Macintosh OSX computer, open the program **Audio MIDI Setup** (located in the **Hard Drive -> Applications -> Utilities** folder). In the **Audio Input** section, set the **Source** drop down menu to **Line In**.



Recording : The next step is to begin recording the audio from your source material. First, press the **Record** button in the Audacity Control buttons. Then, press the **Play** button on your Tape/Record player. You should begin to see and hear the waveform as Audacity records your

material. Once your material has ended, press the **Stop** button in the Audacity Control buttons and then the **Stop** button on your Tape/Record player.

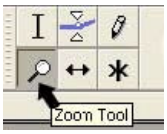
Opening A File: Since we do not have a transfer station here, we will open a pre-recorded file. To open files, just go to the menu bar and choose **File -> Open**. I will open the **project2.mp3** file. The sample file appears in audacity.



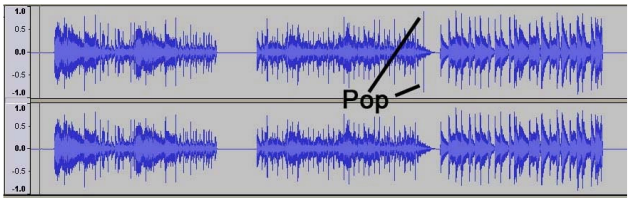
Go ahead and press the **Play** button so that you can hear the recording. Notice that there are clips from three different songs.

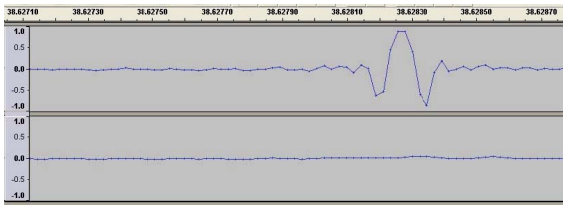
Fixing Pops: More often than not, when you record audio from a cassette or record, you will hear some crackling or popping in your recordings (especially on records). Fortunately, Audacity provides with the tools to remove these imperfections.

The Zoom Tool: In order to fix pops, we need to zoom up close on the waveform. First, select the **Zoom Tool** from the toolbox (looks like a magnifying glass).



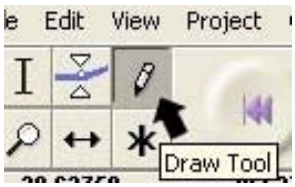
Now, look at the waveform. Notice how at the end of the second song clip there is a vertical line that goes almost all the way up and down the waveform. This is one of the pops on our recording.





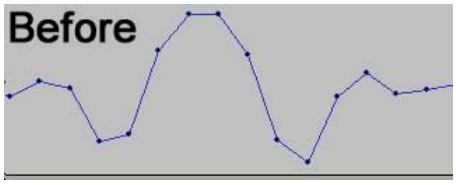
Using the **Zoom Tool**, continue to click on that vertical line until the waveform breaks up into little dots connected by lines. You should end up with something that looks like this (it may not look identical, depending on how much noise reduction you applied).

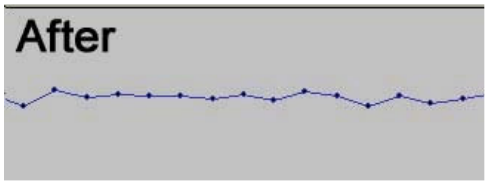
The Draw Tool: Now that we've zoomed up on our pop, we can use the **Draw Tool** to fix it. Select the **Draw Tool** from the toolbar (looks like a pencil).



We're going to use the **Draw Tool** to move the dots that make up the pop back into line. Click on the first dot of the pop that appears below the rest of the wave-forms line.

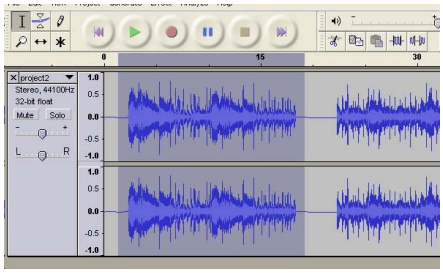
While continuing to hold the mouse down, drag the dot up to meet the same level as the other dots to the left of it. Continue to adjust the rest of the dots in the pop, so that they are all at the same level. You should get approximately the following result:





The pop has now been removed and will not be heard any more on our track. To go back to a normal view of our waveform, select **View -> Fit in Window** from the menu bar.

Saving as Separate MP3 Files: Finally, we are ready to save our project. One of the big advantages that CD's have over tapes and records (besides quality) is that the songs are stored in separate tracks, allowing you to quickly find and play a specific song. We can separate our songs by saving each song as a separate MP3 file. First, choose the **Selection** tool from the tool bar. Now, select the first song clip.

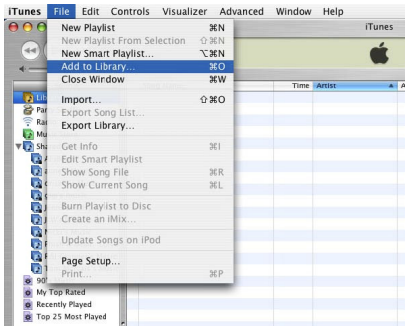


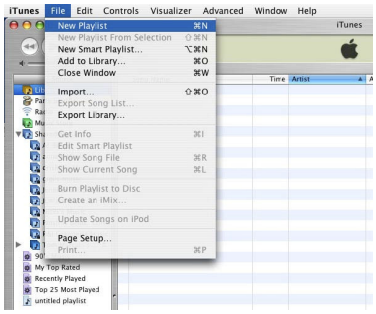
Now, from the menu bar, choose **File -> Export Selection as MP3…** and then a dialog box will appear allowing you to name the file and choose the location where it will be saved on your computer. Repeat this process for the other two song clips.

You will now be able to open these MP3 files in any Audio Burning CD program (I recommend iTunes) and burn these files onto a CD.

Using iTunes to Burn a CD

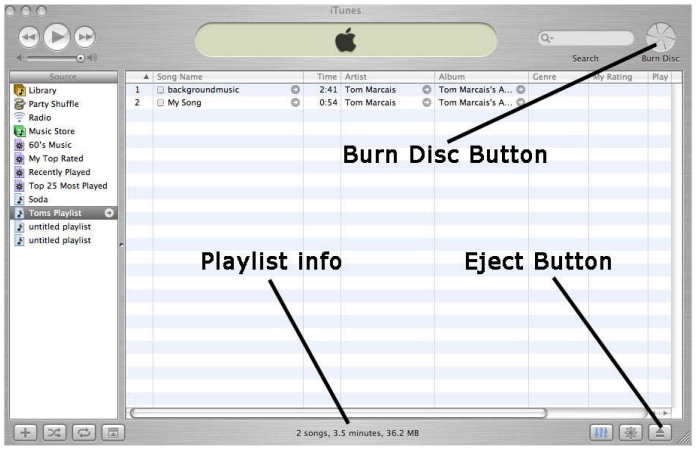
Adding MP3 files to your Library: For those of you who use iTunes as your MP3 player, burning a CD is pretty easy. First, you need to open iTunes and add your MP3 files to the Library. When iTunes opens, choose **File -> Add to Library…** from the menu bar. A dialog box will appear. Browse your hard drive for the MP3 files you wish to add, and then press the **Choose** button. The MP3 file will now appear in your iTunes Library.





Creating a New Playlist: Before you can create a CD, you need to move all the MP3 files you wish to burn to their own Playlist. From the menu bar choose **File -> New Playlist**. An untitled playlist with a musical note icon appears in the iTunes Source list. With the untitled playlist selected, type a name for it. Select the songs in your library that you want to include in the CD and drag them to your playlist. To change the order of songs in the playlist, select the song number column, and then drag the song names to different positions in the list.

Burning your Playlist to a CD: With iTunes open, insert a blank CD into your computer. Select the playlist you want to copy to CD. At the bottom of the iTunes window, check the size of your playlist to make sure it doesn't exceed the amount of space on a CD (usually 650-700MB). Click the **Burn** button twice to begin copying the songs from your computer to the CD. You can watch the progress in the iTunes window. When the files are copied, a CD icon will appear in the iTunes Source List. Click the **Eject** button to eject your CD.



Using the Web Effectively in Higher Education

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Abstract

How I utilized Information Technology to reduce my load as a faculty member. I will demo my automated grading system among others. This system allows me to cut my grading nightmare by more than 50%. In addition, since the system allows the students to view their grades online at any given time during the semester, I do not have a lot of explaining to do. They are given a grading rubric in advance to help them figure out on their own why they get a certain grade. Simply put, the students are in charge. They get to monitor their own progress. They become more motivated. I have also designed a self-attendance recording web-based application whereas the student is responsible to record his or her attendance upon entering class using a password that the system generates randomly for every class period. Students who fail to sign in are considered absent. Once again, the ball is returned to them.

Note: This paper was not received by the time the proceedings went to print. The author will provide written materials at the session or on the web.

RFID – It's Appeal to Higher Education

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Abstract:

The presentation will focus on one of the fastest growing wireless technologies, RFID – Radio Frequency Identification. Basic elements and characteristics of the technology will be defined, along with a discussion of the various uses in industry, government and education. The growing need for curriculum enrichment, integrating RFID into college and university departments and classrooms, will be discussed and explored.

Introduction:

There is a revived technology – RFID - being implemented worldwide that is destined to impact various disjointed areas of our lives. Educators have a responsibility to examine this technology and to convey all aspects of its place in learning environments to insure the maximum benefits of its potential and use.

Simply put, RFID (Radio Frequency Identification) results from a tiny computer chip attached or imbedded in such everyday objects as a book, a car's windshield, a garment, a passport, an animal or even a human artery. These same chips, coming in various configurations of memory and function, are capable of being read and then transmitting real-time information over a network to a computerized database for information analysis and resultant actions by controlling personnel. Certain chip configurations also allow the updating of information on the tag.

Pilot deployments of the technology have achieved successes and serious work is now underway in exploiting RFID technology to the fullest. The stakes are high for all of the participants. Remembering Dustin Hoffman as the beleaguered young Benjamin Braddock, who, while suffering through the awkward seduction by Mrs. Robinson in the Oscar winning movie "The Graduate" in the 70's, was being career-counseled by her unsuspecting spouse to "Get into Plastics!". A current revised version of the same movie would probably have him being encouraged thusly: "Young man, get into RFID!". Let's explore the current merits of that advice by looking at examples of its use.

You are no stranger to RFID if your automobile uses the EZ-Pass on our turnpikes, as you swiftly pass through a tollgate while automatically paying your toll. That white RFID transponder, glued to your windshield, transmits your automobile's identity when it passes under the radio frequency reader overhead at high rates of speed.

As with most technology innovations, the benefits -very often - are often counter-balanced by potential misuses. The Internet and the World Wide Web are vivid testimony to that. The author

of this paper will examine the current uses of RFID technology, its benefits and cost implications and the cultural impact it can have on the general populace it affects.

Defining RFID

RFID Categories:
Active tag: An RFID tag with an internal power source and a transmitter, capable of sending a continuous signal.
Passive tag: An RFID tag without a battery. It is usually powered by the electromagnetic field generated by the reader antenna.
Read-only tags: A tag that has information written to it during its manufacture. This information can only be read from the tag, never changed.
Read-write tags: Tags that are capable of being re-programmed to change existing data or add new data, while the tag is attached to the object it identifies. This capability is referred to as in-use programming, and tags with this capability are referred to as re-programmable, read/write tags, memory cards, and memory modules.
Reader/Writer: An electronic device that reads RFID-based data and/or writes RFID-based data on a tag.
Database: A back-end logistic information system that tracks and contains information about the tagged item.

Ubiquitous Computing: Where Does RFID Fit In?

The term "ubiquitous" relates to the presence of an object that can be anywhere or anything. When applied to computing networks containing RFID-based technology, it defines the method that certain objects utilize to communicate to other objects or computing devices within the network.

Examples of Applications of RFID Technology in Government, Industry, and Education:

<u>Government</u>

DOD – Department of Defense
- **Army - Combat zone equipment identification**
- **Navy – tracking airplane parts and containers**

FDA – Food and Drug Administration
DHS & State Department – PASS system (People Access Security System)

<u>General Industry</u>

Distribution and Supply Chain – Walmart suppliers required to use RFID
Retail – Walmart: tracking of retail sales – goal to replace bar codes
Transportation
- **EZ Pass – vehicle billing and access to turnpikes**
- **Passport monitoring – e-passports in use for international travelers**
- **Airline Luggage – Delta Airlines tracking luggage**
- **Bus service – tracking bus travel schedules and fare equipment**

Logging - Log identification from forest to factory (Germany)
Manufacturing – Automotive and Airplane Assembly
Medical – Patient tags, equipment tracking, prescription tracking, security

- **Implanted microchips for realtime monitoring**

Mining – Personnel and Equipment Tracking, Safety items
Pharmaceuticals – tracking of prescriptions to insure proper use
Technology – Software development, tag readers through USB port
Agriculture – poultry and cattle accounting; monitoring for disease control
Hospitality

- **Hotel check-in, security**
- **Resort – customer protection**

Education

- **Fixed Asset Accountability & Reporting**
- **Curriculum Development of RFID courses in various disciplines**
- **Libraries – Installations in higher education, VTLS capable of RFID**
- **Security and Public Safety**

Generic

- **Fixed Assets**
- **Vehicle Tracking**
- **Security**
- **Passgate use**
- **Computer access control**

Assessment of Integration of RFID into Higher Education Curricula

- The author has developed a plan to integrate RFID technology into the undergraduate or graduate curriculum of a higher education institution.
- This plan, proposed to an interested collegiate enterprise, will result in a curriculum package, comprised of a syllabus, professorial class curriculum and a customized strategy to publicize RFID technology among enrolled and prospective students.

Issues and Challenges of RFID Implementations

- **Standardization of Technology –** The progress that has been made in the implementation of RFID-based solutions is remarkable when one considers the previous lack of standardization for data and tag transmissions. As defined in a recent issue of Infoworld magazine, "the largest single enabler has been the emergence of Generation 2 – Gen2 – officially known as EPCglobal Class – 1 Generation – 2 UHF RFID Protocol for Communications for tag data transmissions". Previous RFID pilot implementations had been using the less effective Class 0 and Class 1 hardware readers and tags. Those protocols were slower and prone to data inaccuracies in early pilot sites.

  Generation 2 tags are 4.5 times faster, have expanded memory and extensive security options and provide worldwide interoperability and are ISO ratified.

- **Defining the problem to be solved –** There is no substitute for intensive analysis of the business logic required in the development of an RFID-based solution. Lack of proper systems analysis in the design stage, akin to the lackluster web-based approach of some

now deceased "Dotcom-based" enterprises, will bring certain failure. A collaborative team effort would be best, employing the skills of a business systems analyst, a network engineer, a "middleware" expert and an operating system specialist to define all aspects of the RFID-based process.

- **Legal and Privacy Issues -** When RFID is implemented for internal uses within an enterprise, there are minimal concerns about issues of privacy invasion of the user population. When utilized externally, however, there is the potential for violations of personal privacy when the necessary precautionary steps are not taken by those responsible for implementing or overseeing the RFID implementation.

Characteristics - As defined in a Microsoft-sponsored report "Radio Frequency Identification (RFID) Privacy: The Microsoft Perspective", risks to privacy protection could occur due to the following characteristics of the technology:

1. **Unobtrusiveness** – RFID tags can be read without clear line of sight, unlike barcodes. Neither tags nor readers need to be visible to a user or observer. However, a protective shield, such as an aluminum cover, can prevent the RFID tag being read. An example would be the reading (or not reading) a citizen's passport in certain public areas.

2. **Uniqueness of ID** – Unlike barcodes, RFID tags can be very specific and can be tracked over time in an accumulated record of sightings.

3. **Interoperability** – Since multiple enterprises can read RFID tags, the potential exists for data "leakage" where unscrupulous organizations could track tag activities and travel.

4. **Proliferation** – As tags continue to decrease in cost, applications of RFID will grow significantly, thereby raising the risks of the characteristics defined above.

Microsoft's position is that it does support RFID use among its customers and will work to "help develop practices and policies that will engage the benefits of RFID while helping to ensure that privacy is protected".

Legislation – We can expect increased legislation at the state and federal level, particularly as it relates to issues of privacy, in the uses of RFID in the near future. Two early instances are:

1. **California, SB 1834 –** Restrict ways that businesses and libraries use RFID tags, attached to consumer goods and books, to identify individual users.
    1. Defeated – June 25, 2005

2. **Rhode Island, HB5929 –** Prohibit state and local government from using RFID to track movement or the identity of employees, students, clients or others as a condition or benefit of services rendered.
    1. Passed by the legislature
    2. Vetoed by the Governor, July 15, 2005

At the federal level, one can expect additional legislative efforts to promote the use of RFID, as in the documentation and tracking of immigrants to this country, simultaneous with efforts to slow down the use of RFID applications for reasons of potential violation of privacy of our citizenry.

Mr. Melloy's presentation will feature a full discussion of the points listed below:

Grant and Business Partnership Opportunities

Government Grants

www@grants.gov website

- **National Science Foundation**
- **Corporate Grant Potential**
- **Collegiate Test Beds**

Trends in RFID Technologies

- **Shortage of Trained Personnel; needs to be addressed now**
- **Venture capitalist interest in RFID providers is growing**
- **Move Toward Standardization; Gen 2 is here.**
- **"Middleware" making installations easier and practical to integrate to ERP**
    - **Sybase product "iAnywhere" is comprehensive product**
    - **Can simulate all vailable RFID products for teaching and testing**
    - **Developer's license is available at no charge.**
- **"For Profit" Educators See Window of Opportunity: Devry, for example.**
- **RFID Product Providers Looking for Educational Partners and Testbeds**

RFID's Next Wave

- **Chipless RFID Technology**
    - **Ultimate goal is RFID tag with cost of less than one cent.**
- **Polymer-based RFID Chips**
- **Hacker-proof RFID tags**
- **"Mesh" Networks – wireless RFID devices communicate to other RFID devices**

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2. Deloitte Research Emerging Technologies Executive Brief, 2006

3. Microsoft, "Radio Frequency Identification Privacy", submission to FTC, June 21, 2004, Revised December 31, 2004

4. Infoworld Magazine, "Tuning in to RFID", April 17, 2006

5. IBM Press, "RFID: A Technology Overview", Sept. 30, 2005

6. REVA Systems, White Paper, " An In-Depth User's Guide to Selecting and Deploying Gen2 Tags, Readers, and Infrastructure", www.revasystems.com

7. Center for Digital Education, North Texas Regional Community College Technology Forum, February 17, 2006

8. RFID Journal, "Realize a Healthier Return On Your RFID Investment", April 17, 2006

Teaching and Learning Using 1 to 1 Wireless Mobile Technology

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Abstract

Mobile computers and wireless networks allow students to have access to information anywhere, anytime. Because the world today is a knowledge-based economy, a wireless mobile environment is becoming necessary to give students access to information all the time. Advances in technology require faculty to be responsive to new methods of teaching and become skilled in various aspects of information technology using Tablet laptop computers. Because students have a computer in front of them all the time in the classroom (1 to 1), new methods of teaching are required to keep students engaged in the content and what is happening in the classroom. Using a mobile wireless computer along with a course management system changes the classroom to a paperless environment. Innovative practices in teaching using wireless mobile technology can impact student learning and allow teaching methods that match student learning styles.

Introduction

In 2004 Dakota State University, Madison, SD, implemented the WMCI (Wireless Mobile Computing Initiative) and developed the campus into a wireless mobile computing environment allowing students to travel back and forth between buildings with their Tablet laptop computers. With wireless mobile computing networks, the classrooms become computer labs. Gateway m275 Tablet PC's are used on campus by faculty and students as the mobile computer in the classroom. WebCT is used as the classroom management tool allowing faculty to communicate course materials to students. The use of new technologies in the classroom can be seen as an opportunity or as a risk by teachers and students. The new technologies can improve learning in the classroom or impede the learning process depending on how the technology is used.

Review of Literature

Key principles and guiding values determine how to use technology in the classroom. Students learn more in class when interacting with the course content using a computer. Students like using a computer to access instructional materials. Students seem to have a positive attitude toward using the computer to supplement classroom instruction (Nilson, 2003). The principles of learning that are part of the general field of educational philosophy and relate to using instructional technology are (1) students learn by doing; (2) without motivation, learning is diminished; and (3) for effective learning, responses are immediately reinforced. Learning improves when the learner is an active participant in the educational process. The method of learning that works best for an individual is the one where the learner becomes the involved in the process. Learners prefer learning experiences that are participatory. Learning is faster when new concepts are used

in the present and the future. Educators need to assess the learner's interest, current skills, and goals and structure the learning environment and methods of teaching that are most satisfying and effective for the learner (Honolulu Community College Faculty Development Committee, 2005).

Alley and Jansak (2001) indicate that the principles of cognitive learning are forces in the design of online learning. Key characteristics of effective learning apply to the development of online learning and traditional learning. The student is engaged in learning with attention focused on the activity. The chance of success is greatest when the student is informed of the expectations for learning. The content of the course should be organized in meaningful sequences, with guidelines to help the student. Learning is interactive, and learners need to be periodically informed of their progress with successes reinforced.

The active role of constructing knowledge and using activity is more meaningful for learning (Piaget, 1972). The study of the effects of prior knowledge, experience, and learning-style provide a framework on how students process information and knowledge gained over time and how knowledge is transformed and used. Learning styles help understand strengths and weaknesses of learners in the classroom (Merriam and Caffarella, 1999). Flannery (1993) indicates that cognitive learning theory for learning takes into account both global and analytical ways of processing information. Teachers who understand the way students learn work with the students' strongest learning style until the students achieve success and perceive themselves as able to learn. The students then are taught to learn in another learning style. In order to facilitate learning in both the global and analytical style, teachers develop learning settings in the classroom that promote global and analytical processing of information in various degrees. Teachers can find ways using technology to teach to the different skills of the learners in the classroom and to match their teachings, texts, and structure to the students' learning styles.

Dunn and Dunn (1993) state that for effective instruction teachers need to use a variety of instructional methods to meet the different learning styles of students. Merriam and Caffarella (1999) indicate that John Dewey's work has a major impact and influence on learning. Dewey's principles of learning indicate that (a) learning occurs through the process of engaging in problem solving, (b) learning is active and exploratory, (c) student learning is participatory, and (d) the teacher is a guide for students. Padgett and Conceicao-Runlee (2000) indicate that as students use more technology, students expect online access to reading materials, syllabi, and resources. Teachers need to be more responsive to students and understand the different ways students learn. Using technology, teachers can emphasize individual levels of motivation and design activities appealing to all students from the motivated learner to the inexperienced learner.

Purpose

The purpose of this paper is to examine how engaging students in course content using wireless mobile Tablet computers affect student learning. Students in three programming classes use wireless mobile Tablets with WebCT where all course materials are available for students. The course materials include the syllabus along with chapter objectives notes, and key terms. Using email helps students send questions about problems with assignments. An assignment page in WebCT lists all the assignments students are to complete. Students go online to read about the assignments, download the files, and complete the work. Once the work is completed, students upload the assignment to the teacher in WebCT. All students' assignments are downloaded by

the teacher to correct and evaluate using the stylus capabilities of the Tablet and then sent back electronically to the student on WebCT. WebCT helps get the course materials to the students, and students use the Tablets to complete the assignments. WebCT is used for online five- to ten-point quizzes to keep students on task with reading the textbook. Quizzing takes a very short period of time, and cheating is not a concern since the quizzes are timed. Tests are given to students who use their own Tablets, and the tests are also timed so students do not have time to look up notes on their computers. Students also have chat and email available, but timing the test helps discourage communication with other students. Timed tests lasted 50 minutes while quizzes are five minutes. Even though students have notes, key terms, problems, and worksheets downloaded on their Tablets, timing tests and quizzes on WebCT discourage students' use during tests. Students are more concerned with answering all the questions in the time allowed rather than trying to look up answers and losing time during the test. All of the activities involving assignments, programs, quizzes, and tests engage the students in course content using 1 to 1 computing.

Research Questions

The study is to determine the effects of wireless mobile technology on student learning in the classroom. The numeric variables in the study includes ACT and course grade. The same teacher teaches all three classes with the classes taught one hour a day three times a week. All students take the programming class as part of the general education requirements and have a Tablet computer in the classroom to use during class. The sample size of the study is 77 students which is a small sample to determine statistically sound analysis. The study addresses the following questions:

1. Is there a difference in students for those who used the Tablet before coming to college and those who did not?

2. Is there a difference among students in how the Tablet is perceived as a tool in the classroom?

3. Is there a difference in how students perceive the Tablet as a distraction in the class?

4. Are those students who see the Tablet as an effective tool in the classroom visual and kinesthetic learners vs. auditory and read/write learners?

Hypotheses

These issues suggest several hypotheses that focus on outcomes for instructional technology using 1 to 1 wireless mobile computers. The hypotheses include:

Hypothesis 1: There is no difference in the two groups of students for those who used the Tablet before coming to DSU and those who did not.

Hypothesis 2: There is no difference among in how students see the Tablet as a tool in the classroom.

Hypothesis 3: There is no difference in the two groups of student on how students perceive the Tablet as a distraction in the class.

Hypothesis 4: There is no difference between those students who see the Tablet as an effective tool in the classroom in terms of learning style (visual and kinesthetic learners vs. auditory and read/write).

Design & Procedure

The subjects included 77 students in general education programming classes that use Tablet computer technology and programming software. The seven-question survey was administered to students who anonymously self-reported the information during class. Explanations were given to the students to determine the course grade as a percent and to complete the 20-question VARK Learning Styles Inventory to determine their current learning style. This learning-styles inventory can be found at the following website: http://www.vark-learn.com/english/index.asp. Students took the inventory and determined their predominant learning style. Once the results were reported, the results were then coded with visual and kinesthetic learners together and auditory and read/write together. Visual and kinesthetic learners were combined because the two learning styles focus on active engagement with hands-on activities. Auditory and read/write were combined as the focus is on students who listen to the teacher lecture or read to understand content.

Instrument

The instrument used was a seven-question survey that students were required to complete. The six-question survey consisted of the following questions:

1. What is your grade (as a percent) in the course?
2. What is your ACT score?
3. Did you use a Tablet PC before coming to DSU? (1 = No; 2 = Yes)
4. How do you see the Tablet PC as a tool in the classroom? (1 = Not helpful or Neutral; 2 = Helpful or Very helpful)
5. Do you feel the Tablet PC is a distraction for you in the classroom? (1 = Yes; 2 = No)
6. What is your preferred learning style? (1 = Auditory or Read; 2 = Visual or Kinesthetic)

Students took the learning style inventory located at http://www.vark-learn.com and reported their learning style as determined by the 20-question VARK inventory

Results

Descriptive statistics and independent t tests were used to analyze the results of the data. The mean for the class using grade (percent) in the course is 80.30% while ACT mean for the course is 21.52. A Spearman correlation coefficient was calculated for the relationships between the student's current grade as a percent in the course and the student's ACT score. A significant positive moderate correlation was found ($r(77) = 606$, significance at the 0.01 level).

1. Difference in the two groups of students for those who used the Tablet before coming to DSU and those who didn't using grade in the course.

The data shows a significance difference in the means of the two groups with significance at .013 with $p < .05$. The mean for students (number of students = 38) who used the Tablet before coming to DSU was 77.08, and the mean for students (39) who did not use the Tablet before coming to DSU was 83.44. Looking at the data itself, the mean is higher for those students not using the Tablet while those using the Tablet had a lower mean. This indicated that other variables may have caused the difference in the means.

2. Difference in the groups of students on how students see the Tablet as a tool in the classroom using grade in the course.

The data shows no significance in the difference in the means of the two groups with a significance at .128 where $p > .05$. Those who see the Tablet as an effective tool in the classroom (67) have a mean of 81.06 while those who did not see the Tablet as an effective tool or felt neutral about the Tablet (10) have a mean 75.20. With such a small sample size of 10, the conclusion cannot be determined to be statistically significant.

3. Difference in the two groups of student on how students perceive the Tablet as a distraction in the class using grade in the course.

The data shows that there is a significant difference in the two groups of students and how the students perceive the Tablet as a distraction in the classroom with a significance at .000 where $p < .05$. Those who see the Tablet as distraction in the classroom (32) have a mean of 74.78 while those who did not see the Tablet as a distraction (45) have a mean of 84.22. The data indicates that those who see the Tablet as a distraction and have a lower mean may be those students who are not on task in the classroom and use the Tablet for email, chat, games, etc. in class. Those who do not see it as a distraction and have a higher mean may be those students who are on task in the classroom and use the Tablet as an instructional tool while in the classroom.

4. Difference between those students who see the Tablet as an effective tool in the classroom in terms of learning style for visual and kinesthetic learners as opposed to auditory and read/write.

The data shows that there is no significant difference in the two groups of students based on learning style with a significance at .887 where $p > .05$. Those students who are visual, kinesthetic learners (60) have a mean of 80.20 while those who are auditory, read/write learners (17) have a mean of 80.65. The sample size of 17 is small which makes the results statistically insignificant.

Findings

1. There is a correlation between course percent and ACT score in a classroom. According to the data, there appears to be a correlation between the student's current percent in the course and the student's ACT score.

2. There is a difference in the two groups of students for those who used the Tablet before coming to DSU and those who didn't using the grade in the course. A significant difference was found between the means of the two groups ($t(77) = 2.549$, $p < .05$). Analyzing the data, the mean is higher for those students not using the Tablet while those using the Tablet had a lower mean. The two groups being compared had other variables that may have caused the difference in means such as ACT score and previous programming courses; therefore, the data indicates that Hypothesis 1 is rejected.

3. There is no difference in how the students see the Tablet as a tool in the classroom using their grade. The analysis of data indicates no significance in the difference in the means of the two groups ($t(77) = -1.539$, $p > .05$); therefore, according to the data, Hypothesis 2 is not rejected.

4. There is a difference in the two groups of student on how students perceive the Tablet as a distraction in the class using the grade in the course. Distractions include chat, email, games, and surfing the Internet. A significant difference was found in the two groups of students and how students perceive the Tablet as a distraction in the classroom ($t(77) = -3.932$, $p < .05$)); therefore according to the data, Hypothesis 3 is rejected.

5. There is no difference between those students who see the Tablet as an effective tool in the classroom in terms of learning style (visual and kinesthetic learners as opposed to auditory and read/write). No significant difference was found in the two groups of students based on learning style ($t(77) = .143$, $p > .05$); therefore, analyzing the data, Hypothesis 4 is not rejected.

Conclusion

The teaching style in the classroom uses hands-on activities with students readily working on the computer to complete the activities. The activities include online quizzes and tests taken in class, programming assignments that are downloaded and completed, and assignments that are completed and submitted in class. Using WebCT to post course materials, assignments, and online quizzes provides access to assignments and resources and allows availability all the time. When students engage with course content through active learning activities using Tablet computers, students are on task and motivated to use computers to access resources and complete assignments. Students come to class to complete the assignments using the Tablet, but the Tablet is a distraction in the class if the teacher does not keep the students actively engaged with activities during the class.

After the Tablet has been used in the class and students develop organizational skills for handling a wireless mobile computer, the survey should be given again to analyze if distractions in the class decreased or were eliminated. For future study, the Tablet as a distraction in the classroom should continue to be studied as students increase their skills at managing time in class, and faculty increase skills at engaging students during class. The purpose of the survey and paper was to determine if mobile wireless Tablet technology made a difference in student learning. The data indicates that the Tablet may make a difference in learning because the Tablet is a distraction away from the teacher and what is happening in the classroom. Teachers have to engage students in learning activities to keep their attention on course content. Teachers have to develop

new teaching strategies using technology to engage students and to focus students' attention in class so students use computers for learning tasks.

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Evaluation of the Success of a Student Response System in a Computer Concepts Course

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Abstract

Student Response Systems (SRS) are becoming more popular in the classroom. The use of an SRS system is to give students the opportunity to control their learning. This study looks at the application and success of an SRS system in an introduction to computing course.

College Students as Adult Learners

Students in a higher education setting are caught between the world of pedagogy (the teaching of children) and the world of Andragogy (the teaching of adults). College students have left a world of pedagogy where they are taught what is expected of them by government agencies and school districts. In the andragogical setting, students are choosing what topics they wish to learn with a focus on a specific career or goal.

As teachers of adults, it is the educator's responsibility to address the four characteristics of adult learners (see Table 1) with the respect and attention that they deserved [6], as well as to help motivate the adult or, in the higher education setting, the new adult, to learn. One way to increase the motivation is to stimulate the adult's interest in advancement or learning. Giving some level of control to the adult learner can increase the student's motivation as well as increase the amount of learning that occurs.

In addition, Chickering and Gamson identified "Seven Principles for Good Practice in Undergraduate Education" (March 1987) which identified the need for active learning for students and their need for prompt feedback. In any classroom, and in particular in a large one, this goal becomes difficult for the instructors to manage [4]. This is particular difficult when combined with the students' out-of-class life demands. To compete against some aspects of life, the classroom and the teacher need to reduce any other barriers students encounter in the classroom such as boredom, speed of instruction delivery [6], existing knowledge of the topic, or time of day (such as the after-lunch fatigue). One such tool that a teacher can use to engage the students is the use of a Student Response System (SRS).

Table 1. Four Characteristics of Adult Learners

Characteristic	Description
Autonomy	The direction of the educational process (courses, majors, etc.) is left to the student to choose.
Application of experience and knowledge	While the life experiences of an entry-level college student are not at the level of a non-traditional college student, current college students do have other demands of their time (such as work and family) and may, in fact, have some previous work experience that influences their choices.
Goal-oriented	People enroll in college for a variety of reasons -- from not having anything else to do to pursuing a specific career. Both of these reasons have specific goals from "just" taking a course to taking a course that gets the student closer to that goal of a career.
Relevancy	Adults need to know why they need to learn a specific task, ability, or knowledge. What they are learning must be seen as relevant their current interests or their career goal [6].

What is SRS?

Student Response Systems are used in institutions around the U.S., from Arizona State University to Wake Forest University in North Carolina and from elementary schools to colleges and universities. A student response system allows students to provide immediate feedback to their instructor regarding their level of understanding of a topic.

SRS systems can range from hand-held remote-control devices where students can select responses to the use of a software system and standard PC computers which provide the input via a specific Website. Either way, responses are transmitted, the data collected and tabulated, and forwarded on to the instructor. The instructor can, if she chooses, show a graphic representation of the collected responses. The data can also be saved for use at a later time by the instructor [4].

The SRS system (Numina II) in use at the University of North Carolina Wilmington (UNCW) is a Web-based student response system. The system uses wireless networks, handheld computers, and a data projector. Students submit their responses to question via a Website. On this Website, students see an answer pad specific to the question posed by the instructor and use this answer

pad to respond to the instructor. The general form of Numina II resembles the audience participation portion of the TV show "Who Wants to be a Millionaire."

The Website allows students to submit responses to questions posed by an instructor. The instructor poses a question, using a variety of formats, and directs students to a Website that generates the appropriate answer pad on their computer or pocket-PC screens through which they submit their responses. A variety of question formats are possible. On the backend, a database stores the question's responses. Since the students do not login to the system, there is no information about the student associated with the questions. Responses are completely anonymous [7].

Once questions have been presented, an image, such as in Figure 1, appears in the classroom view. When students respond, they see a graphical representation of the answers as shown on the right side of Figure 1. Students are presented, on the Website, with a simple view for selecting their answers. Figure 2 shows one example of a student view.

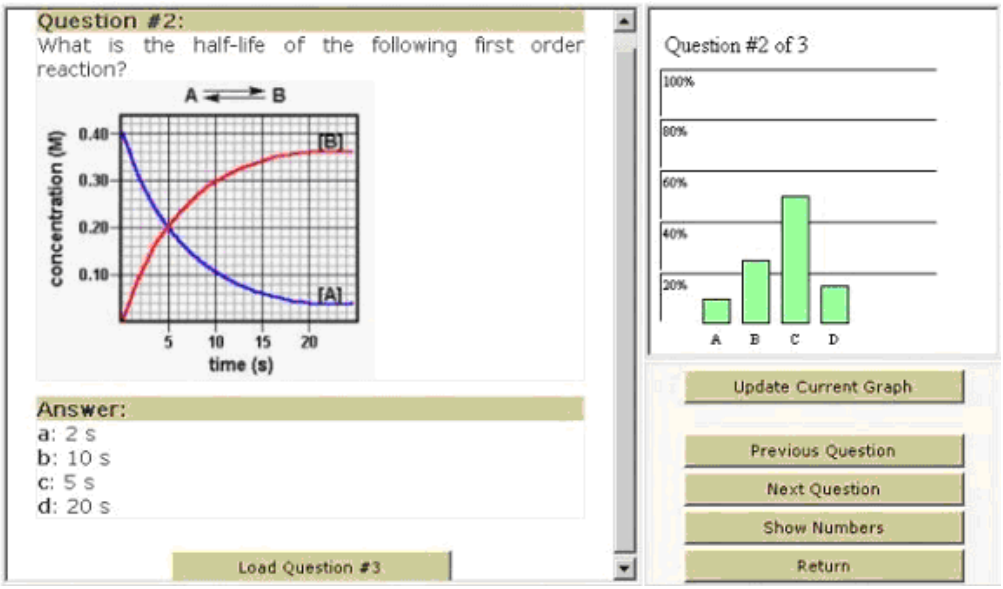

Figure 1. Example of UNCW's Numina II SRS classroom view [7].

Use of a Student Response System (SRS) may help both students and the instructor in the active learning classroom [4]. The rate for student participation in some courses at UNCW rose from only 30 percent of the students to nearly 100%.

The SRS system is more than an electronic "raising of the hand." In many settings, students may be unwilling or uncomfortable to signal a lack of understanding through raising their hands. For an instructor, silence can be interpreted to mean that students understand the topic or information presented [5]. SRS, then, is an opportunity to express thoughts, questions, concerns through a level of anonymity. In addition, as the instructor receives the input from the students, SRS becomes an opportunity to provide immediate feedback [4]. Through the use of SRS, the instructor (and the students) can see how people have responded to a question (what percent or number have answered "A," "B," and so on.). Time is not lost while the instructor counts hands [4].

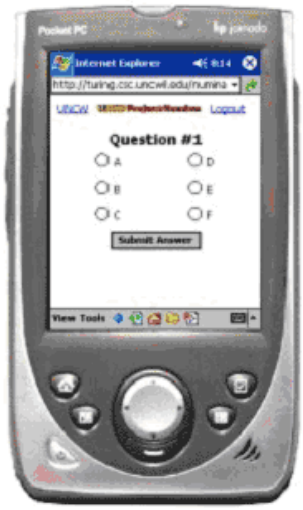

Figure 2. Example of UNCW's Numina II SRS student view [7].

There are other advantages for the students as well. Andragogy suggests that students need to be actively engaged in the learning process. An SRS system can help achieve this. Frey and Wilson [2] list five educational benefits that an SRS system brings. Horowitz [3] also found five similar benefits for the learner.

1. The SRS engages students in the instruction through asking questions, allowing input on the speed of instructional delivery.
2. The SRS allows collaboration and consensus-building through the immediate receipt of questions, answers, and opinions from the students.
3. The SRS provides immediate feedback to the students. Based on input from the students, instructors can modify their instruction and clarify concepts.
4. The SRS increases the amount and type of communication between the instructor and the students. Rather than waiting for the students to respond or to visit during office hours, the SRS system provides an immediate opportunity for students and instructors to communicate regarding course and classroom issues.
5. The SRS collects data from the students that can be used for classroom and content evaluation, as well as provide data to the students that can be used for other forms of evaluation.

Focus of the Study

At UNCW, many students take an introduction to computer concepts course to fulfill the institution's computer-literacy requirement. Frequently, 14 sections of this course are taught each semester with each section trying to cover all the required topics in addition to learning how to use productivity software such as Microsoft Office. For some of the students, however, this material may be a repeat of information that was provided to them in high school (North Carolina has a high school computer literacy requirement as well). The use of Numina II SRS allows the instructors to control the speed at which information is provided. The instructor can also choose to either skip material or to delve deeper into the topic. Numina II is used by some of the instructors to question students' understanding of the material and the speed at which it is presented.

To determine if the use of an SRS system in this course made a difference in student outcomes, four of the introductory courses taught during spring semester 2005 were compared. Two of the

sections (n=52) were taught using Numina II SRS and two sections (n=57) did not use Numina II. While the SRS sections were taught by one instructor and the other sections taught by a different instructor, the sections utilized the same lecture slides, class projects, and exams. Two different instructors were used to prevent possible "carry-over" in terms of speed, depth of discussion, etc. to the non-SRS sections. In each section, students were presented with three multiple-choice exams conducted over WebCT and used the same grading system. Student success rates, as defined by exam grades, were compared.

The lecture format of the course utilized PowerPoint slides to highlight points of interest from each chapter. The PowerPoint slides used were virtually identical among the four sections; however the slides for the SRS sections had prompts for the instructor to ask SRS questions. Based upon student responses, the SRS instructor would then vary her lecture to either skip some topics, delve more deeply into others, or continue at her normal pace.

Procedures

The grades from all four sections were collected and listed in spreadsheet form. The grades of each of the groups were recorded in two spreadsheets to keep the information separate between the experimental (SRS) and control (non-SRS) groups. All exam grades were recorded, including those of students who failed the courses. Only students who did not complete all three tests (and had withdrawn from the course) were eliminated from the data. If the student did not withdraw and missed any test, they were assigned a grade of zero. The means for each course were determined and a two-tailed independent samples t-test was used to compare the means of the experimental and control group samples.

Null Hypothesis

The null hypothesis created for this study was that there would be no statistically significant difference between the means of the exam grades of students enrolled in the SRS version of Introduction to Computing and Computer Applications course when compared to the exam grades of students enrolled in the non-SRS version of the course.

The above null hypothesis was tested at the level of .05 significance. This level of significance was chosen with some certainty that the results would fall within a 95% range of confidence.

Region of Rejection

The region of rejection for the hypothesis described above was two-tailed. A two-tailed test was used since the research hypothesis is non-directional for effect of instructional method on grade outcomes. The 5% region of rejection area was equally divided between the two tails.

Statistical Tests

The arithmetic means of the final grades of each course was determined by adding all the corresponding letter grade values and dividing the result by the number of students who received a final grade. Once those values had been determined, the two-tailed independent samples t-test was used for comparing the means of the experimental and control group samples. The t-test was used because each of the courses was a small sample and was drawn from the same parent population.

A statistical analysis software was utilized to compare the final grades or scores of the two groups. The means and standard deviations for each group were also determined. Results were kept separate for each of the different courses.

Assumptions

There were several assumptions required by this study. First, it was assumed that the instructors for both the traditional and distance-education courses provided consistent instruction for each of the two groups. Second, it was assumed that the instructors used the same criteria for grading in each of the two courses. Third, it was assumed that the teaching style of both instructors was similar enough across the four sections to have been only a minor influence on the outcome. Fourth, it was assumed that all of the students registered in both sets of courses had an equal chance to pass the course. Fifth, it was assumed that each group entered the course with the pre-requisite skills needed to complete the course.

And the Survey Says...

At the end of the semester, the various final exam grades were collected from both sets of courses and plotted in a spreadsheet format. The grades were collected with no names associated with them. Only after the names had been removed and the exam scores randomly sorted were the data provided.

The exam scores of each of the samples were recorded in an Excel spreadsheet to keep the information separate between the experimental (SRS) and control (non-SRS) groups. Each set of courses was given its own worksheet within the spreadsheet. There were no incompletes ("I") or unreported grades ("Z") associated with either set of courses. All grades were included, including those of students who failed the courses. The students who withdrew from the class with a "W" were not included in the final calculation. Only those students who completed all three exams were included. The grading for both groups followed a traditional plus/minus system.

The means for each course were determined and a two-tailed independent samples t-test was used to compare the means of the experimental and control group samples to determine if there was a statistically significant difference in exam scores between the experimental course and the control course.

Exam averages for each of the exams is shown in Figure 3. The average for Exams 1, 2, and 3 for the SRS sections is 72.2, 81.1, and 78.8 respectively with an overall grade of B or 83.2. For the non-SRS sections, the average for the three exams is 76.2, 73.0, and 77.0 respectively with an overall grade of B- or 80.9.

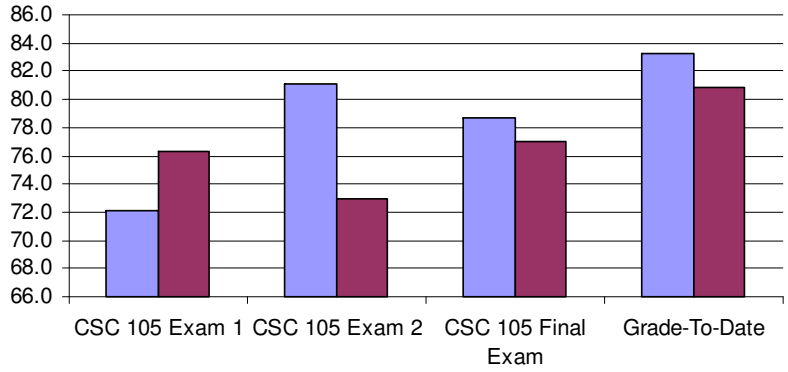

Figure 3. Exam averages for SRS (blue) and non-SRS (maroon) sections.

The grade breakdown for the SRS sections, Figure 3, shows a bell-shaped curve with a grade of B as the median grade.

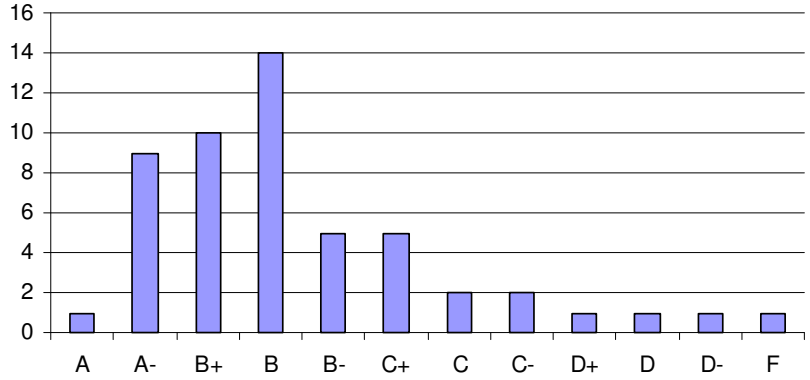

Figure 4. Grade distribution for the SRS sections.

The grade breakdown for the non-SRS sections, Figure 5, also shows a bell-shaped curve with a grade of B as the median.

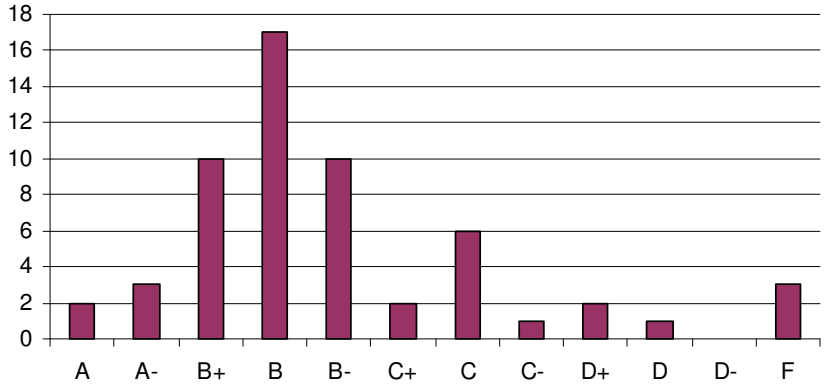

Figure 5. Grade distribution for the non-SRS sections.

Figure 6 shows the overall grade distribution for the two groups.

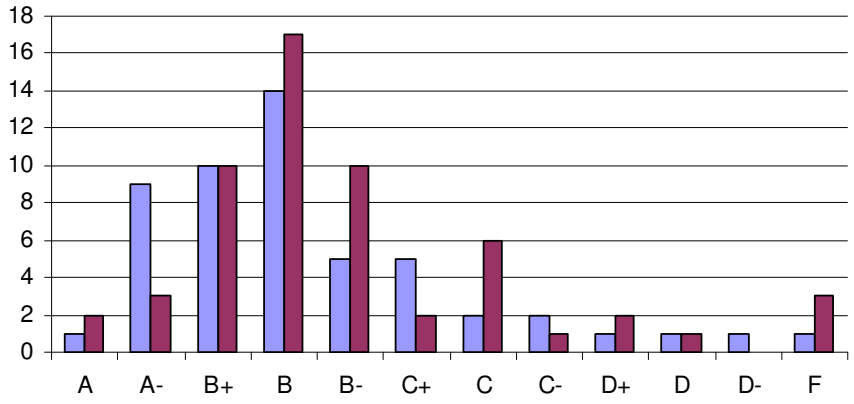

Figure 6. Grade comparison between the SRS (blue) and non-SRS (maroon) sections.

Exam 1
A two-tailed region of rejection was used with $\alpha = 0.05$ and a critical value of 2.04 at a degree of freedom of 108. The results ($z = 1.236585179$) showed there was no statistically significant difference in the sections of the course when one section is taught using SRS and the other section is taught without SRS. The results were achieved using Microsoft Excel software and the values confirmed manually.

Exam 2
A two-tailed region of rejection was used with $\alpha = 0.05$ and a critical value of 2.04 at a degree of freedom of 108. The results ($z = 2.629631818$) showed there was a statistically significant difference in the sections of the course when one section is taught using SRS and the other section is taught without SRS. The results were achieved using Microsoft Excel software and the values confirmed manually.

Exam 3
A two-tailed region of rejection was used with $\alpha = 0.05$ and a critical value of 2.04 at a degree of freedom of 108. The results ($z = 0.892113902$) showed there was no statistically significant difference in the sections of the course when one section is taught using SRS and the other section is taught without SRS. The results were achieved using Microsoft Excel software and the values confirmed manually.

Overall Exam Scores
A two-tailed region of rejection was used with $\alpha = 0.05$ and a critical value of 2.04 at a degree of freedom of 108. The results ($z = 0.996060003$) showed there was no statistically significant difference in the sections of the course when one section is taught using SRS and the other section is taught without SRS. The results were achieved using Microsoft Excel software and the values confirmed manually.

The null hypothesis for this study stated that there would "be no statistically significant difference between the means of the exam grades of students enrolled in the SRS version of Introduction to Computing and Computer Applications course when compared to the exam grades of stu-

dents enrolled in the non-SRS version of the course." The null hypothesis failed to be rejected for two of the three exams.

The independent t-test scores for exams 1 and 3 were below the critical values at a 0.05 level of significance; however it was above the critical value at a 0.05 level of significance for exam 2.

Table 2 shows both groups with the individual means for the SRS instruction format and the non-SRS instruction format, the degree of freedom (df), t-values, and p- values. Students in the traditional classroom courses, as shown in Table 2, had a higher final grade point average.

Discussion

The results of this ex post facto study further do not support the evidence that students who take an active role in the classroom using SRS score statistically significant higher exam grades than those who do not use SRS.

To better compare these two types of teaching formats, as many as the variables as possible should be controlled or kept to a minimum [1]. This study controlled for textbook, semester in which the course was offered, exams, grade base, and PowerPoint lecture slides. The one area that was not controlled was for the instructor.

The results of these comparisons showed that, while there was a statistically significant difference in exam 2, there is statistically no significant difference between the two modes of instruction when controlling for textbook, semester in which the course was offered, exams, grade base, PowerPoint lecture slides for exams 1 and 3, and for the overall grade for the course.

Table 2. Individual Means for SRS and non-SRS Instruction Formats

	Means		Degrees of Freedom	t-values	ρ-values
	SRS Format (Ex-	Non-SRS Format (Con-			
Exam 1	72.15	76.25	108	1.234585179	ρ>0.5
Exam 2	81.08	73.00	108	2.629631818	ρ>0.5
Exam 3	78.75	76.96	108	0.892113902	P>0.5

While the results of exam 2 are interesting, the overall result of no significant difference here means that the end results, student final grades, are not significantly different between the two modes of instruction.

While the comparison between the two means showed there was no significant statistical difference between the two modes of instruction for this course, the internal validity of the methodology for evaluating the students in either group can be questioned. In hindsight, the instructors may believe that they were equal in the evaluation because assignments and grades were the same in both sections; however, the instructors' teaching styles could not be controlled.

Internal validity may also have been influenced by the small sample size. The total number of students compared in two groups were 52 and 57. The interpretation of the results should be done carefully with the small sample. With a comparison over time, when the population of students becomes larger, the end results may be different.

Conclusions

Two conclusions resulted from this study. The conclusions were the result of the research question that asked if there was a statistically significant difference between the exam scores of students in either the SRS based course or the non-SRS based course when controlling for the textbook, semester in which the course was offered, exams, grade base, and PowerPoint lecture slides. Results from the study showed there was no statistically significant difference between the two groups. The independent samples t-test results failed to reject the null hypothesis at a 0.05 level with regard to the independent variable or method of instruction.

Recommendations

As a result of this study, several recommendations can be made. Because the t-test does not assess whether the quality of instruction is better in one setting or the other, it is recommended that the quality of instruction between the two methods also be compared.

A second recommendation would be to add a control of instructor to the setting and evaluate the course again using both an SRS based and non-SRS based instructional format.

The third recommendation would be to continue with additional comparisons of other courses that utilize both the SRS based and non-SRS based instruction. This continued comparison would provide information for future courses that could add SRS based instruction to its standard teaching format.

A fourth recommendation would be to compare results within the two groups to determine if there is a statistically significant difference in final exam scores between the genders.

A final recommendation would be to compare results from student evaluations to determine if there was a statistically significant difference in whether the students felt they had learned more in an SRS based instructional format.

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Ethical and Legal Issues for the Information Systems Professional

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Abstract

We are living in an era in which we routinely deal with issues such as privacy, digital security, identity theft, spyware, phishing, Internet pornography and spam. These costly and time consuming concerns were completely foreign to the American public only a few years ago. State and federal privacy and security legislation is evolving with the intention of protecting the general citizenry from harm and organizations from financial loss and civil or criminal lawsuits. Organizations, particularly information systems professionals within organizations, are being called upon to deal with these issues and institute controls to minimize risk.

This paper will examine the growing issue of malicious digital risks from both a legal and ethical perspective. The relationship of these risks to the core values and ethical conduct of the information systems professionals in our organizations will be explored. A cost-benefit perspective will be used to discuss the effect of legislation on organizations and society at large. Finally, the content of university level curricula designed to address these issues will be suggested

Introduction

There is a frequently used expression that emphasizes that information has no ethics. The ethical aspect of organizations and the manner in which information is managed resides with the values that are inherent in the people that comprise the organization. The manner in which information is used is dependent on the ethics and beliefs of the people that make up the organization, especially the organization's leadership. It has become increasingly clear that information is a valuable organizational resource that must be carefully safeguarded and effectively managed just as other organizational resources are managed. Information cannot secure itself or protect itself from phishers, spyware, or identity thieves.

In general, people have become much more technologically savvy. Largely due to the dramatically increased scope of information available via the Internet, the ease of access to information, and the broadened scope of computer literacy, the security of information and the privacy of individuals have become areas of significant concern. Concerns about security and privacy as well as ethical dilemmas dominate our daily lives. As a result of personal concerns and fears, and the rapid increase of theft of personal information, organizations have developed and / or revised codes of ethical conduct. Simultaneously, our government agencies have enacted laws and legis-

lation that are specifically related to ensuring the privacy and security of information and individuals.

Ethics

As individuals, our civility toward each other is an indicator of our ethical values. Likewise, the value set of individuals is the sole determinant of the use of information. Because ethical issues cover a very wide spectrum, many organizations attempt to develop a broad framework that managers can apply to issues as they occur. One such general framework is derived from an article written by Richard Mason (1986). Mason identified four areas of critical concern for managers. They include privacy, accuracy, property, and accessibility and are frequently referred to by the acronym PAPA. Mason's article, which continues to be referenced as providing an ethical framework, contends that control of information as it pertains to those four areas is critical.

Another type of framework that has emerged as a standard in many organizations is a code of ethical conduct. Codes of ethical conduct are typically published by professional organizations, however, many organization have published organizational codes of conduct. For information systems professionals, the most popular professional code of conduct is that published by the Association for Computing Machinery (ACM). The complete ACM Code of Ethical Conduct is available online at http://www.acm.org/constitution/code.html (Gray, 2006).

As we prepare future professionals for employment in technology fields, it is imperative that we develop a sense of awareness of the potential types of ethical issues that are common to information systems organizations. Included in a long list of issues that are covered by policies in most organizations are policies for ethical computer use, information privacy, acceptable use, email, Internet use, and an anti-spam policy (Haag, 2006).

Pearlson (2006) points out that managers must be involved in monitoring outward activities of the business because customers and their privacy are affected when there are outward breaches. Equally important are inside issues such as internal surveillance and monitoring activities, because these affect employees. Because Internet usage, instant messaging and email are so prevalent in today's organizations, a number of software surveillance products have been developed and are being implemented. Monitoring and surveillance have increased as the need to protect privacy, insure security and control the privacy of information has increased (Pearlson). However, the use of these products and practices in themselves frequently create ethical dilemmas and must be properly communicated to employees and implemented properly.

Organizational Issues

The financial world and corporate community, in general, were rocked by the accounting scandals at ENRON, TYCO, and WorldCom. These Scandals focused attention on the lack of ethical conduct on the part of a few individuals and the magnitude of the harm and financial ruin that can result. However, the technology field has been overtaken with other types of behavior that can affect anyone who uses technology. Computer virus and hacker attacks are intended to destroy data and software and disrupt computer services. In 2002, alone, more than 7,000 computer viruses were reported (Henry, 2005). Phishing attacks frequently target a specific group of people and are intended to secure personal information, usually financially related, from innocent and unsuspecting responders (Gonsalves, 2004).

Criminals are especially interested in acquiring social security numbers, bank account information, credit card numbers and other financially-related data that can help them to steal identities or money from unsuspecting customers (Bradford, 2005). Bradford also reported that external hackers are the most significant risk to companies, but that a great amount of damage and threats to cyber security originates with insiders, especially disgruntled insiders. On the other hand, others contend that the most serious threats to computer security comes from individuals thought to be trusted insiders. Particular vulnerability comes from disgruntled and terminated employees. Although the two week notice for resignation or termination remains popular, terminating all network access upon notice of termination of employment is most effective (Henry, 2005).

Paul Roberts in an eWeek article (2005) reports that, programs commonly referred to as "spyware" or "adware" have become very widespread. These programs monitor users' online behavior, threaten compliance efforts and intellectual property, and create problems for computer users and IT administrators, alike. It is reported by Webroot Software, Inc. that spyware is a $2 billion per year industry (Roberts). It is also reported that a clean-up of spyware or adware will be an expensive challenge. Distribution of spyware is usually in bundles with such things as freeware and computer games.

Some of the problems that prevail as a result of spyware include slow computer processing speeds and pop-ups taking over. Research attributed to Harvard Law School student, Ben Edelman indicates that adware and spyware bundling deals are lucrative, even for companies not in favor of inclusion. Some spyware companies will pay up to one dollar per install. Microsoft reports that approximately 33 percent of application crashes are caused by spyware. Remedies for spyware include installation of anti-spyware software and switching from the more vulnerable Microsoft programs (Roberts, 2005).

Identity theft is the appropriation of someone else's identity to commit fraud or theft (Sovern, 2004). One of the possibilities to help prevent identity theft in the future involves biometric technology such as fingerprints or voice scans used to verify the identity of credit applicants. The general sense at this time is that this may be a cure that is more costly than the problem to be solved (Sovern). However, the consequences of identity theft are significant, and the financial impacts exceed billions of dollars each year (Lacey, 2004). The victim is subject to loss of funds or other property, a tarnished credit history, a possible criminal record, difficulty in securing employment, and an inability to obtain goods and services (Lacey, 2004). Identity theft is a problem that affects both individuals and organizations, and remedies must be developed.

It became apparent after Y2K that security and privacy issues required attention. Viruses were very prevalent, operating system and application vulnerabilities were increasing and computer security breaches were increasing at an alarming rate. The organization's first line of defense, the firewall, was most likely installed because it was easy to install and maintain and didn't disrupt regular business applications. However, security from these early firewalls was absent. The cost of repairing damage from Internet attacks was staggering (Henry, 2005).

By 2003, there was a shift in attitudes toward security from perception as an expense side of the balance sheet to perception as an asset. In selecting firewalls, there was a notable increase in the evaluation of firewalls based on their ability to provide security. It remains imperative that firewalls, while being effective, must also be easy to manage (Henry, 2005).

From the short list of scenarios above, one can easily understand that organizations were forced to radically alter their processes with regard to privacy and security. In addition to the many measures taken by organizations to safeguard privacy and security, new laws and legislation have been introduced to help decrease the number and magnitude of privacy and security breaches.

Legislation and Compliance Requirements

Internally, organizations realized that they were not meeting expectations and privacy concerns in the late 1990's and early 2000's. Government agencies also realized that we are facing a new and monumental problem. This brought about new legislation and laws to help ensure that personal privacy and security of information would be protected.

Haag (2006) does a wonderful job of summarizing legislation that has been enacted to help ensure the privacy of individuals and the security of information. A table summarizing some of the key legislation appears below.

Established Information Related Laws (Haag, 2006)

Privacy Act - 1974	Restricts the government's collectable information; requires permission to disclose name-linked info; enables your access/correction of your info
Family Education Rights and Privacy Act - 1974	Regulates government & third party access to education records and ensures the student's access
Cable Communications Act - 1984	Requires viewer's consent for cable providers to release their viewing preferences
Electronic Communications Privacy Act - 1986	Employees do not have privacy rights on their firm's computers
Computer Fraud and Abuse Act - 1986	Requires authorized access to computers used for financial institutions, US government, or interstate/international trade
The Bork Bill (Video Privacy Protection Act - 1988)	A consumer's video rental info can only be used for marketing directly towards him/her
Communications Assistance for Law Enforcement Act - 1994	Requires the ability for government agents to intercept all wire and wireless communications, and caller-ID information
Freedom of Information Act - 1967, 1975, 1994, & 1998	Allows anyone to examine government records unless it's an invasion of privacy
Health Insurance Portability and Accountability Act (HIPPA) - 1996	Requires the health care industry to keep patient information confidential
Identity Theft and Assumption Deterrence Act - 1998	Made ID Theft a federal crime and established a central federal service for victims
USA Patriot Act - 2001, 2003, & 2006	Allows law enforcement access to any restricted information while investigating terrorism
Homeland Security Act - 2002	Limits Freedom of Information Act; allows government agencies to mine data on one's emails and web site visits
Sarbanes-Oxley Act 2002	Provides investors with accurate and reliable corporate disclosures

Fair and Accurate Credit Transactions Act - 2003	Consumers' right to a free credit report; full credit card number cannot be on a receipt; requires credit agencies to take proactive measures
CAN-Spam Act 2003	Penalizes businesses for sending unsolicited e-mails to consumers
Financial Modernization Act of 1999 (Gramm-Leach-Bliley Act)	Protect consumers' personal financial information held by financial institutions

Without detailing all of the charted legislation, several pertinent laws warrant special mention. For instance a new Federal Trade Commission rule went into effect on June 1, 2005 as part of a congressional crackdown on identity theft. Basically the law requires that any personal information that businesses obtain from credit bureaus and other agencies be destroyed so it cannot be stolen or misused (Kittredge).

Signed into law on December 4, 2003 the Fair Accurate Credit Transactions Act (FACTA) is intended to thwart the growth of consumer fraud and identity theft. For example, the FACTA disposal rule requires every employer with one or more employees to dispose of any electronic or paper documents or face federal fines of up to $2,500 per violation and state fines up to $1,000 per violation (Gurchiek). It also obliges credit bureaus to block the reporting of any information that is based on the transaction of an identity thief once the consumer provides specific information (Sovern, 2004). FACTA also addresses several specific aspects of identity theft including compulsory credit card number truncation on receipts, mandates to credit issuers to investigate address changes and new card requests , fraud alert requirements for credit reporting agencies, mandatory blocking of identity theft related information on credit reports and free annual credit reports (Linnhoff, 2004).

Another act that is intended to reduce the amount of unwanted spam is the Federal Trade Commission's Controlling the Assault of Non-Solicited Pornography and Marketing Act of 2003 (CAN-SPAM). Although CAN-SPAM has not yet had a significant impact on email problems, a recent report indicated that spam accounted for 67% of email messages during the first eight months of 2005, and this figure represented a nine percent decrease from the same period in 2004 (Spring, 2005). The Act has also helped reduce the amount of world spam created in the US from 46% of world spam in 2004 to 26% in 2005. At the same time, however, world spam is up, with China and South Korea leading the way ("Legislating Cyberspace," 2006).

Federal legislation such as the Sarbanes-Oxley Act and Gramm-Leach-Bliley Act emphasize the importance of identity management. Managers must be aware of how information is being used, maintained, and provided and also how it can be effectively protected and updated to meet business needs while, at the same time, complying with audit and privacy regulations (Sturdevant).

The piece of legislation that warrants special consideration for IT professionals is the Sarbanes-Oxley Act of 2002 (SOX). This legislation has a far-reaching impact on publicly traded companies. Although originally aimed at the financial health and regulatory visibility and accountability of public companies, the act has also significantly impacted IT departments. Particularly Section 404 of the act requires that auditors certify the underlying controls and processes used to compile financial results. Officers are held personally responsible for financial information reported, and penalties range from fines to a five to 30 year jail term (Pearlson 2006).

SOX Section 404 requires public companies to attest to the effectiveness of internal controls at year end. SOX stresses that upper management has ultimate responsibility for ensuring that adequate controls are in place throughout the organization (Summary of Sarbanes-Oxley, 2002). Although SOX was originally targeted at accounting, it became obvious very quickly that IT plays a vital role in ensuring the accuracy of accounting data. It is imperative for IT professionals to become "well-versed in internal control theory and practice to meet the requirements of the act" (Sarbanes-Oxley, FAQ, 2006).

Although the focus of SOX is on financial controls, many auditors required IT managers to extend their attention to organizational controls and risks in business processes (Pearlson, 2006). Some companies have created new IT positions to deal with compliance challenges (Bednarz, 2006).

Compliance is Costly

The implementation of adequate system controls and attention to compliance and corporate governance requirements are expected to increase corporate budgets. For example, process manufacturers are expected to increase their IT investments in 2006 from 3.5% to 3.7% of total revenues as reported by AMR Research of Boston (Seewald, 2006). The report goes on to state that the primary impact on increased costs is regulatory compliance. The Gartner Group of Stamford, CT reports that a 2005 survey of 190 firms revealed that compliance and corporate governance requirements including Sarbanes-Oxley (SOX) regulatory mandates will account for 10-15% of IT budgets up from less that 5% in 2004 (Seewald). The Gartner Group also indicates that although there is no single SOX compliance software, two new software markets have emerged in response to compliance regulations. They are financial compliance process management software (records retention, archiving and access, management oversight, substantiation of due diligence) and application and access control software (segregation of duties, adherence to change management procedures) (Seewald).

A study of 450 companies conducted by Foley and Lardner and KRC Research indicated that in large organizations with a capitalization around $1 billion, audit fees increased about 35% in 2002 due largely to SOX implementation. AMR Research reported that SOX compliance is like "Y2K" and will cost as much as $2.5 billion. The rule of thumb has been an average of $1 million in SOX expenses for every $1 billion in revenue (Bendnarz, 2006). AMR Research also reports that collective spending on SOX compliance has increased from $2.5 billion in 2003 to $5.5 billion in 2004 to $6.1 billion in 2005 and will exceed $6 billion in 2006. The typical allocation of costs breakdown as 39% for internal labor, 32% for technology and 29% for external consulting. As companies gain SOX experience, these costs are expected to decrease (Bednarz).

Conclusions and Recommendations

One can readily conclude that the inter-related issues of personal and organizational ethics, privacy, information security, and protective legislation have formed a rather complex web that must be understood by technology managers. Spyware, adware, and phishing attempts have grown in sophistication and prominence. Identity theft is a threat that must be taken seriously by all members of our society. Organizations have taken preventative actions through enactment of codes of ethics and codes of conduct. Government agencies have responded with legislation intended to protect the integrity of data and the privacy of individuals.

Educators are aware of the growing complexity of information security and the ethical issues that revolve around the multitude of possible breaches. Some may contend that it is difficult to teach ethics and values, but, as educators, we have a responsibility to develop a sense of awareness of the issues. More and more colleges and universities are offering, or in some cases, requiring ethics courses. If you are concerned about some of the issues raised in this paper, a required ethics-course may be worthy of your consideration.

As we assess our technology curricula, the following considerations may warrant your consideration for possible inclusion in revised curricula:

- A course in information ethics that examines the types of ethical dilemmas likely to be encountered by technology professionals.
- Inclusion of professional codes of conduct such as the Association for Computing Machinery Code of Ethical Conduct.
- Detailed coverage of the range of issues related to identity theft.
- Emphasis on system security controls.
- Comprehensive coverage of laws and legislation to develop a sense of awareness of compliance requirements that affect technology professionals.
- Specific discussion and familiarization with Section 404 of the Sarbanes-Oxley Act.
- A strongly recommended or required field employment or internship experience.

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Hazardous Waste Disposal Issues for IT

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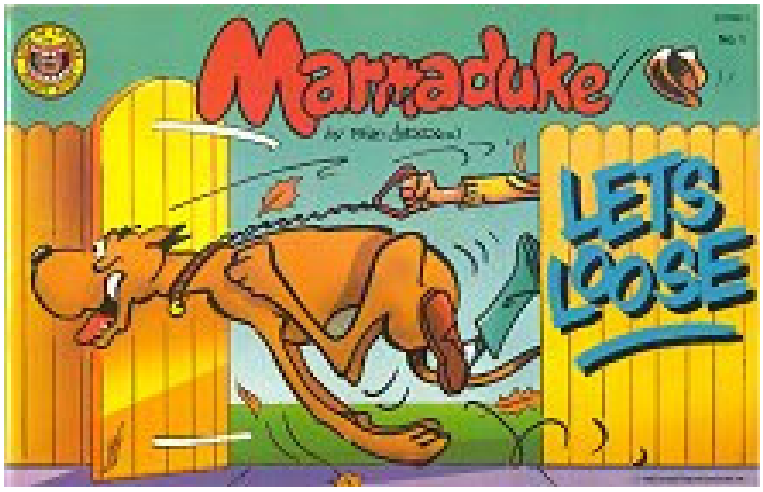
Kicking and Screaming…



The classic Marmaduke comic strip provides an apt metaphor of the entry of the Berea College Information Systems & Services (IS&S) department into the world of hazardous waste disposal issues and regulations. We are Phil Winslow dragged along on a "walk" by Marmaduke, an enthusiastic juggernaut who can barely be steered and can certainly not be stopped. Berea College, like many other institutions, has seen explosive growth over the last decade in the amount of information technology equipment that must be managed to provide adequate access to software capabilities, electronic communication and Internet based resources for our students and faculty. As all this equipment has aged and begins to require replacement, and particularly as laptop computers have generated a flow of spent batteries, we have had to learn about proper disposal practices and set up processes to handle equipment and batteries coming out of service.

In 1997, Berea College published a Campus Information Resource Plan which called for dramatic increases in access to computers and network connectivity for our students. This plan led to the development of our EDGE (Empowering a Dynamic Generation in Education) program, launched in the fall of 2002, which provides a laptop computer to every student. In 1997, old computers were sold at the annual surplus property auction and hazardous waste was an issue for the Chemistry department, not IS&S. By 2003, IS&S had a storage room full of obsolete and non-functional computer equipment that we did not want to inflict on other institutions or the local population. The summer of 2004 saw our first wave of laptop computer battery replacements, generating a pool of 800 spent lithium ion batteries we didn't know how to dispose of. And this year we are seeing the first mass replacement of student laptop computers. At the same time, the expanding adoption of laptop computers and LCD monitors has created a high rate of retirement of older CRT monitors. CRT monitors are made of leaded glass. Batteries are full of chemicals. Switches contain mercury. Circuit boards are made with leaded solder. California has declared LCD monitors and laptop computers to be hazardous waste[1]. Berea College IS&S is in the hazardous waste business.

Everyone's Problem…

Lots of other IT folks are in the business along with us. Statistics are often quoted implying that millions of obsolete computers are piling up and that a large backlog of disposal issues exists. According to a recent presentation by an EPA representative, 50 million computers are becoming obsolete each year and 2 million tons of electronic equipment are being discarded annually[2]. Representatives of a waste handling company have indicated that by 2007, over 500 million PC's will have become obsolete and require disposal[3]. These statistics may be based on a 1999 study published by the National Safety Council[4] and a 2003 study published by the International Association of Electronics Recyclers (IAER) [5]. A summary of selected information from the IAER study can be found in Compumentor's fall 2004 research report[6].

So what's a higher education IT professional to do? First, let's get familiar with some terms.

Defining Some Terms…

Waste Stream: The definition below comes from the U.S. Environmental Protection Agency (EPA) web site, a good source for information about terms, acronyms, regulations, etc. Electronic equipment and used batteries are sometimes referred to as specific waste streams.

> "The total flow of solid waste from homes, businesses, institutions, and manufacturing plants that is recycled, burned, or disposed of in landfills, or segments thereof such as the 'residential waste stream' or the 'recyclable waste stream.'" [7]

Generator: In the context of hazardous waste disposal, that means you and me and our employers, as opposed to a component for an old automobile or hydroelectric plant. The definition excerpt below from the EPA web site points out that one is a generator if one's action causes hazardous material to move from being in use or in storage to being slated for disposal.

> **"Generator:** … 2. Any person, by site, whose act or process produces regulated … waste or whose act first causes such waste to become subject to regulation..." [8]

TCLP: Pronounced "tee clip". I couldn't find a good definition from the EPA, so I offer this one from Aerotech Laboratories, Inc.

> "Toxic Characteristic Leaching Procedure (TCLP) is an EPA SW-846 analytical method (Method 1311) that simulates sanitary landfill contaminant leaching in waste samples. Based upon concentrations of the TCLP constituents and guidelines set forth in 40 CFR 261.4, the solid waste samples can be deemed hazardous or non-hazardous." [9]

TCLP is the accepted procedure for determining whether waste material is deemed hazardous. According to a recent e-scrap seminar put on by the Kentucky Department for Environmental Protection Division of Waste Management that about 70% of CRT monitors when crushed and submitted to a TCLP evaluation[10], will be deemed hazardous waste. A 1999 University of Florida study found that 21 of 36 monitors tested (58%) were deemed hazardous by TCLP. [11]

Universal Waste: The EPA defines certain hazardous waste in this category because of its high volume and large number of generators in order to make the disposal process more economically feasible. Their web site states:

> "The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (e.g., thermostats) and lamps (e.g., fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal." [12]

Due diligence: Refers to the exercise of an acceptable level of care to assure that our handling of hazardous waste materials and the actions of our business partners are not in violation of law or damaging to the environment. A general definition from Wikipedia reads:

> **"Due diligence** (also known as *due care*) is the effort made by an ordinarily prudent or reasonable party to avoid harm to another party." [13]

Cradle to grave responsibility: Everyone who handles a given unit of hazardous waste shares in the responsibility for any negative environmental impact caused by that waste, no matter whose mismanagement, error or misjudgment caused the problem. The EPA web site explains in more detail:

> "Under the full Subtitle C program (hazardous waste program), only the waste handler that violates a hazardous waste regulation is "liable" (i.e., subject to enforcement) for that violation. Generators of hazardous waste are not responsible for mismanagement by subsequent waste handlers. The universal waste rule does not change this allocation of responsibility.
> Generators **are** responsible for subsequent mismanagement under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund), however. The universal waste rule does not change CERCLA liability. Since universal waste are still hazardous wastes, entities that generate universal waste remain liable under CERCLA for remediation of any releases of universal waste." [14]

Hazardous waste regulatory requirements vary depending on the rate of material entering the waste stream from a generator.

> **"Conditionally Exempt Generators (CE):** Persons or enterprises which produce less than 220 pounds of hazardous waste per month. Exempt from most regulation, they are required merely to determine whether their waste is hazardous, notify appropriate state or local agencies, and ship it by an authorized transporter to a permitted facility for proper disposal." [15]

> **"Small Quantity Generator (SQG-sometimes referred to as "Squeegee"):** Persons or enterprises that produce 220-2200 pounds per month of hazardous waste; they are required to keep more records than conditionally exempt generators. The largest category of hazardous waste generators, SQGs, include automotive shops, dry cleaners, photographic developers, and many other small businesses." [16]

> **"Large Quantity Generator:** Person or facility generating more than 2200 pounds of hazardous waste per month. Such generators produce about 90 percent of the nation's hazardous waste, and are subject to all RCRA requirements." [17]

Legal Regulations…

Second, let's get to know some of the legal regulations that guide us in properly managing waste materials. RCRA, the Resource Conservation and Recovery Act (often pronounced "rickruh") is the law enacted in 1976 that defines hazardous waste handling, reporting and disposal requirements.[18] CERCLA, the Comprehensive Environmental Response Compensation and Liability Act, enacted in 1980, defines liability for the costs of response to environmental damage due to hazardous waste and establishes the "superfund" for addressing the cost of response where no liable parties can be found.[19] Each state will also have regulations that may be more stringent than the federal laws require. Universal Waste regulations provide for exemptions from some of the requirements of RCRA for certain high volume item. Batteries are in this category and CRT monitors and other electronic equipment are under consideration for inclusion. As long as one follows the guidelines for managing eligible material as Universal Waste, the exemptions apply. However, if those materials are improperly handled, all the requirements and potential penalties of RCRA apply. Regulations for Universal Waste vary according to the volume of waste accumulation. Most colleges will fall into the Small Quantity Generator category, accumulating less than 11,000 pounds of waste at any given time[20].

Electronic Equipment…

Now we can talk about our inventory of out of service equipment. At Berea College, we started by looking for a partner to help us properly dispose of or recycle our growing stockpile of computer equipment we could no longer use. At first it was free, or perhaps they would even buy us a round of pizza. More recently, as the disposal of CRT monitors became more expensive, and resale of old computers became less profitable, there has been a charge per unit. We are fortunate that a local computer and parts resale company has now become a full service e-scrap recycler. The goal is to turn equipment over to them before it becomes waste. We are able to turn equipment over to them and receive documentation by serial number where applicable that they have received the equipment as usable or potentially repairable. They then apply their own procedures to determine whether the equipment will be refurbished and reused, processed for recycling, or processed for disposal. If at that point the equipment becomes hazardous waste, they are the generator. This method may not be valid in all states. In a recent seminar with Kentucky Department of Environmental Protection staff, there were differences of opinion regarding the implications of state regulations, but we believe ourselves to be in compliance.

It is possible that electronic equipment will soon be defined as a Universal Waste. According to a document published by the EPA in June 2002, CRT monitors are under consideration for inclusion in the Universal Waste category.[21] There are those who oppose the idea[22], and no decision seems to have been made. I have been told but have not been able to verify that a decision was originally expected by October, 2005 and that other electronic equipment was being considered along with CRT monitors. If a commodity is defined as a Universal Waste, it can be turned over to a licensed Universal Waste handler without detailed documentation, can be stored on your site for up to one year, and does not contribute to your hazardous waste generation rate for purposes of regulatory classification as a conditionally exempt, small quantity or large quantity generator.

If, on the other hand, the trend for electronic equipment moves toward greater regulation, we could end up with reporting, storage, and transportation requirements for some items similar to those currently in force for hazardous chemical wastes.

Selecting a Recycling Partner…

When selecting a service partner, one needs to consider capacity, service, price, and values. The provider must be able to handle the volume of equipment being transferred. UNICOR presents capacity as an important consideration in the Veterans Administration decision to use their services.[24] Most small colleges do not have such large volume, so other factors will likely be more important. At Berea College, we see the quick service and low transportation costs available from local service provider Kentucky Recycling as an important factor. We also place a high value on recycling and processing controls, one of the factors that led us to use Big Green Box for battery recycling. A recent front page article in the Lexington Herald-Leader decried the "primitive" processes used by e-waste processing facilities in China[23]. Those concerned about overseas waste disposal problems may want to choose a partner that is careful about downstream processes and assures that they will be up to an agreed-upon standard beyond that legally required by the locale. Of course, if the downstream processing is in the USA, the cradle to grave responsibility concept makes it important to verify that good controls are in place. UNICOR, a part of the Federal Prison Industries, touts their high worker safety standards.[25] Worker safety may be an important consideration, and the use of prison labor is seen by some as a positive factor and by others as a bad idea. Each organization will want to evaluate options in the light of all these considerations and their own values and needs.

Prevention and Purchasing…

Prevention can also be an important part of your electronic waste strategy. Keeping equipment in good repair and using eBay or other methods to sell or donate it to another person or organization as soon as it is no longer needed will prevent the accumulation of equipment for disposal. The EPA's electronics recycling web site contains information about equipment donation and an overview of equipment purchasing environmental considerations.[26] When purchasing new equipment, one needs to consider the entire life cycle. Leasing may be a good option, providing a standard level of equipment currency and a program for moving the equipment on to another use or disposal at the end of the term. Some manufacturers offer end of life equipment disposal service as part of the equipment purchase. Other considerations include ease of disassembly and component chemistry options. Equipment that is glued inside a plastic case is more expensive to break down for recycling at end of life than equipment for which the case opens easily. One might choose a manufacturer who uses more biodegradable materials or fewer hazardous materials. The City of Portland, Oregon has included many of these factors in their procedure for procurement of electronic equipment.[27] Taking disposal issues into account when purchasing equipment can reduce later concerns with cost and regulatory issues associated with hazardous waste.

Toner and Ink Cartridges…

Recycling of copier and printer toner and ink cartridges has been around for quite a while. Depending on the formulation, waste toner may be designated as hazardous, but as long as the cartridges are used up and sent for recycling, they will not be classified as regulated waste.[28]. Lex-

mark, HP and others typically provide return-for-recycling packaging with toner cartridges. CORE Recycling Concepts and other vendors will purchase properly packaged spent toner and ink cartridges. CORE points out that it is important to keep inkjet cartridges separate because toner powder will clog the jets and render them unusable. [29]

Batteries…

At last we arrive at the subject that started the hazardous waste discussion at Berea College IS&S – laptop batteries. In the spring of 2004, as we looked ahead at the impending replacement of over 800 batteries used in the laptop computers issued to our first and second year students, we were presented with a welcome opportunity. One of our student administrative assistants needed a project for her senior seminar in Environmental Studies. We suggested the battery disposal challenge and soon had a student-faculty-staff partnership going. Her research surfaced two viable options, RBRC and Big Green Box. We later found that a third option existed in the company that handles our other universal wastes such as lead/acid batteries and fluorescent light bulbs and ballasts. RBRC, the Rechargeable Battery Recycling Corporation, handles all types of rechargeable batteries at no charge to generators. The only cost would be shipping. Since batteries are considered Universal Waste, the shipping must be in a container approved by the U.S. Department of Transportation (DOT) for the purpose. While our original study identified RBRC as the lowest cost option, when we later evaluated more carefully the cost of proper shipping containers and shipping costs, the difference was minimal. Big Green Box, the service recommended by our study and subsequently deployed, provides a standard DOT approved container for collecting and shipping batteries. Shipping and processing costs are prepaid at the time the boxes are purchased. Another factor that attracted us to Big Green Box was that their process results in recycling all components of the battery including plastic and chemicals. RBRC's process disposes of lithium, plastics and some other components by incineration. As a Universal Waste, batteries are allowed to be stored at the generator's site for no more than one year. A system must be in place that will demonstrate the maximum length of time each waste battery is stored. To address that issue, we simply write the date on the box when the first battery is placed into it. We also report each box to our Environmental Health and Safety office so required records can be kept and reporting done regarding the college's volume of waste accumulation.

Berea College has been pleased with the Big Green Box battery recycling program. Since beginning our process, we have sent out 24 boxes each containing about 40 batteries. We have verified that Big Green Box is a certified Universal Waste handler and that their containers are DOT approved for shipping batteries. Our recycling office is working on programs to collect various types of batteries from students and staff, and they are also considering use of the Big Green Box product.

Review and Conclusions…

As IT departments must deal with more and more equipment coming out of service, management processes must address hazardous waste issues. Strategies for prevention and proper disposal are available to minimize the cost and headaches. By selling operational used equipment and by connecting with reliable equipment recycling partners, organizations and individuals can avoid declaring electronic equipment as waste and will not need to determine if it is deemed hazardous. Using up toner and selling or returning spent toner cartridges for recycling avoids the need to handle toner as potentially hazardous waste. Disposing of batteries according to Universal

Waste regulations can result in a workable and affordable process. Exercising due diligence to verify that one's own processes and those used by recycling and disposal partners are sound and compliant with regulations can minimize risk of future liabilities. By keeping informed about regulations, risks and options, IT professionals can maintain a total management program that helps protect their organizations from the hazards of waste disposal.

Internet resources that may be of interest…

General information site for electronics recycling and disposal:
http://www.waste.ky.gov/programs/rcla/Electronics+Recycling.htm

A concise review of hazardous waste disposal basics:
http://www.osh.net/articles/archive/osh_basics_2002_aug28.htm &
http://www.osh.net/articles/archive/osh_basics_2002_sept30.htm

Presentation on electronic equipment hazardous waste considerations:
http://www.federalelectronicschallenge.net/resources/docs/tonetti.pdf

A review of electronic equipment disposal due diligence concepts:
http://www.ciwmb.ca.gov/HHW/Events/AnnualConf/2005/April28/Session1/E-WastePgmMgmt/E-wasteDD.pdf

National Recycling Coalition – a source of information about all recycling:
http://www.nrc-recycle.org/default.htm

International Association of Electronics Recyclers:
http://www.iaer.org/

Institute of Scrap Recycling Industries:
http://www.isri.org/

National Center for Electronics Recycling:
http://www.electronicsrecycling.org/NCER/

Big Green Box:
http://www.biggreenbox.com/StoreFront.bok

Rechargable Battery Recycling Corporation:
http://www.rbrc.org/call2recycle/

Marmaduke book cover graphics:
http://www.tonystrading.co.uk/galleries/comicstrips/marmaduke.htm

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Shareware in the Networking World

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There are many tools that often can be used in a college environment to enhance the learning of learners in a fundamental networking class. This paper will briefly explore a few of them.

In classes of this type, protocol analyzer software (also called protocol or network sniffers) is frequently used to show the exact data that is traversing a network. To this end, there are several tools. There are many of these products that range from freeware to more expensive versions such as HP's Overview product line. Let's explore a few of these products. Due to space limitations, we will actually explore two of these products.

The concept of Network protocol analysis is a process for a device or a program to decode trailers and network protocol headers to interpret the information and data inside the packet encapsulated by the protocol. To manage protocol analysis, packets must be captured at real time for later analysis or line speed analysis. Such a device or program is called a Protocol Analyzer.

In the prototypical network architecture, a stacked approach is used to design communications and network protocols. One of the most promoted network architecture reference model is the OSI model. This model is an excellent model for showing this stacked approach. However, realistically, the TCP/IP Model is used in everyday transactions. Protocols at one layer should communicate with protocols at the same layer. The major purpose of a protocol analyzer is to decipher the protocol at each layer. The protocol information of multiple layers, may be used by the protocol analyzer to identify potential issues in the network communication, which is referred to as expert analysis. Such a critical service is deployed by many leading protocol analyzer products for advanced network troubleshooting. Protocol analyzers decode various layer packets and protocols to re-construct lower level packets, such as, Link IP or TCP level into higher level, such as, application level messages for in depth understanding of user activities and network traffic. This approach is used in protocol analyzers when user surveillance and network traffic monitoring are the main goals.

A protocol analyzer can be used for both stealing information off a network or for legitimate network management. Maintenance personnel and network operations utilize protocol analyzers to conduct forensic analysis of network security breaches, analyze packets, monitor network traffic, troubleshoot network problems and watch network resource utilization. The use of unauthorized protocol analyzers can be remarkably dangerous to a network's security, due to the fact that they can be inserted almost anywhere and are virtually impossible to detect, which makes them the favorite weapon of choice in a hacker's arsenal.

It should be noted that these products, at least the ones discussed In this paper, are centered around their use on Ethernet networks. Ethernet was built around a "shared media approach; namely that all machines on a local network share the same cable. This implies that all machines are able to "see" all the traffic on the same wire. Ethernet calls this “carrier sensing”. This essentially means that Ethernet has a built-in "filter" allowing it to ignore all traffic that doesn't belong to it (it analyzes the MAC addresses as it listens). It does this by ignoring all frames whose MAC address doesn't match to its own MAC address. Etherscan Analyzer turns off this filter, setting the Ethernet hardware into "promiscuous mode". Thus, Etherscan Analyzer can see all traffic passing through Ethernet wire, regardless of what MAC address is contained therein.

There are numerous protocol analyzers on the market. They fit into two basic types of protocol analyzer types: distributed and portable.

A portable protocol analyzer (or sniffer, as it are sometimes called) is software installed in a PC or a stand-alone device. Portable protocol analyzer can do analysis and data capturing in real time or play back data for later analysis. The cost of a portable protocol analyzer is ranged from a few hundred dollars to tens of thousands dollars depending on the network type; ethernet, gigabit ethernet, optical media WAN links etc to monitor, the types of data analysis that are done and who the vendor is. Portable protocol analyzers are usually used by engineers to monitor traffic of a single domain of LAN or for network troubleshooting at certain point of a network.

Distributed protocol analyzers have two parts: Consol, a software package installed in the Network Operation Center to centrally monitor all Probes and Monitoring Probe, a device deployed at various point of the network. The Distributed protocol analyzers are typically deployed by large enterprises to monitor their network from a centralized location such as NOC. The cost of deploy the Distributed analyzer is ranged from tens of thousands of dollars to millions of dollars. In addition to analysis and packet capturing, a distributed analyzer also uses and retrieves RMON and SNMP data for additional network statistical information. More information on this issue can be seen via the SNMP Standard at www.ietf.org.

The first one we will look at is Etherscan. Etherscan was founded in 2000 by a group of people interested in network technologies. They had been designing and developing application software for more than 3 years, with experience in low-level programming, GUI development and network technologies.

Etherscan Analyzer is a protocol and advanced network traffic analyzer. It works on all Windows-based operating systems. By using Etherscan, you can analyze and capture all packets transmitted in your section of the local network. Etherscan decodes all primary protocols, including TCP/IP, Ethernet, TCP/IP utilities, and NetBEUI. It is also able of reconstructing TCP/IP sessions. With this property, you can easily see data in their original format. For instance, you will be able to read the real text of an email, in addition to any attachments.

Using Etherscan you can freely filter the network traffic. Make use of flexible, powerful filters after or during capture to isolate traffic by packet content, error type, protocol, or specific node. (Don’t worry; we will show this later on).

Etherscan Analyzer has expansive capabilities, but is still very easy to use. Even amateurs can operate it without problem. All features are easily accessible.

Etherscan Analyzer reconstructs TCP/IP sessions. This allows you to observe data in their original format. The reconstruction is thoroughly compliant with RFC, the program detects hijack attempts and checks session integrity. It has the ability to save and watch captured session in text, html format and binary. As shown in the lower portion of this session view.

Session View, Tool Bar, and Capture Options

Capture Options - maximum packets in buffer, number of packet buffer can hold

Operation - Run continuously when buffer is full, Etherscan Analyzer will overwrite old packets in buffer, stop capture after filling buffer, when buffer is full, Etherscan Analyzer will stop capturing packets

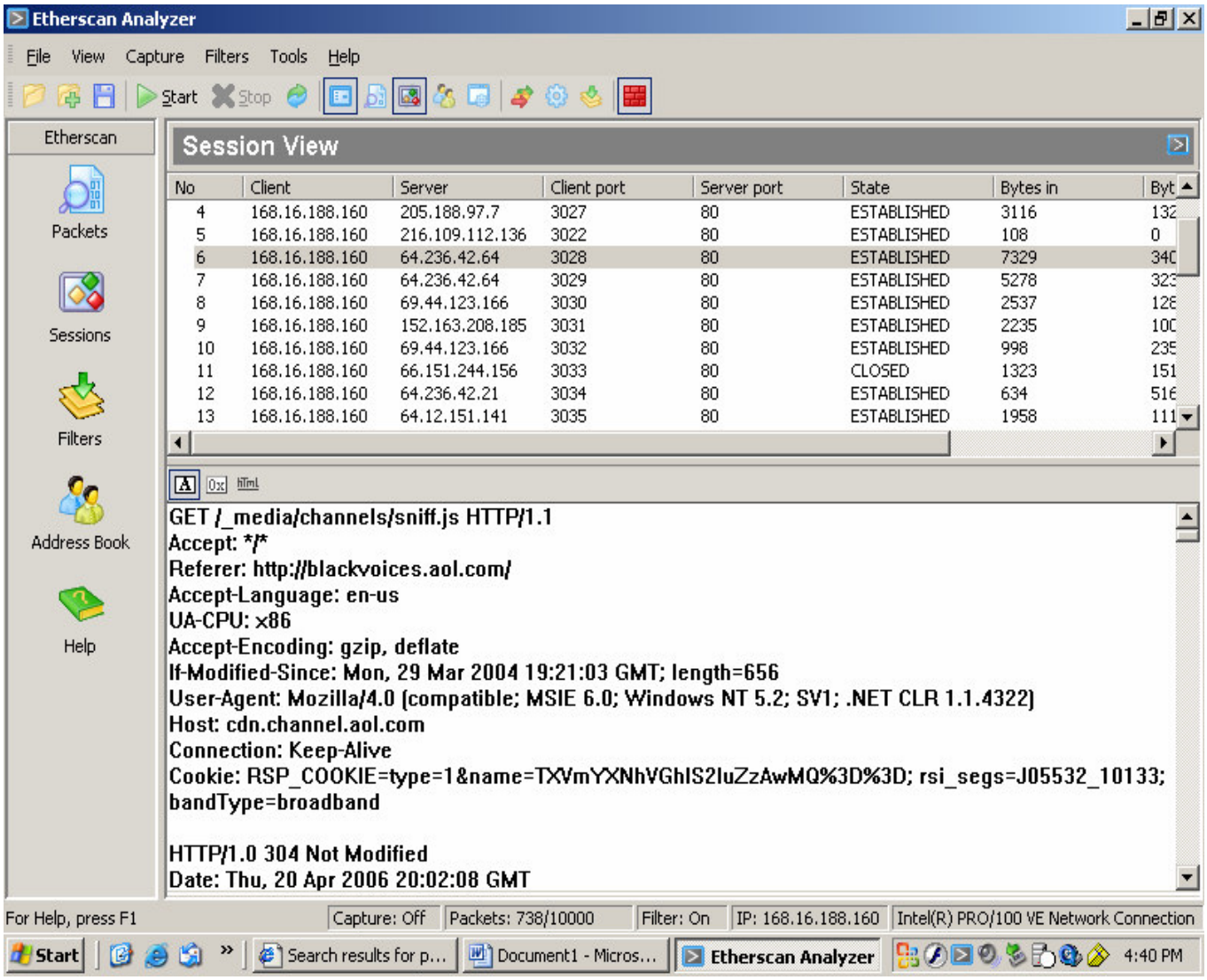
DNS which is a system that stores information associated with domain names in a distributed database on networks, such as the Internet. The domain name system (Domain Name Server) associates many types of information with domain names, but most importantly, it provides the IP address associated with the domain name. It also lists mail exchange servers accepting e-mail for each domain. In providing a worldwide keyword-based redirection service, DNS is an essential component of contemporary Internet use.- Enable DNS resolving, when this option is enabled, Etherscan Analyzer will resolve IP addresses to domain names. With this option enabled, resolved IP addresses will be automatically added to address book.

Menu – File, open, save, save decoded packets, save session, exit, view, packet view, session view, update, show left control bar, clear packet list, clear session list

Auto Scroll – capture, start, stop, enable/disable filter, and filters; edit filter, clear filter
save filter, load filter, apply filter.

Tools - packet sender, select adapter

Options – help, help topics, about etherscan, links, etherscan web site, support, buy now.

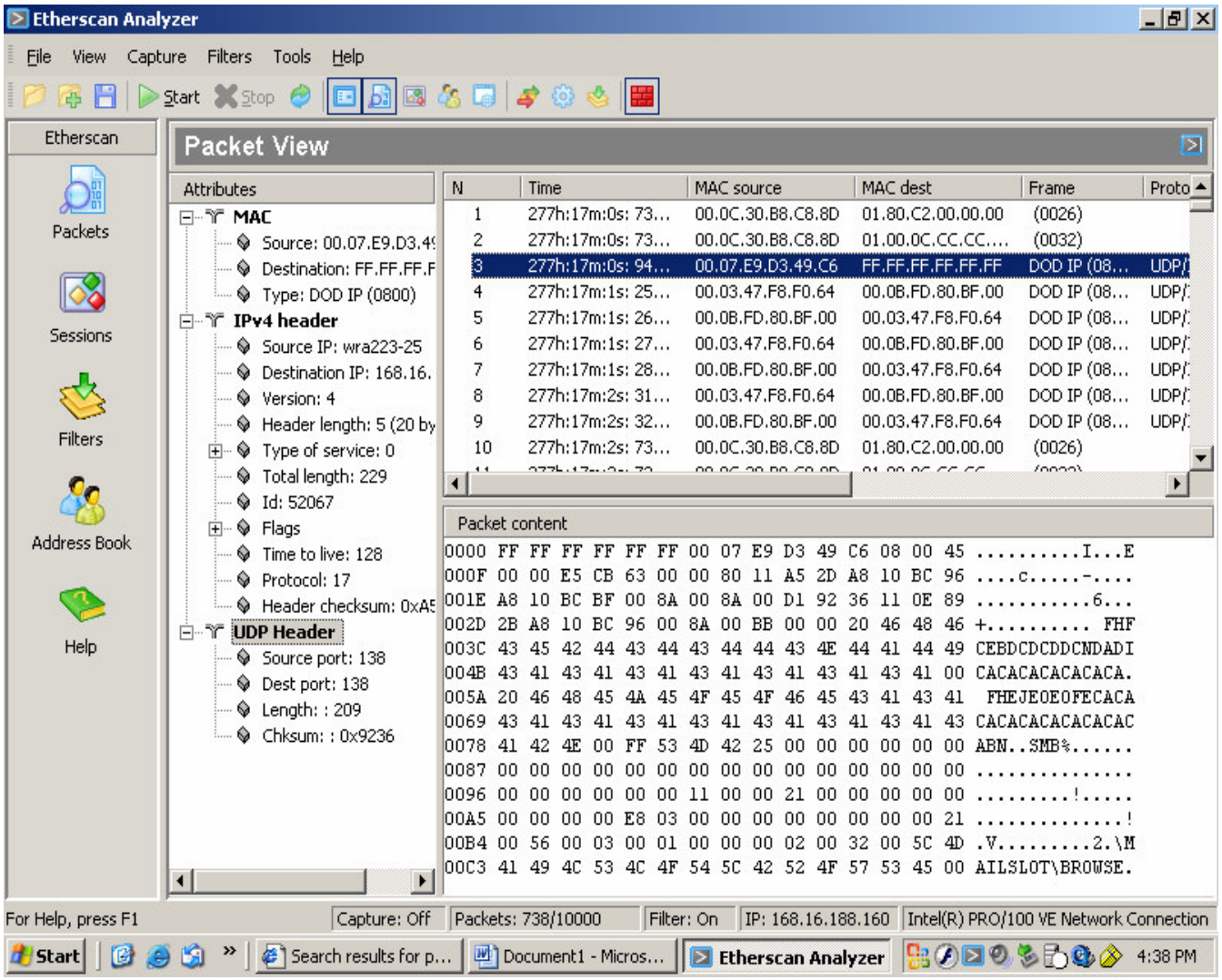


Sophisticated Protocol Decoding

Etherscan Analyzer can decode a large number of protocols, e.g. UDP Ethernet, IP, TCP, and various others. When decoding, Etherscan validates the checksum and checks packet integrity and other fields of the packet. Information about packets is shown on the left panel.

Packet View Options and Left Pane

Mark packet; mark current packet, mark all packets, mark all displayed packets, unmark all packets, unmark all displayed packets, invert selection, mark unmarked packets and vice versa, add to address book, add Source, add source IP address to address book,
add destination, add destination IP address to address book, delete this packet, delete current packet, delete all marked, delete all marked packets, protocol decoder



Help in Program Debugging

Etherscan Analyzer helps in the network software debugging process, view every packet the tested program receives or sends and enables the tester to observe program network activity. Etherscan largely reduce the amount of time needed to locate any network problem and assists in seeing any potential problems before they actually arise.

Extensive Filtering Mechanism

Etherscan Analyzer contains one of the best filtering implements on the market. You are able to filter packets on software and hardware level for specific words and for specific protocol fields. You can effortlessly configure the Analyzer to see only the desired packets you want. You can also save filters to a disk and upload them again afterwards.

Examples of filter operation

IP Filter - Enter IP address you want to filter in Add IP address and press Add button. IP address you entered will appear in IP Addresses list.

Port Filter - You can add standard protocol ports from Known ports by double-click in list or by pressing <-Add button
Also you can press enter port number in Custom port field and press Add button to add it.

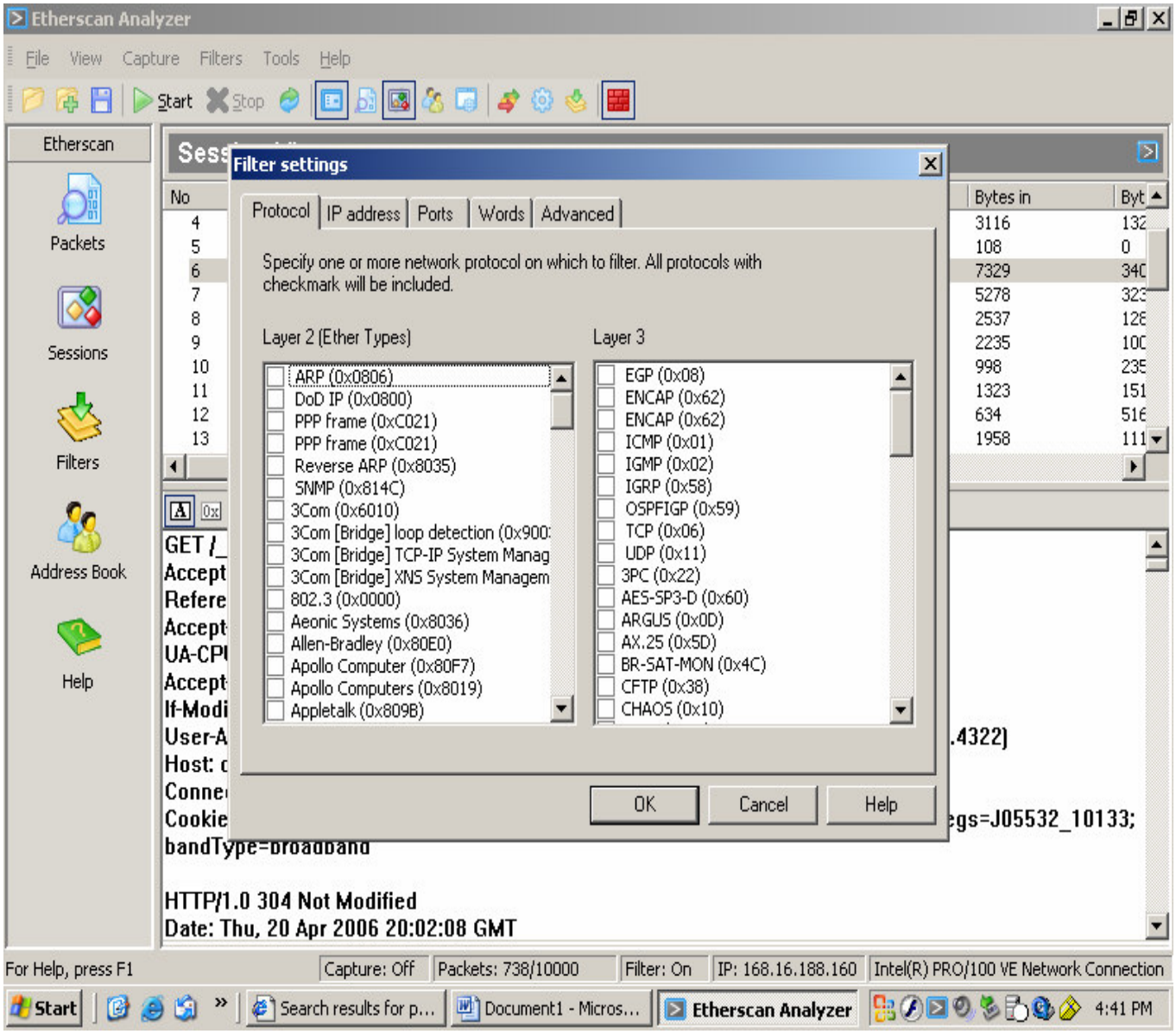
Word Filter - Add word
Enter word you want to filter in Add word field and press <-Add button.

Filter Mode
Select to include or exclude packets that contains words you entered.

Words in packets
Use AND or OR radio buttons to specify if packets should contain at least one string (OR) or all strings from the strings list (AND)

Advanced Filter - Use this filter to filter packets based on their size.
You can filter for any size packet or with packet size equal to, greater than or less than specified.

Protocol Filter - Use this filter to filter packets based on their type.



Spyware detection

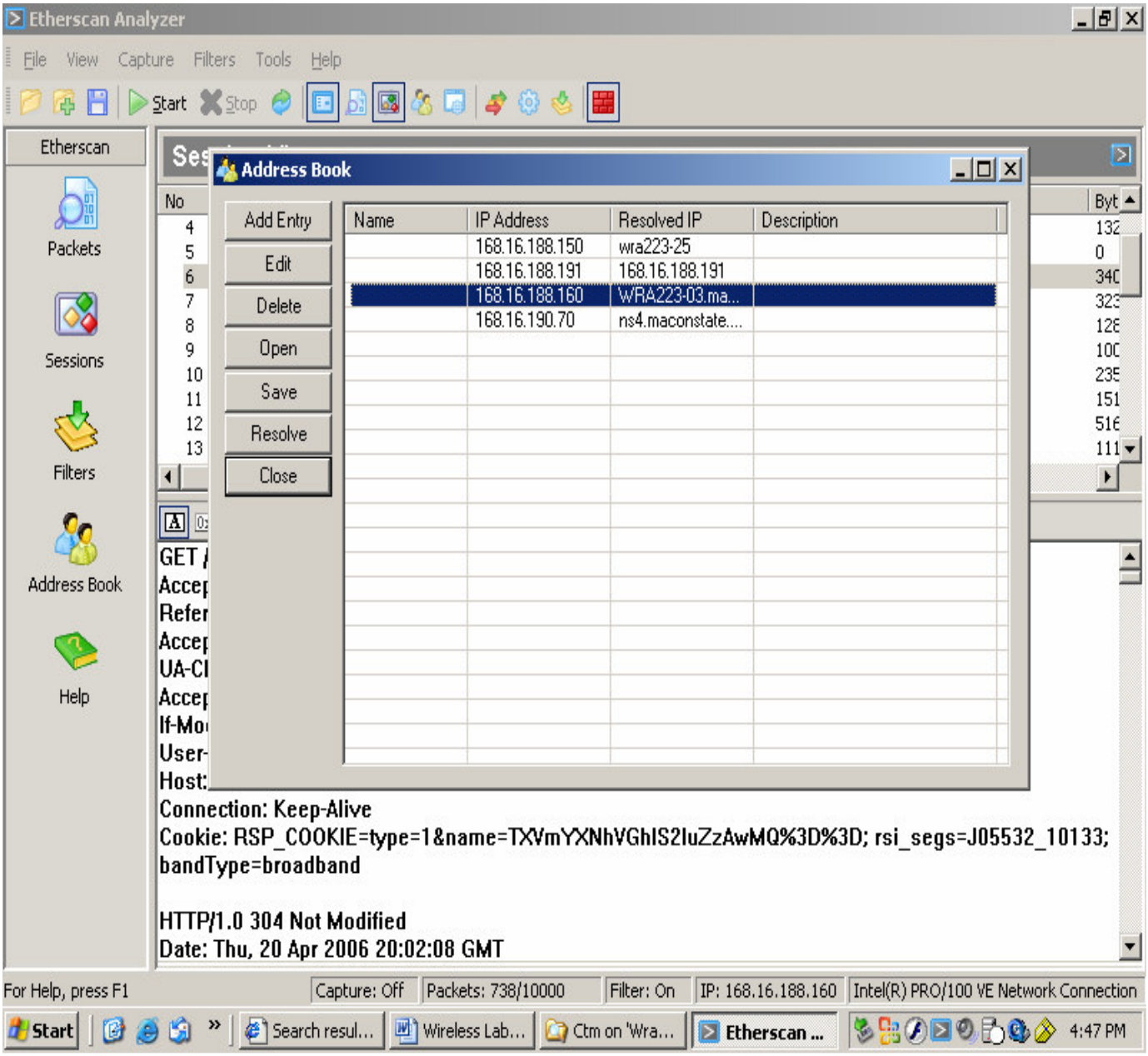
Etherscan Analyzer allows detecting of any activity, which starts from your computer. You are able to see all packets instantaneously as they travel on your network. You can easily detect spyware programs on your computer.

Educational Tool

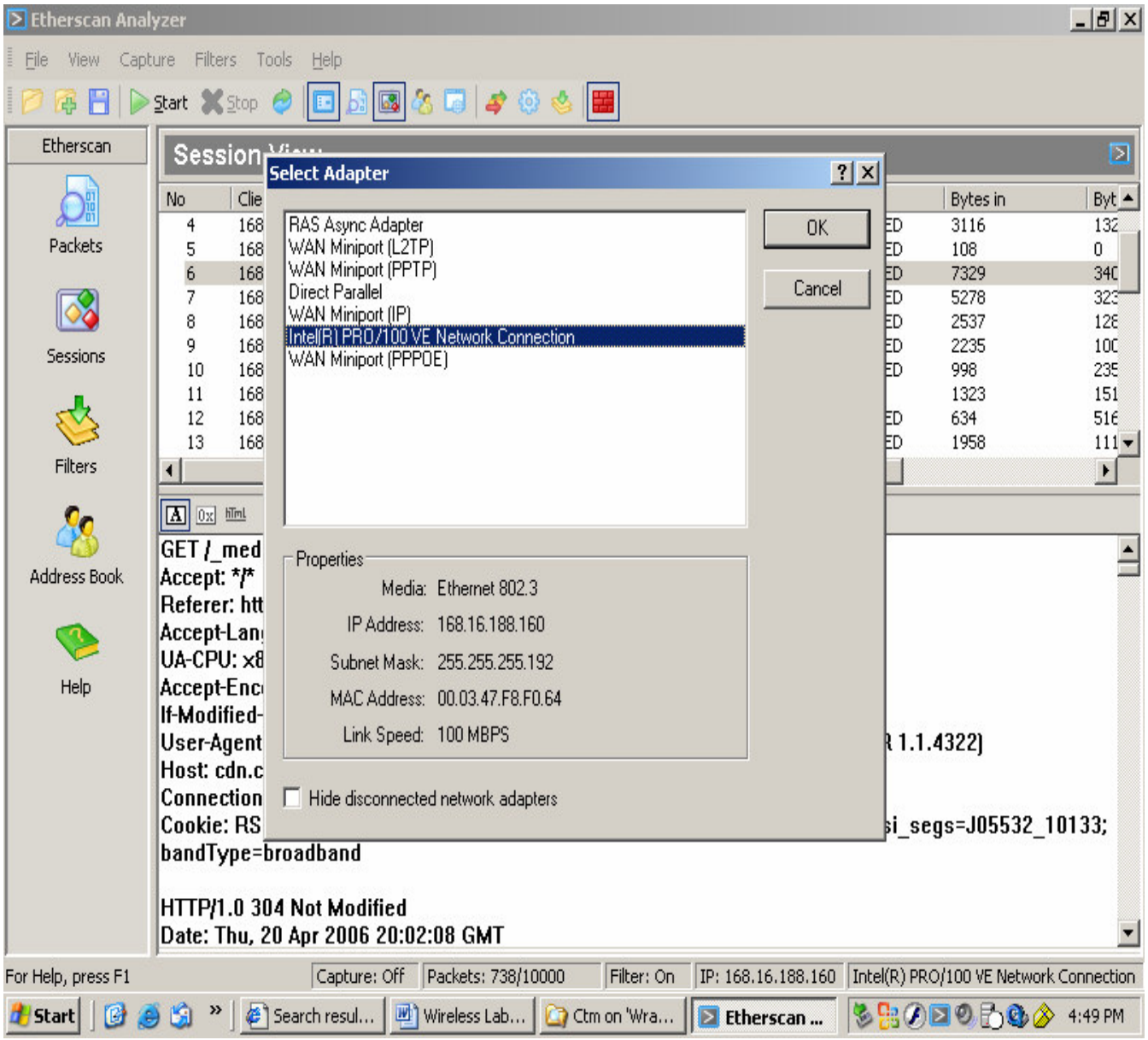
Etherscan Analyzer provides a lot of easy-to-use information assists the user in understanding network concepts, operation of popular protocols and programs. Analyzer can be an indispensable tool for every student.

Other Useful Features

Address book



The ability to choose various adapters



The second product we will look at is the freeware product Ethereal. As previously discussed, a protocol analyzer is a piece of software capable of capturing and analyzing packets present on a connected network. Packets are units of information a network transmits that consist of a number of headers and a payload field containing data. Sometimes it is advantagous to look at these packets individually rather than as a whole. This is accomplished using a protocol analyzer. Instances a user may want to look at individual packets include: gathering statistics about the size, type, and number of a certain type of packet, finding the source of errant packets (troubleshooting), or monitoring suspicious network activity.

As mentioned above, packets consists of a number of headers and some piece of data. The headers are attached as the packet moves from top of the application layer to the physical layer to be sent out over the transmission medium. Each layer's header at the sender's side contains control

information used by the same layer at the receiver's side of the transmission. Using a protocol analyzer we can examine the headers used at each layer. Information provided in the headers can help find the cause of problems in a higher layer. For example, if a file transfer was a lot slower than normal one could turn on a protocol analyzer and look at the packets flowing in and out of the network. If we see a lot of checksum errors at a lower level, we might surmise that there is crosstalk or other interference on the line causing a lot of retransmissions. Now we would know to examine the physical network for problems rather than the computer itself.

Positioning to Receive Packets

To receive and monitor these network packets, the user must first connect to the network in a way his host computer will receive the data he wants to monitor. This sounds simple, but modern networks attempt to send data directly to a destination computer, not broadcast it to all hosts on a network. This makes packet sniffing more difficult on fully switched networks than on networks utilizing hubs. This is because all traffic sent to a host on a hub is also broadcast to all other hosts connected to the hub. Switches do not do this; they only send data to the destination computer.

A malicious user could work their way around this limitation by forcing the switch to send all traffic through their host machine using a method called ARP spoofing. This works by conning the switch into mapping the legitimate user's IP address onto the malicious users MAC address. All traffic is then forced to the malicious users PC to be logged and monitored before it is forwarded the legitimate user. There is little reason a network administrator, or other person designated to take care of the network, would have to use this method so we will not talk about it further.

The ideal position for a protocol analyzer is on the host the user wants to monitor traffic on. This allows direct access and will not slow the rest of the network. The second best position would be a host connected to a backbone switch using a special port that mirrors all traffic the switch sees to that specific port **(Fig 1)**. This method is useful for monitoring the traffic of many hosts on a network while minimizing the performance hit to that network. The last suitable position is connected to the same hub the hosts you wish to monitor are connected to. In this configuration you will only be able to monitor all traffic broadcast on that particular network segment **(Fig 2)**.

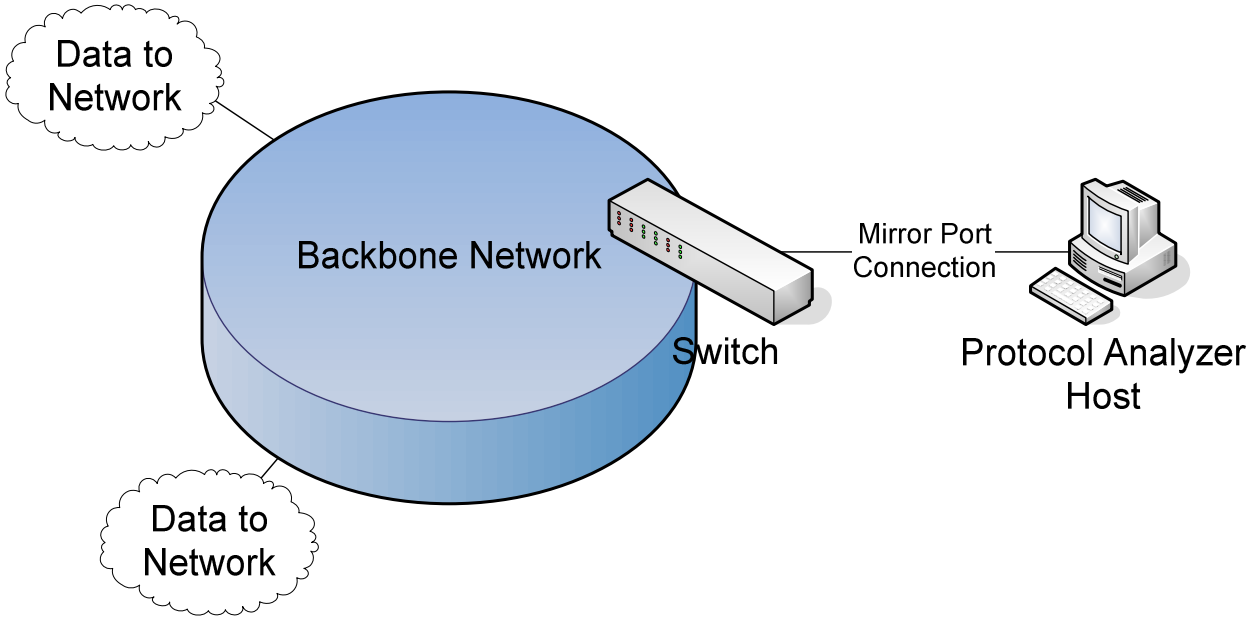


Figure 1: Protocol Analyzer on a Mirroring Port

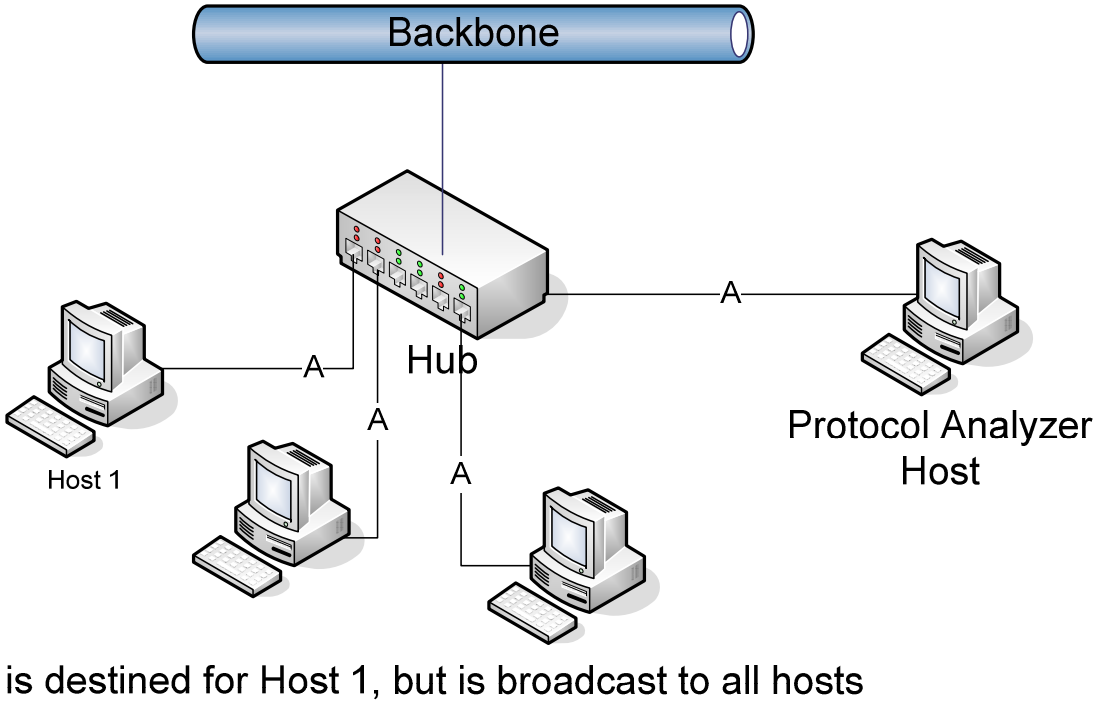


Figure 2: Protocol Analyzer on a Hub

Introduction to Ethereal

Ethereal is an open source protocol analyzer used to perform monitoring, troubleshooting, and statistical activities on a network. Because Ethereal is open source, it differs from other commercial products in a few key ways. First Ethereal is free, with no trial periods or other limitations regardless of the number of computers you wish to use it on. Second, because Ethereal is

open source, the source code is freely available to anyone. Users are free to modify this code as they see fit with only one limitation: the inability to sell products based on this freely available code for profit. All people who modify, or write new code for Ethereal are encouraged to post this code on Ethereal's site for additional modification and public use. For example, if someone modifies Ethereal support a new protocol, these modification are rolled into the core installation files for everyone to use. The last and I feel most important difference is the tremendous support the open source community provides. This extensive documentation is needed for programmers to understand how something works so they can modify it to fit their needs. The Ethereal community is located at www.ethereal.com

Theory of Use

Using Ethereal or another protocol analyzer has three main steps. First you must configure the program to use the correct network adapter and specify what type of data you would like to capture. The second step is to let the program run and capture data during the period of time you are interested in. The final step is to look at the captured data and performing your troubleshooting, analysis or statistical task. Although these basic steps sound easy enough they each contain more granular steps that will determine the effectiveness of your network capture. I will review these specific steps below.

Selecting the network adapter to capture traffic with is usually a straightforward task. Selecting the type and amount of traffic to capture is the more difficult part. The idea is to capture the traffic that will help you solve a problem the host computer or network is experiencing. The problem arises when you do not know where your problem lies, and thus what traffic to capture. When this problem arises I would suggest capturing all the packets on the network, or only filtering out things you knew for sure worked correctly. Other times it will be obvious what to capture, for instance if you are having problems with DHCP, you might want to capture all packets in the DHCP process by using a filter to filter out everything else. Narrowing you capture in this manner makes troubleshooting quicker because you don't have useless information to sift through.

For problems the user can easily reproduce, it is easy to determine when to run the network capture. Simply start the capture, reproduce the problem and let it run its course, then stop the capture and analyze the data for problems. Using this method narrows the amount of data captured to that taken during the duration of the problem. A problem that is not easily recreated is much harder to capture and often requires a longer capture interval. Unfortunately this often means a capture will record a large period of normal operating data for each problem event. If a user is actively watching the data capture this could be minimized by only keeping the most recent X packets needed to have a good view of the problem. However if the problem occurs, and no one notices it, the data about the problem will likely get flushed away when new packets arrive.

Once a sufficient amount of data is captured, it is often necessary to perform additional analysis to make the data useful for troubleshooting or other tasks. To perform this analysis, Ethereal uses pieces of software they call dissectors. Essential each packet contains a number of headers in addition to the data it is carrying. Ethereal uses dissectors to dissect these headers and display this information to users to help them troubleshoot or perform other network tasks. Each header contains different information depending on what layer it is from but some common fields do exist. These are: source/destination address at that layer, protocol version, header/data size, and

usually some checksum information. Because many headers exist in a single packet, multiple dissectors are used and Ethereal identifies the type of packet using the highest layer header type. For example Ethereal dissect HTTP, TCP, IP, and Ethernet headers for a HTTP packet while labeling that packet using its highest-level header: HTTP.

The dissectors are one of the main focuses of Ethereal's open source community. Overtime the open source community has grown the list of supported protocols from a small selection well-known protocol into a list over 750 protocols strong. Protocol dissectors are not limited to Ethernet. Medium such as ATM, Fiber, Wireless, and Token Ring are also supported. Protocols for a wide variety of purposes are also supported, from FIX (Financial Information eXchange) which powers banks and stock brokerages to AIM Chat used by a popular instant messaging program.

Captured packets can be further filtered using Ethereal's display filter which is similar to the capture filter. Both filters support filtering by protocol, port, size, and type (multicast/broadcast etc) using a syntax called PCap. The display filter expands on this syntax to give more advanced filtering abilities, usually based on header information. For example, the capture filter can distinguish between ARP and IP packets but it can not distinguish IP packets with a bad checksum vs. IP packets with a good checksum. Using information in the header of the packet, the display filter could make this distinction and filter out either.

In addition to the advanced filtering abilities, the display filter is also easier to setup and use. This is because Ethereal provides an expression builder that helps users select filters without having to remember the exact syntax. To use the example above, instead of users having to remember ip.checksum_good == 1, they could enter the expression builder and select the IP checksum from a hierarchical list and force Ethereal to filter out any packets with bad checksums. Users can also apply display filters quickly by right clicking on a packet containing information they would like to use as a filter and selecting "apply as a filter." For example to focus on DNS packets in a capture you could select the DNS packet and apply it as a filter to hide all other packet types.

Ethereal Installation

Ethereal installs much like any other Windows program. All that is required is for the user to go to www.ethereal.com, locate the download page and download the Windows Version of Ethereal. Be aware that this is a large download, typically in excess of 24MB.Once the download is complete, double-click on the executable and follow the on screen prompts. You will notice the Ethereal also installs a library called Pcap which is what Ethereal uses to capture and perform limited filtering on network packets. Simply keep following the on screen instructions and specify where you want to icons to display. It should be noted that without installing Pcap, Ethereal will not be able to capture packets. Pcap can also be retrived from many other sites.

Using Ethereal

I will now use Ethereal to capture traffic while I surf the web, download email through a POP3 account, and log into an FTP website. This will give a good step by step demonstration of using Ethereal to setup a capture, perform a capture, and then perform some analysis like finding POP3 or FTP passwords.

Step 1: Setup the Capture

After Ethereal is opened, click the upper-left button with the caption "List available capture interfaces." The next dialog box will show you the network interface name and IP address for your computer (**Fig 3**). Click on the Prepare button to the right of this to bring up the capture options dialog box. This is the dialog box used to select filenames, sizes, display options, stop-capture triggers, and the capture filter. We are going to filter out ARP packets to save resources and make it easier to focus on other packets that are part of this demonstration. To do this we enter "not ARP" in the blank capture filter text box **(Fig 4)**. Now click Start to display the Capture Info dialog box and the normal view of Ethereal.

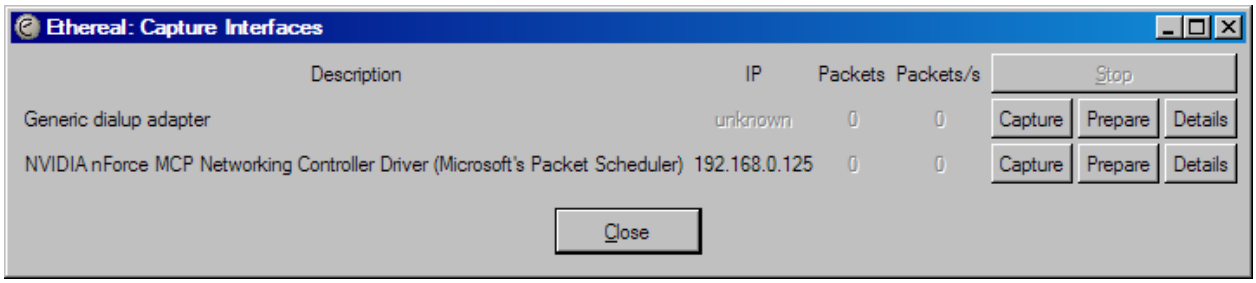


Figure 3: List of Network Adapters

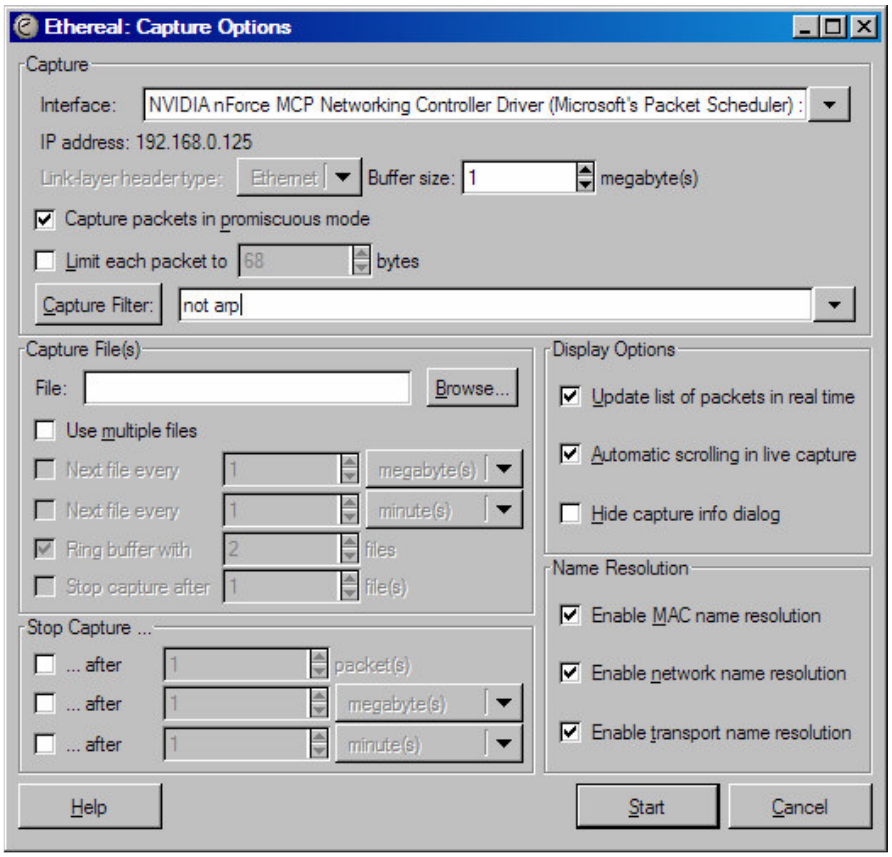


Figure 4: Capture Options

Step 2: Perform Actions to Capture

Now we will perform the actions we want to see the network activity for. First we will go to the Macon State College website located at www.maconstate.edu. Notice that as you do this, the Capture Info dialog box keeps a running tally on the various types of packets used **(Fig 5)**. During this exercise we will predominantly see TCP packets and UDP packets for HTTP, POP3, FTP, and DNS respectively. Next I will go to ftp://members.cox.net and log into the ftp server with the username ethereal.test and the password findme99. Finally I will open Microsoft outlook and retrieve the email for ethereal.test using the same password from Cox's POP3 email service. To stop the capture I click stop on the Capture Info dialog box. This causes the dialog box to disappear and all packets to display in the main Ethereal window.

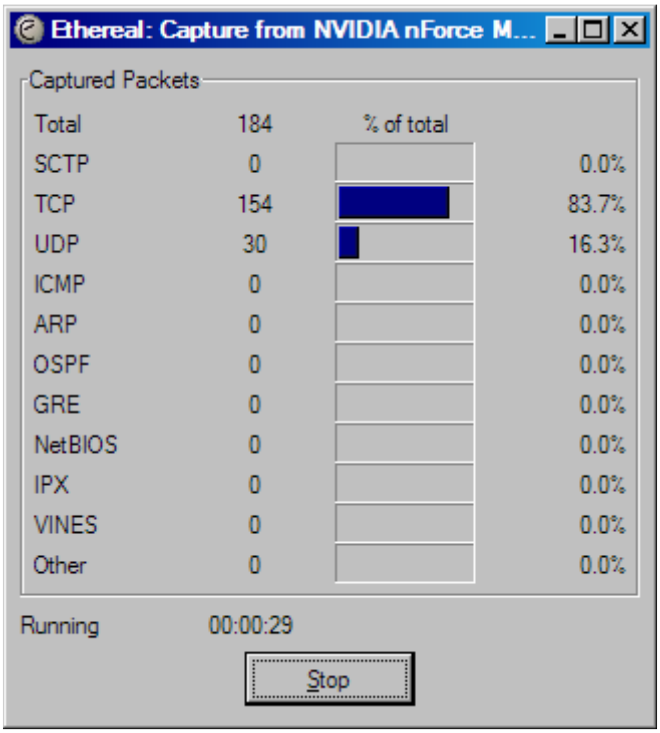


Figure 5: Capture Statistics

Step 3: Analyzing the Data

As you look at the list of packet you will notice some are different colors than the rest. This is because Ethereal colors the packet according to their type, or other significant factor such as an error or retransmission. The way packets are colored can be changed using the Coloring Rules dialog box accessed by the third button from the top right **(Fig 6)**. These rules use the same syntax as the display filter. You should also notice a list of headers displayed in the bottom section of Ethereal's windows. This list can be expanded using the + sign to display the contents of each header for a packet.

Filters are applied using the display filter syntax in the filter toolbar and clicking Apply. For example if we wanted to look at only the DNS traffic for this capture we would enter DNS in the filter toolbar and hit enter or click apply. This hides all other packet types, leaving only the DNS

packets which are colored blue by default **(Fig 7)**. To remove this filter we simply click the Clear button and all packets are redisplayed. You can also apply this same filter by selecting a DNS packet, right-clicking the DNS header on the bottom of the screen and selecting "Apply as Filter." This same method is also used to filter by other header fields including: Ethernet source/destination, IP source/destination, ports, flags, and checksums. You may concatenate filters using the same context menu by selecting the "and/or" options. The "Prepare as filter" option writes the filter syntax but does not automatically apply the filter.

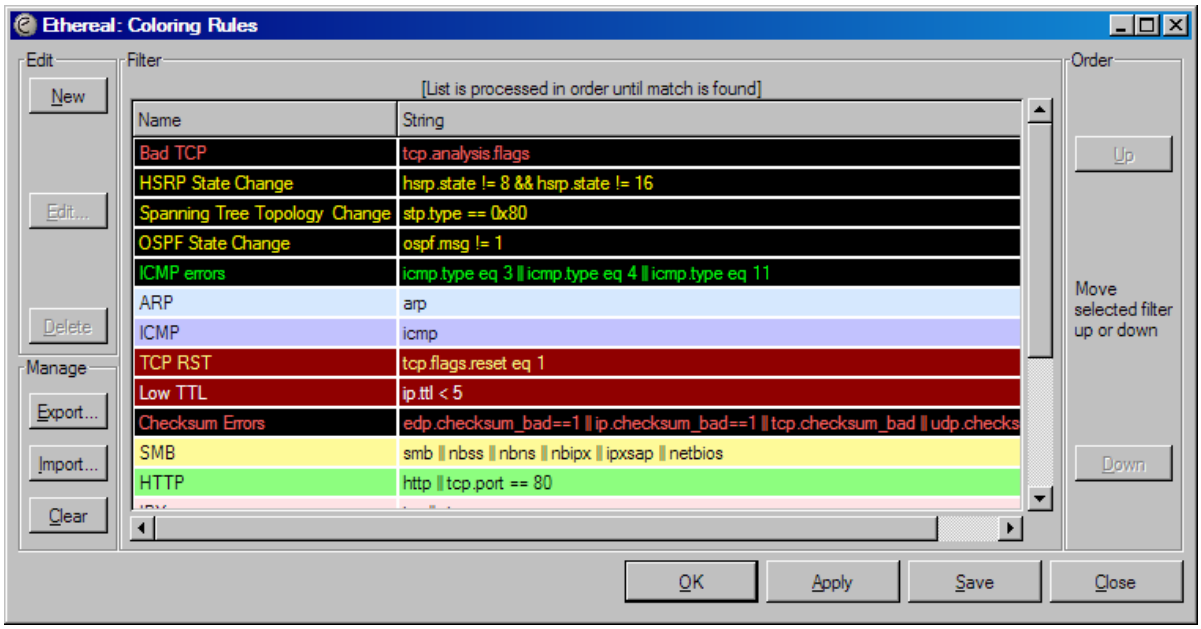


Figure 6: Coloring Rules

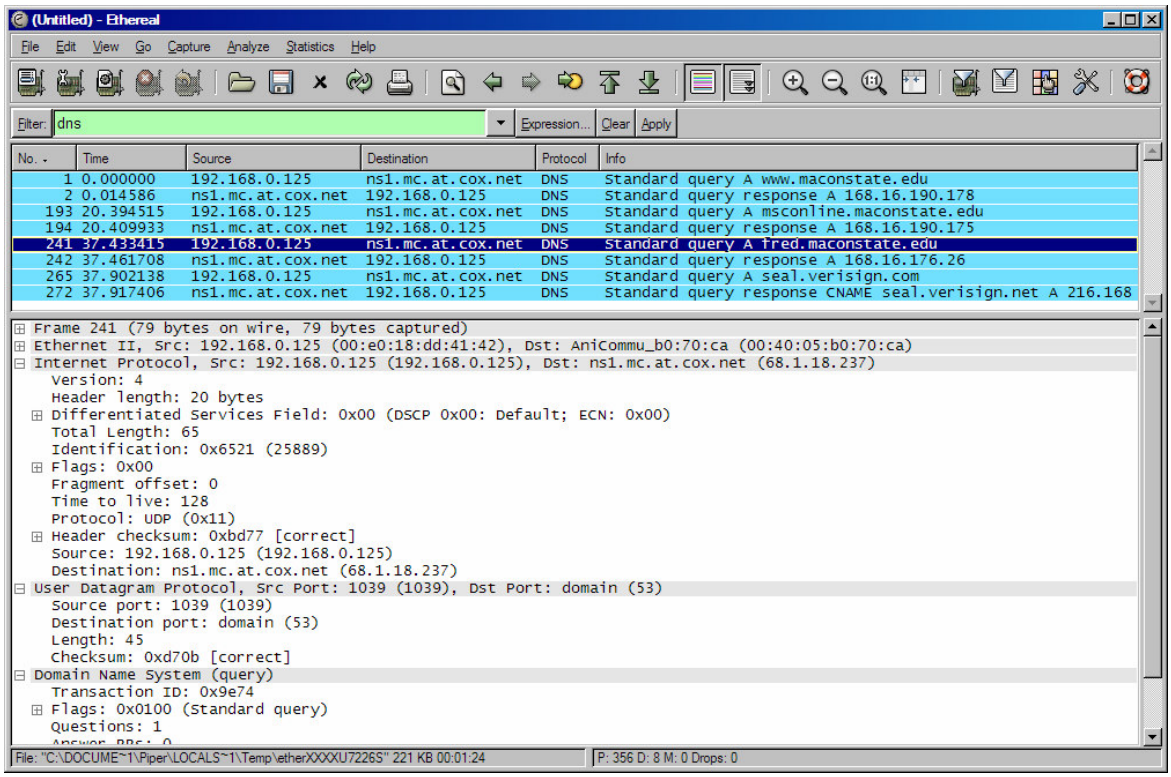


Figure 7: DNS Filter Applied

More complex display filters are often built using the expression builder. This tool allows users to create very specific filters without having to memorize the display filter syntax Ethereal uses. This saves quit a bit of time because the filter syntax is fairly complicated. Users access the Expression Builder by clicking the "Expression…" button right next to the filter text box. When the tool opens, a list of protocols is displayed on the right. To see the filterable settings of each protocol you select the + sign. The TCP protocol has over 60 settings that the user can use to filter packets. To filter IP packets with a valid checksum we would go to the IP protocol list and scroll down until we found the ip.checksum_good field. Once that is selected, we select the == operator and select true in the list to the right. Once we click Ok to close the Expression builder we see the ip.checksum_good == 1 with a green background in the filter toolbar **(Fig 8)**. This means it is a valid filter so we click "apply" to enable the filter. Now only packets with a valid IP checksum will be displayed. Clear this filter before you continue.

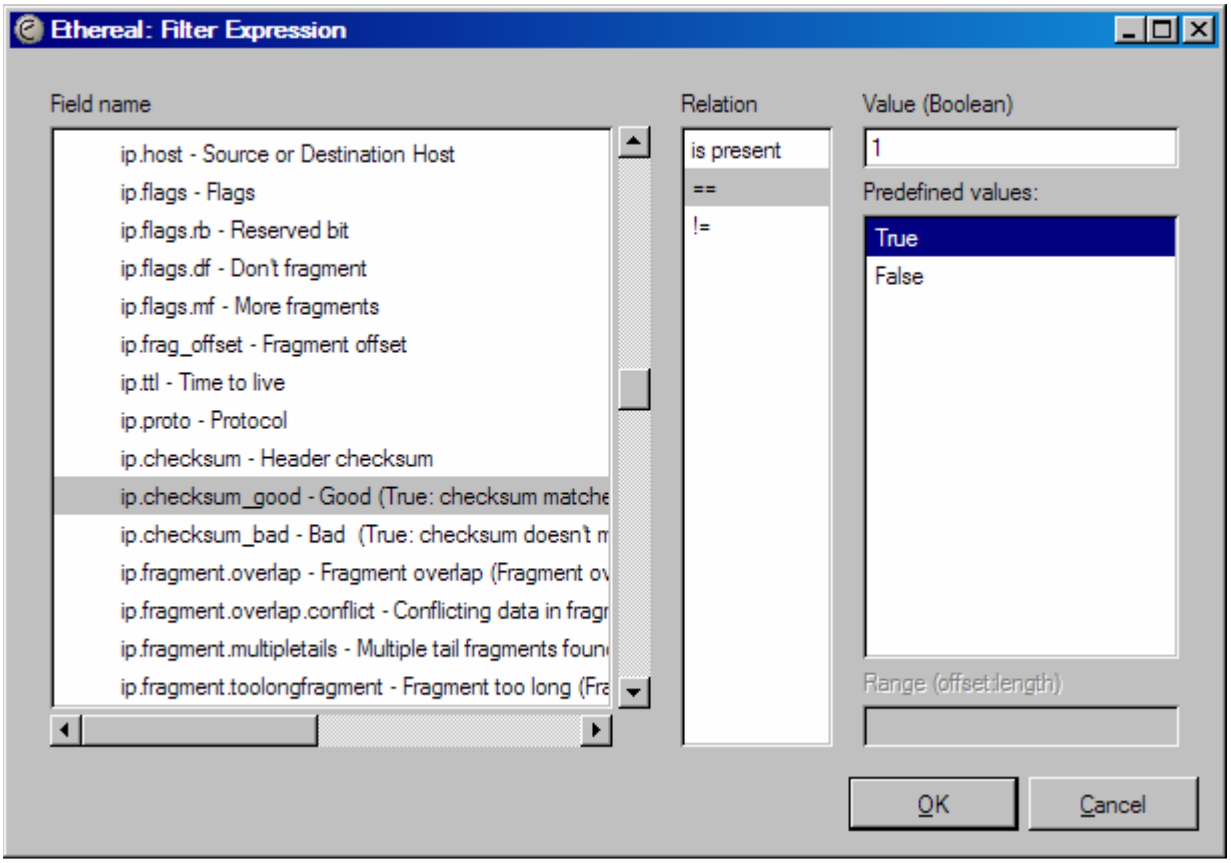


Figure 8: Expression Builder

To retrieve the passwords from the email and FTP account we will use a feature of Ethereal called "Follow TCP Stream," available from any TCP packet the user right-clicks. This is essentially a filter that limits output to a conversation between two hosts using source/destination address and ports. Then the contents of the packets are concatenated in a window and displayed using ASCII text. Any un-encrypted text, including user names and passwords, are easily readable in this format. To demonstrate this point, filter out everything except POP3 traffic, then right-click any packet and select "Follow TCP Stream." In the window that opens you will see the conversation between your computer and the server. Near the very top you should see the username ethereal.test and the password findme99 **(Fig 9)**. Now exit out of that stream and

change the filter to see all FTP traffic. As you follow the FTP stream you can also see the user-name and password near the beginning **(Fig 10)**.

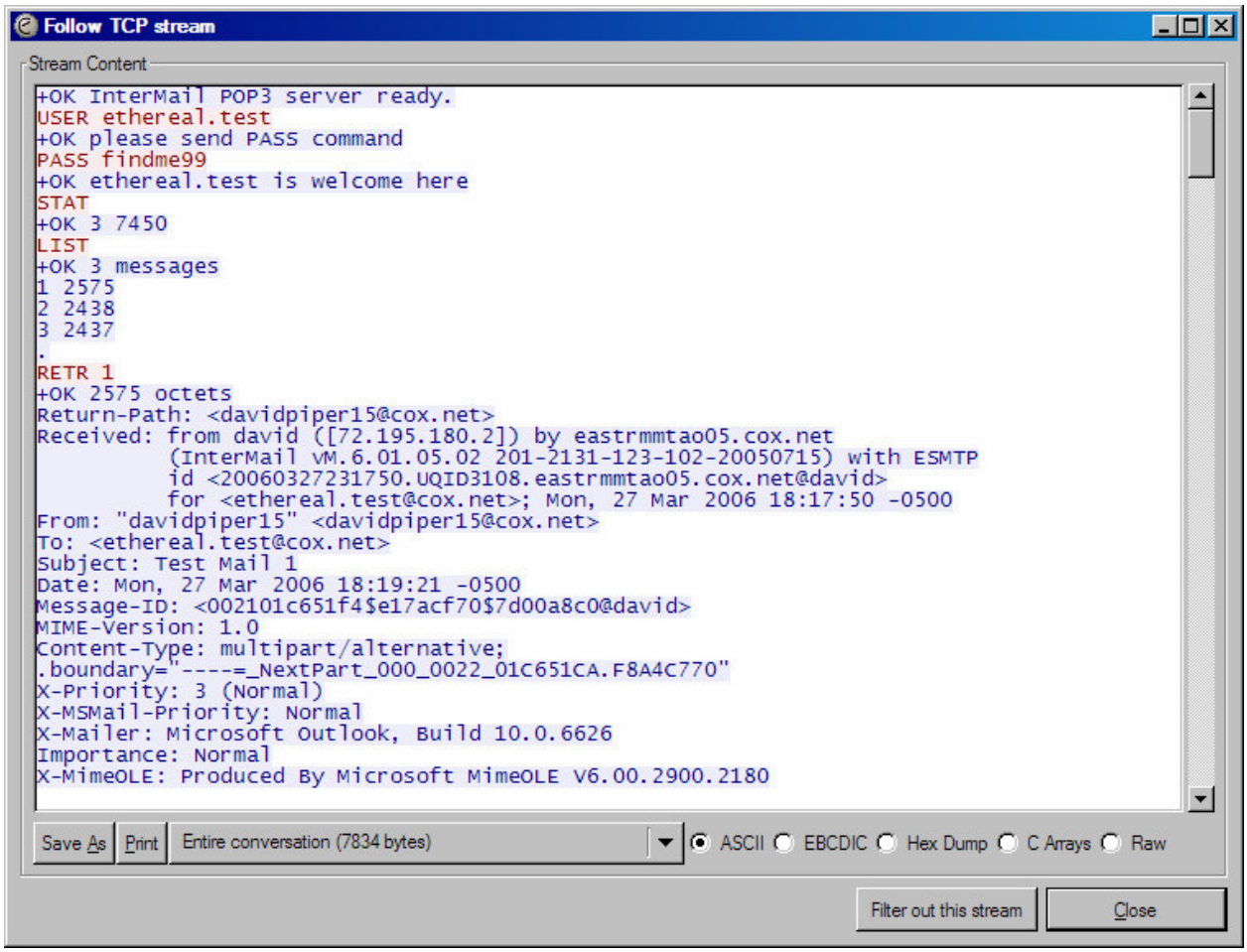


Figure 9: Cox Email Stream & Password

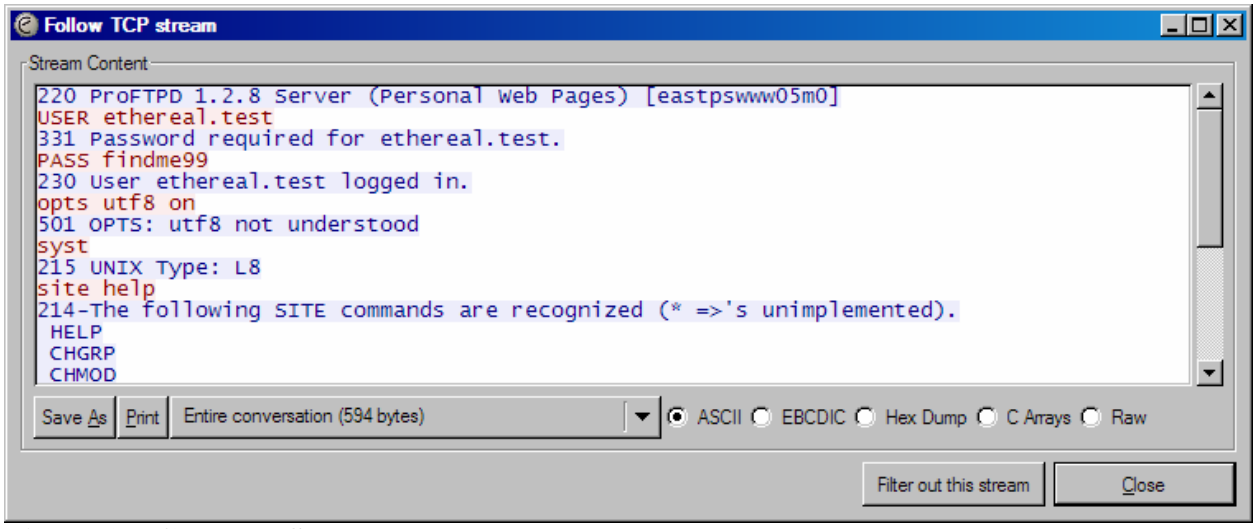


Figure 10: Cox FTP Stream and Password

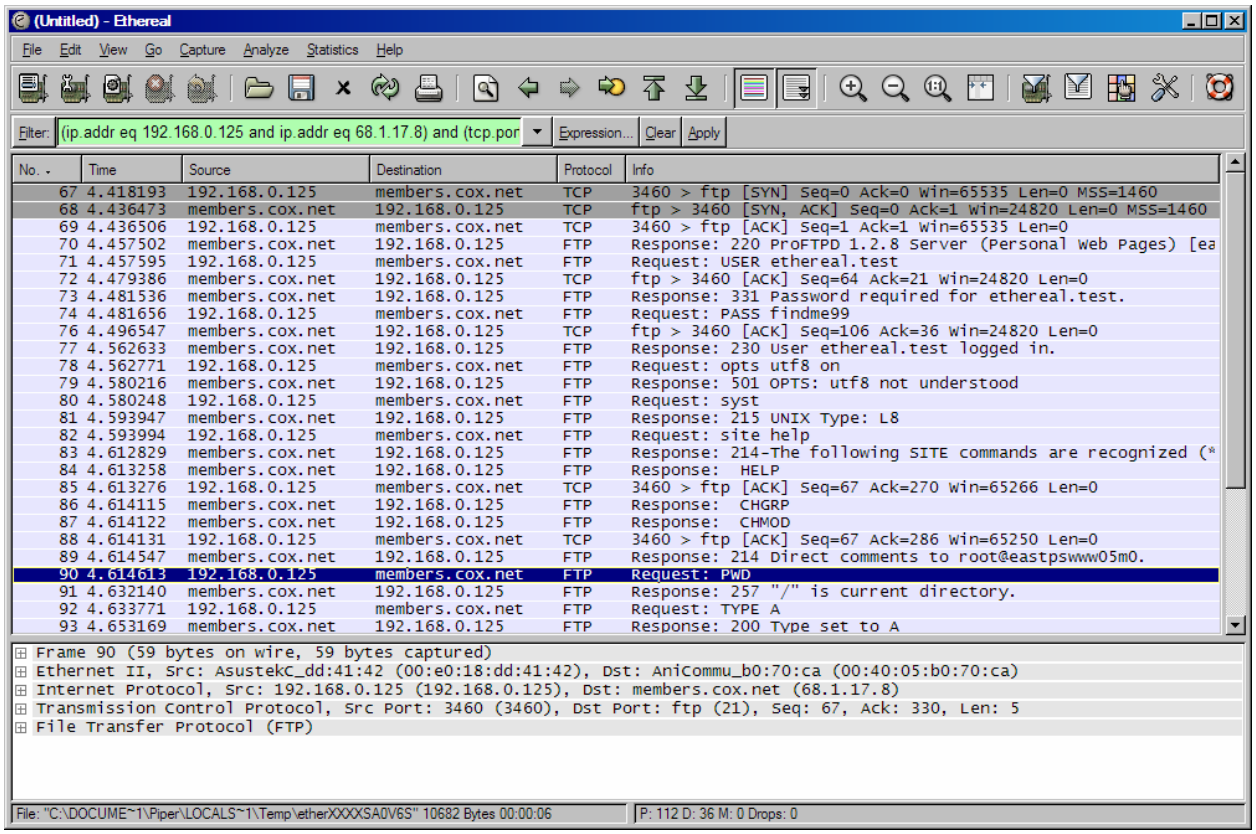


Figure 11: Resulting Filter of Following a Stream

Summary

A network protocol analyzer (or sniffer) is a tool that allows users to monitor and troubleshoot traffic on their network. This is accomplished by capturing individual packets and looking at information contained in their headers or payload areas. Because these tools must be on the same route as a packet in order to capture it, where they are located is an important factor in their use. The best areas include on an individual machine experiencing problems or on a backbone router/switch configured to replicate all traffic to a specific port. The latter position will give you a large sample of data from all machines using that backbone. Connecting to an unmanaged switch typically won't work without some type of ARP spoofing. This degrades performance and should be avoided.

Ethereal is an open source protocol analyzer available for free without any limitations. Open source also means that extensive documentation for everyone from developers to end users is available. Ethereal supports over 750 protocols over a wide variety of mediums including: Ethernet, Fiber, ATM, and Wireless. The capture engine is based on a program called Pcap which uses its own capture syntax and filter to exclude packets from being captured. On top of this capture engine, Ethereal has added an extensive display filter to aid troubleshooting and other analysis. Users not familiar with this syntax can use the Expression Builder to build complex filters quickly and easily. Alternately filters are quickly applied by right clicking the desired attribute and selecting "Apply as Filter." All types of filters can be concatenated or negated using standard "and/or" and "!" expressions respectively. Network captures can be saved in various formats for future analysis by Ethereal or other programs.

As you can see, these two products display a great deal of power for a user. You are able to monitor and filter network traffic, anywhere on your network. I will show how these two products work as well as several others of this type such as alternatives for the expensive Visio and so on. CDs of these products will also be distributed.

Resources

Fogie, Seth; The Ingredients to ARP Poison. http://www.samspublishing.com/articles/article.asp?p=29750&seqNum=3.

Ethereal Software and User's Manual. http://www.ethereal.com/. Last accessed April 8, 2006.

Etherscan Website. http://www.etherscan.com/analyzer/index.html.

Recent Developments in Cyber Law

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Abstract

Due to recent national and international legal decisions and executive directives, the impact the Law has on cyberspace has broadened. Provisions of the Patriot Act as wel las recentr decisions by the European Union have focused attention on enforcement actions on the IT front. Broadened law enforcement powers throughout the legal spectrum have dramatically impacted this arena. Specific recent developments will be presented along with those being considered.

Note: This paper was not received by the time the proceedings went to print. The authors will provide written materials at the session or on the web.

Creating and Sustaining Cyberspace Initiatives that Maximize Technology and Enhance Learning: Faculty Perspective at One Campus

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Paradigm Shift for Technology

Creating and sustaining cyberspace initiatives is a growing higher education phenomenon. Alfred P. Sloan Foundation's Sloan Consortium (Sloan-C) actively engages institutions and organizations committed to quality online education. "Sloan-C recognizes that new ideas and implementations are taking place every day inside the relatively young field of online learning, as thousands of institutions practice the art in their own distinctive ways" (Lorenzo & Moore, 2002, p.3). Fairmont State University (FSU) is one of these thousands of institutions immersed in the process of developing and maintaining effective practices in the online teaching and learning environment. This paper will describe how Fairmont State University has created and sustained a variety of quality online initiatives from the perspective of "non-techie" teacher education faculty members.

In any endeavor that is viewed as a paradigm shift, it is important to address those issues considered to be enabling factors as well as those considered to be impediments. Passmore (2000) identifies three impediments to web-based course delivery faced by university faculty members: (1) limited access to and experience with resources for web-based design, development, and delivery; (2) uncertainties about the status of intellectual property; and (3) lack of a reward system tied to innovation in instruction. The Sloan Consortium has identified enabling factors which are referred to as the "five pillars for quality online education" and include: learning effectiveness, student satisfaction, faculty satisfaction, cost effectiveness, and access. As the Sloan Program Director, Frank Mayadas has stated:

"We are achieving a two-fold goal: One is to share knowledge that other educators can examine and perhaps emulate, and the other is to substantiate that online teaching and learning does indeed work, not just here and there, but for many people in many disciplines, in many kinds of institutions" (Lorenzo & Moore, 2002. p.3). While Fairmont State University is still working to-

wards achieving the Sloan-C two-fold goal, the institution has been successful at minimizing the impediments to online teaching and learning.

Evolution of the University and Technology

The authors' focus is to provide a broad overview of Fairmont State and the evolution of its successful cyberspace initiatives. In addition, the authors will comment on how the various successful initiatives have addressed some of the enabling factors (pillars) and impediments to online teaching and learning.

Fairmont State College was founded in 1865 as a normal school and is located in Fairmont, West Virginia. Fairmont State attained university status in 2004 and has a total student population of approximately 7800 students with about 200 full-time faculty members. Prior to 1999, Fairmont State (FS) had no online course management software, and faculty development efforts consisted mostly of encouraging two-hour demonstrations by in-house personnel who had many other duties as well. As a result, little interest was shown in "e-learning and teaching" except from "faculty techies" and "early adopters." This all changed in 1999, when a statewide opportunity evolved to adopt WebCT as an online learning management system. FS adopted WebCT and initially utilized an off-site resource, West Virginia Network (WVNET) to manage the system and provide training. WVNET offered two-day workshops with moderate stipends for faculty and managed all courses via online communication from another location.

The next transition at FS was the most significant: the 2001 hiring of Dr. Daniel J. Bradley as the new president. He established the following goals that would challenge all faculty members at FS: (1) every course would have some online WebCT presence by 2003 (specifically – each course would need to include the syllabus tool and the gradebook tool); and (2) the number of fully online courses and programs would grow substantially. It became very evident that the current practices and policies would not lead to the now established goals, that WVNET could not meet the intensive training and course demands, and online-education management would need a centralized on-site presence and a director.

Teaching in the 21st Century

Noting that the current infrastructure and procedures would not meet the vision of the new president, the university hired Dr. Roxann Humbert to direct and establish the Learning Technologies Center. Dr. Humbert instituted the Online Learning Advisory Committee (OLAC) in 2001 to provide consultation with the administration in developing a campus-wide plan for online learning. Dr. Humbert provided the philosophical and pragmatic background for the various future online initiatives, the culmination of which resulted in an occasional paper written for the University in 2005, *"Teaching and Learning in the 21st Century."* In the paper, Humbert describes how education and teaching are changing physically, culturally, and technically and how higher education must accommodate these changes to educate clients for a new world context. Her examples are poignant as she suggests that the mouse and the screen are replacing paper and pencil; computer screens replacing the chalkboard; and up-to-date online resources replacing dated textbooks and other library hard copy. Culturally, learning and teaching are no longer place and time bound.

Students. No longer do students have to wait "until class" to ask the professor a question or to get clarification about assignments or to get their "papers back." Instructors are no longer the "sage on stage" but are the "guide on the side," playing more "constructive" roles as they prompt students to actively construct, manage, synthesize, and evaluate their learning. Instructors can now easily team with colleagues at home and at other venues to deliver courses and to invite experts into the process. A final shift sees a change from an emphasis on teaching to learning, and in the process, for example, the mode of the "midterm" and "final exam testing" gives way to multiple and authentic assessments as the tremendous number and kinds of real-world resources come into play on the World Wide Web.

Students must be trained to problem solve and faculty need to forsake the "term paper" for cross curricular or interdisciplinary projects, case studies, simulations, or other activities that are authentic and grounded in real-life work. Can students be taught to think critically? It is a difficult task with varied meanings but at its root is a mental set which directs one to analyze, search, compare, contrast, speculate, and seek opposition to the prevailing norm. It was mentioned earlier that faculty need to seek multiple ways for assessment. Those who teach using multiple means engage their students accordingly.

Faculty. Faculty are changing because students are changing. College-goers today are computer savvy, visually oriented, and expecting to be taught accordingly. They already know how to get information and seek inquiries from "experts" online and consistently use the online environment for any number of social and personal needs. Faculty need to capitalize on that savvy and train their students for a changing economic and cultural global context. They need to give students four basic competencies for the "new world": technical savvy; problem solving skills; critical thinking; and "learning how to learn" as a life-long endeavor. They don't need "computer skills"; they bring these into the classroom with them. But they need "technology skills" and concepts, not just training to use a specific piece of software for example, but to understand the basic concepts underlying the software. Faculty must model technology; it must be evident in the course experiences and relevant to the content at hand.

Finally, faculty need to acquire and progressively develop a proficient technology base. Course work currently noted on their doctoral transcripts won't suffice. They need to give students emerging technologies and to show their students what is being learned; how it is being learned; that it may or will soon change; and that relearning will need to occur. This is the focus for life-long learning. Are we ready for such instructional challenges? Are we doing the best things for our classrooms, and are we ready for 21st Century learning and teaching?

The Mission

At FSU, the process of getting ready began in several ways and through several concurrent initiatives. Each initiative was directed toward a progressive shift in the learning and teaching contexts. These occurrences would lay the groundwork for FSU; being able to create and sustain cyberspace initiatives that would maximize technology and enhance learning. FSU, by its mission and history, is a teaching institution. Thus, effective teaching and instructional innovation are expected of faculty. With that said, the following have evolved at FSU with regard to WebCT and the Learning Technologies Center.

Learning Technology Center. The Learning Technologies Center (LTC) committed to advancing the use of new media and digital technologies in the educational programs at Fairmont State by: providing a broad range of access to new multimedia technologies; conducting workshops and demonstrations on new multimedia technologies and WebCT; writing online documentation; and providing individual consultations.

WebCT. FSU navigated through several versions of WebCT and currently has adopted WebCT Vista, a fully integrated, course delivery system available to all instructors for online course development and/or online course enhancement.

Online Course Development (OCD). The LTC established an Online Course Development Program (OCD) intended to facilitate the development of new, or conversion of traditional, baccalaureate or community-college credit classes to be taught entirely online using WebCT Vista. The LTC funds a preset number of projects each semester at levels between $1,000 and $4,000 each, depending on the scope of the project and the number of credit hours involved. Table 1 summarizes the number of faculty, including adjuncts, trained between 2001-2004. Table 3 summarizes the number of online courses developed between 2001-2004.

Faculty Mentoring. The LTC began a Faculty Mentoring Program. The LTC has faculty mentors on campus to help with questions that their colleagues might have in developing an online course. The mentors come from a variety of academic disciplines.

WebCT Vista Academies and Bootcamps. The LTC implemented WebCT Vista Academies and Boot Camps. This encouraged "late adopters" to think about online course delivery. The first approximation for these faculty was to receive training and experience in simply creating an online presence -- perhaps to make syllabi accessible for face-to-face classes via the syllabus tool. Additionally, utilizing the grade book tool component was added which provided students access to important and timely information. Table 2 summarizes the number of courses implementing the syllabus tool and the grade book tool between 2001-2004. The academies consist of four days of extensive hands-on training on WebCT Vista, online pedagogy, and best practices for online education. Training classes are on the first Saturday of the month, with the final class on the last Saturday in November or April (depending on the semester). The Boot Camps are very similar, except they consist of four consecutive days during certain weeks in the summer.

Student Support. The LTC provides student support for WebCT Vista in the form of online tutorials, a website dedicated to WebCT/Vista FAQ's, and a Help Desk. The LTC and the library also collaborate to provide student support via email and telephone communication. Table 4 summarizes the number of students enrolled in hybrid and online courses between 2001-2004.

Impact of Cyberspace Initiatives.

The following graphs represent trend data gathered from the academic years 2001-2004. Data from 2005 and 2006 are not currently available. These data should give the reader an idea about the impact of the cyberspace initiatives implemented by the Fairmont State Learning Technologies Center.

Table 1. Percent of Faculty Trained on Learning Technologies between 2001-2204

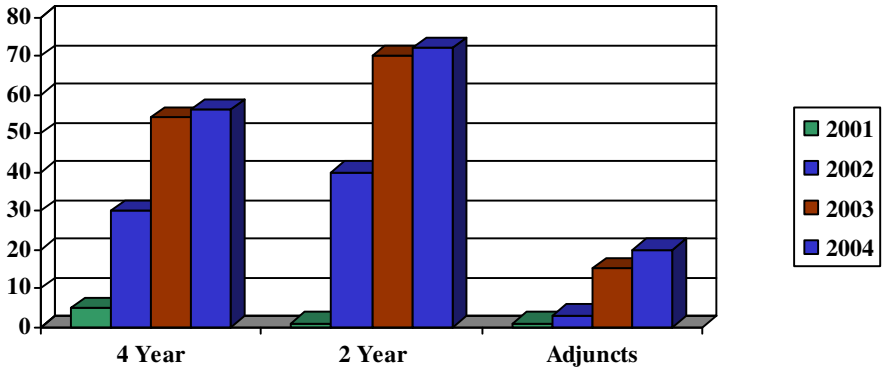


Table 2. Number of Courses Implementing the Syllabus Tool and Grade Book Tool between 2001-2004

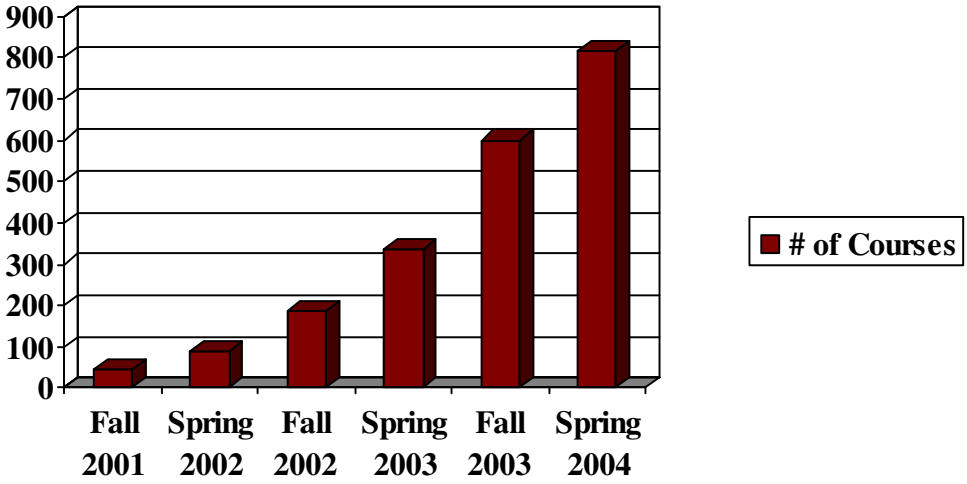


Table 3. Number of Online Courses Developed between 2001-2004

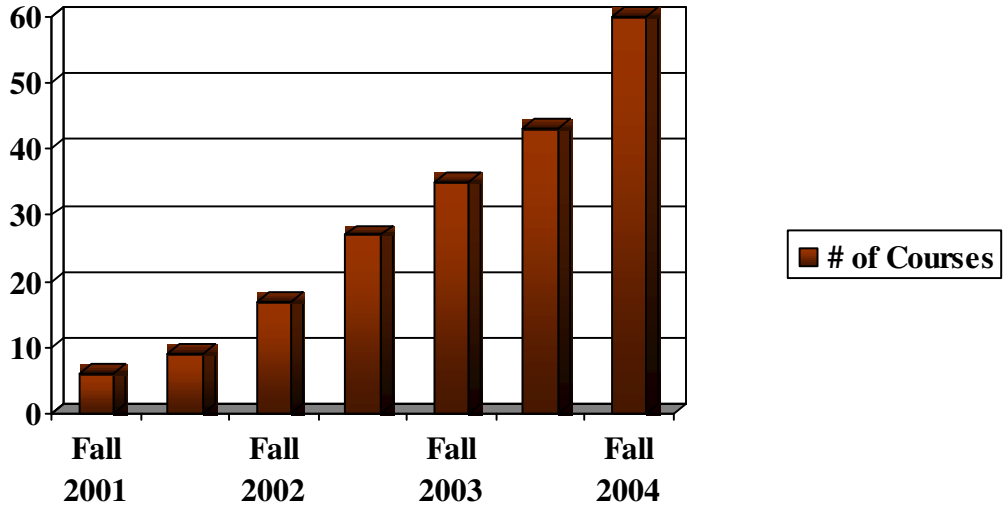
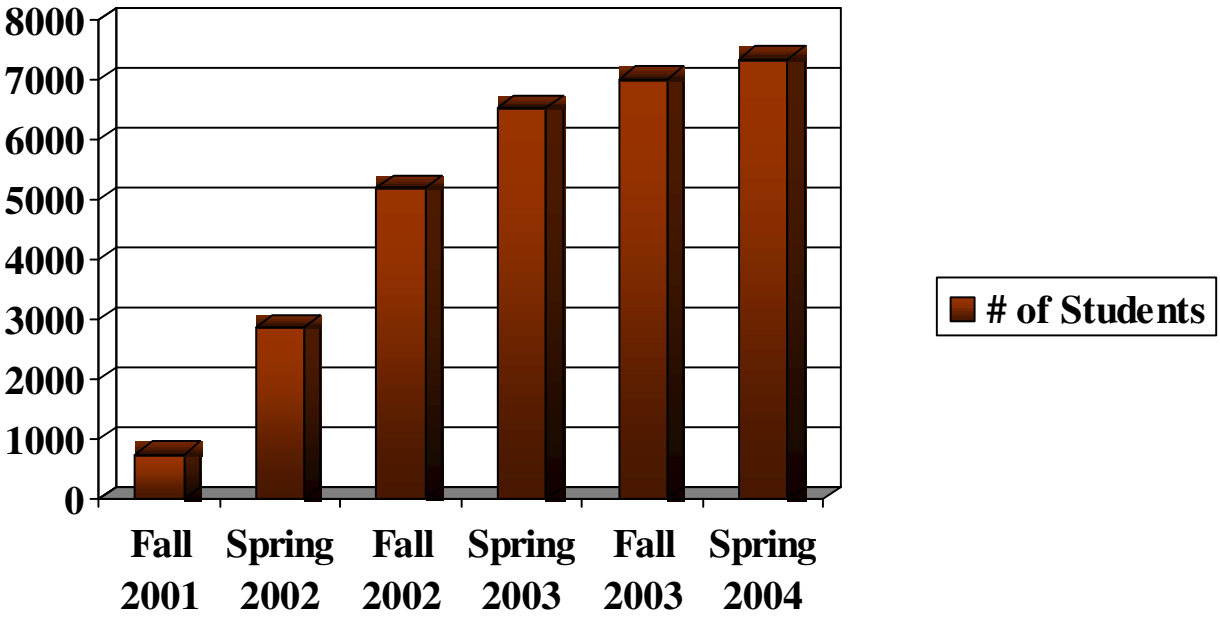


Table 4. Number of Students Enrolled in Hybrid and Online Courses between 2001-2004



School of Education Initiatives

Online Presence. In addition to the general overall initiatives of the Fairmont State Learning Technologies Center, the authors want to explain courses, programs, and "spin-off" projects specific to WebCT Vista and the Fairmont State School of Education (SOE). Every course in the

SOE has a hybrid online presence; many education courses are offered wholly online; and every graduate course is offered online. Assignments, quizzes, reflective journals, and clinical projects typical of a traditional face-to-face course are also apparent in the online courses. Examples of courses include: Introduction to Education, Human Growth and Development, and Educational Psychology as well as the comparable foundation courses in the graduate programs.

Graduate Education. As mentioned previously, Fairmont State was granted university status in 2004. Along with this graduate status, the FS SOE received the right to offer graduate programs. Offering graduate courses wholly online (especially for in-service teachers with numerous professional and personal responsibilities) has allowed the graduate programs in the SOE to increase enrollment more than any other graduate program offered on the university campus. Some graduate programs are solely offered by the SOE and other programs are collaborative efforts with another state university. Graduate programs include: Special Education, Masters of Art in Teacher Education (non-teacher education graduates with a bachelors degree in a teachable field), Online Teaching Certificate, Education Leadership, and Reading.

Virtual Relationships and Collaboration. Some very unique "spin-off" projects, developed by the SOE, include utilizing WebCT Vista for the following initiatives: multicultural student teacher exchange with various other student teachers in other higher education institutions (for example, the University of Puerto Rico); virtual collaboration among student teachers during their internship; virtual collaboration among K-12 Professional Development Schools, public school cooperating teachers, public school students, and student teachers; and study forums for teacher candidates required to pass the Praxis Exams (for example, Principles of Learning and Teaching) in order to obtain teaching licensure.

Fairmont State offers a *Future Teachers Academy* in the summer months in an effort to provide high school students with a week-long informative camp on the university campus for those who may have indicated an interest in becoming a teacher. These Future Teachers Academy participants are introduced to WebCT Vista and given a user name and password to access a forum that not only allows communication during the camp, but also allows communication once they leave and return to their homes and respective high schools. They are permitted to communicate with one another, the SOE academy director, and faculty who participated in the academy.

Overcoming Impediment Issues and Modeling Quality Online Pillars

"Concern about the availability of all types of resources is one impediment faced by faculty members considering the adoption of web-based instruction" (Passmore, 2000, p.4). "The Monroe Model," was explained in the Sloan Consortium Report. In general, this model is a team effort that effectively responds to the need for online faculty support at multiple levels. In addition, it supports the faculty in academics, training, instruction, the library, technology, and student services. By providing multi-faceted support, faculty can devote less time to administration and more time to the development and delivery of their course and interaction with learners (Lorenzo & Moore, 2002. p. 6). In briefly reviewing some of the impediments and quality pillars of the online environment presented in this paper, the authors believe that the Fairmont State Learning Technologies Center initiatives have more than adequately addressed some of the perceived impediment issues and modeled quality online pillars.

Summary

Since "non-techie" faculty members have embraced the cyberspace initiatives instituted by Fairmont State and its Learning Technologies Center, it is likely that other higher education faculty would embrace these as well. If faculty perceive that the impediments to web-based delivery have been minimized and that enabling factors have been implemented, the end result may be similar to what these authors have experienced: "Creating and sustaining cyberspace initiatives that maximize technology and subsequently improve teaching and learning."

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Outsourcing 24x7 Computer Support

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Abstract

As more and more colleges and continuing education providers are looking to delivery systems consisting of online courses and hybrid courses, the need to provide adequate student and faculty support for these systems increases. These models imply an "anytime, anywhere" delivery and an expectation that there will be someone to call or help when needed. Setting up a online or phone based support system can be expensive and beyond the technological reach of many small educational providers. But outsourcing that support with a pricing model that allows for passing the costs to the student can open the possibility for extending this service to smaller institutions. This paper examines why Marygrove College chose outsourcing this support and their experience with the process.

Introduction

"Why do we persist on running colleges and universities on an 8-5 schedule tailored to those staffing our offices and teaching our classes rather than to those using our services and taking our courses?" (Spanier 2003) It's a good question and most educational institutions have used it as a basis for wholesale change over the last few years. Most of this change has been centered in the service providers at an institution. More and more institutions are moving registration, advising, payment and financial aid services online, to allow for 24 X 7 access for their students. Who do they notify when something doesn't go as planned or a student needs help with these services at midnight on a Saturday? Telling them to wait until Monday may not meet their needs.

At the same time, how does a small institution afford to provide support or assistance to meet these changing student needs? Staffing phone lines and writing helpful software may be cost prohibitive to many institutions. The answer may be found in letting others with that expertise help out.

Why do we need 24 x 7 support?

The purpose of this paper is not to convince anyone of the need for this support, but we must understand some of the needs if we are to provide good service. You are probably involved in moving your institution forward by providing Course Management Systems, online registration or other services to your students. These systems come with an expectation of anytime/anywhere availability. This availability also implies support when they have a question or a problem.

The number of non-traditional students and non-traditional methods of delivery are increasing. Nearly half of all college students in the US today are over the age of 25 and this number will be increasing. (Aslanian 2001) Many of these adults will be working and using services provided by the commercial sector. Their expectations will be that the services will be available. The need for ongoing and continuous education and certification of skills will add to the need to provide these services in an anytime/anywhere fashion.

You cannot also just expect these students to know how to use your systems or services. Just because the traditional age students has grown up with technology does not mean they know your college's fee structure or payment options. The online service can also lead to a belief that ANYTHING can be added to the anytime/anywhere equation. You need to communicate and be firm on rules such as add/drop deadlines, payment deadlines and ramifications. Who do they see when they have questions or the litany of excuses?

Exactly who are you serving with the 24 x 7 support?

The obvious answer is that we are supporting students. This is the ultimate need, but we cannot forget that we need to support faculty as well. An EDUCAUSE 2003 survey indicated that the greatest growing need for support in e-learning is for support faculty. Instructors are increasing as likely to access their online courses during non-business hours. Who do they call when they cannot properly format or print an online discussion? On our campus, this was a big selling point for the outsourced support. We could answer some pedagogical questions as well as just handle basic support features. It also was a source of reassurance for faculty that if they needed help in the middle of the night they could get it.

You also may want to consider the type of student you are supporting. At Marygrove we have a large population of non-traditional age students. Many of our students have never used a computer or had very little experience and knowledge of basic computer functions. We also had a large population of our distance learners that were teachers. These students would often be connecting from computer in their schools. This exposed our need for support to a very a large disparity of computers and operating systems.

At Marygrove we have about 800 undergraduate students, mostly commuter students. (about 75 are in our dormitory). We have about 400 on-campus undergraduate students that are hear mainly during the evenings and on Saturday. We also had a distance-learning population of about 3,500 that worked in cohorts in schools using video tapes, workbooks and a mentor. The need for 24 x 7 support became apparent when we decided to have the distance learning group use Blackboard, email and online registration.

You could try and apply some estimating techniques to generate how many calls you would expect. You could then use some Erlang formulas or other queuing techniques to try and determine the number of staff you would need to meet the demands. The overweighing factor for us was cost. Simply put, it was going to be very difficult to staff a position to answer these calls for all of the hours needed.

At Marygrove, we were about to embark on allowing a large population of distance learning students, access to information online. Prior to this, they did not have access to their records, everything was done via snail mail or telephone. We had a large population that had a very small

window of time to call. The thought of all of these calls and questions converging on us was a little overwhelming.

How can you go about support these needs?

Let's just look at the economics of manning a phone line 24 hours a day seven days a week. Lets leave the volume of calls out of this for the time being. Just assume you have one week off for each semester and an additional week off at Christmas, you would need 48 weeks of support.

48 weeks x 7 days x 24 hours = 8064 hours.
@$10/hour that is $80,640/year
@$12 hour that is $96,768/year
@$15 hour that is $120,960/year

Now this is just for one person taking one phone call at a time. If you add in peak hours and peak times of year, you really cannot handle it with one person. In our case, our 3500 distance learners were teachers. When do teachers call for help or support? At lunchtime and right after school ends! Our phones get swamped. So you need to consider manning for peak hours as well. Support is sporadic, but it is demanding of time and concentration.

Do not be duped by the idea that a person running the support line can also do some other tasks. The very nature of that assumption is that both the student support and the other task are not valued. Using students to help man the help desk lines is an idea. But how is faculty going to feel about being helped by a student? Also be careful of the information that these supporting students would have access. Do you really want students helping other students submit assignments or check grades? This would limit their usefulness.

In addition to manpower, you also need to consider the phone equipment or computer equipment you need to handle call or computer inquires. An ACD (Automated call distribution system) is a must to handle more than one call. A website updating procedures and FAQ's are another need. Finally, a tracking system to manage the calls and get information about the calls is needed.

All of this adds up quickly. Even a bare bones configuration can quickly get into a 6 figure annual investment. Are you really prepared to take on this task yourself? This is were outsourcing or partnering needs to be factored into the equation.

What is it that you are supporting?

The process of identifying our students also helped refine what applications and systems that we would need supported. The place to begin is to look at what you are offering via the website or online. Your course management system, (in our case Blackboard), your online administrative systems, your email system, and any other commonly used campus application should be considered. Remember, its frustrating for a student to call and receive help for an issue with Blackboard but then to get no help for a problem with searching for classes. (This is very much like a waiter saying, sorry, not my table.)

It is important to remember that the vast majority of calls to a support line deal with simply accessing the online service. Statistics range from 60% to 85% of all calls being a password or log-in id related issue. (Note: Do you really want students to help other students reset their

passwords?) Our experience has been about 75% of calls are system access related. For this reason it is important to consider your process and procedures for resetting the passwords.
Besides system access issues, here is a list of other items that rose to the top of support needs at our campus.

Blackboard (or any course management system)
Email
MS Word
Powerpoint
Registration
Search for Classes
Financial Aid awarding and status
Payment processing
Tape and Book orders for our distance learners.

Note that some of these categories are quite specific to the ways that our college conducts its business. Specifics in process and procedures such as these are often the reasons that people will not consider allowing outside services to run their support. This should be the beginning point. It is important to consider when trying to establish good 24 x 7 support for students, is that the implied availability is greater than the capacity of many schools to provide.

Economies of Scale

For Marygrove College, the realities of a 24 x 7 support line in assumptions made about what to support. We made the assumption that students would want assistance via phone and online at all times. We also knew that there were many policies and practices that were unique to our institutions method of doing business. Despite the complexities, the economics of trying to build a support center did not make sense.

Initially, while trying to find a vendor to assist us, the idea was just to contract out staff to answer the call. There were very few contractors, ready to staff a call center for technical assistance and they had the same cost limitations that you would have if you did the staffing yourself. A new pricing model was needed, one where "sharing" of staffing resources and overhead were used.

Call Center Model

What was needed was a model that would allow for the cost of the support to be spread over several customers. This model would have pricing based on the number of students or calls taken, rather than on a flat cost. We began to look beyond contract help to actual call center vendors. At the time we were investigating this, there were not a lot of vendors that specialized in higher education support. Course Management System support was only available through the vendor. We worked directly with our vendor, Blackboard, and a newly formed offshoot company called Presidium Learning.

Now days there are several call center vendors that provide course management support. The pricing model is readily adaptable to higher education. It consists of a flat "set-up" fee and then a dollar amount per user. So an example would be a $5,000 setup fee and then $20/user for 3500 users. The nice thing about this model is that most of the cost can be passed to the student in the

form of a course fee or technology fee. In the case of Marygrove, we had not charged a tech fee to our distant learning population in the past so it was appropriate that when we offered these new services, that we added a fee.

The flat set-up fee provides many things. One is toll-free telephone number for your students to call. Another is a website. The final decision point for us came down to faculty support. AS we mentioned, faculty will also be users of this system. WE decided that since Faculty would want support on how to use Blackboard better, that we chose someone with an expertise in Blackboard and then train them on the other applications. With buy in from the faculty, it would be easier to get students to use the system.

Getting the specialized support for your institution.

As previously stated, it did not make sense to get support for Blackboard, but not get support for any of the other on-line services. So we needed to find a vendor willing to work to support our on-line email and other applications. We started our contract with the vendor in July with the intent to start on-line support when classes resumed. We began with FAQ type situations. (See Exhibit 1) But some of the most effective training was actually allowing the vendor's staff to test processes.

A byproduct of training the outside vendor is better consistency and communication of your own internal processes. When you try to teach someone else a process you have learned, you learn the process even better. For example, our case of a student's classes not showing up in Blackboard helped us communicate better. Early in the term it is because the instructor may not have activated their course, or it could have been an issue with registration. We documented ways to handle these instances and verify which was the correct situation. Later in the term we got a rush of calls on why they were not registered. Well, it was because we had un-enrolled students that had not made payment arrangements. We had to add this to our processes.

Communication, Communication, Communication

Any good relationship needs ongoing communication. It is no different with a outsourced support model. We constantly keep our vendor informed of changes to our campus online services. We keep them aware of maintenance schedules and campus events and holidays that may impact the need for support. They also contact us with issues and problems. Early in the term we had difficulty keeping up with the number of connections for the password reset service on the VPN. We had to expand that to allow the vendor to provide good service.

We have monthly meetings where we review the call statistics and look for any trends and handle the periodic "troublesome" call. These meetings allow for good exchanges and build rapport and confidence in each other. We hope to have annual or bi-annual campus visits where we can meet some of the actual support staff and show them our facilities.

Summary

Support of on-line services for an institution comes with an expectation of 24 x 7 availability. Users need on-line and live access to people who can help with their issues. The costs of this support can be prohibitive to small institutions. Outsourcing this support can provide a pricing

model that can be affordable and passed along to the students. When providing outsourcing, it is beneficial to have a well documented and understood set of internal processes. The communication necessary to achieve these well documented processes is very beneficial to all parties.

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Aslanian, C.B., "Adult students today", The College Board: New York, 2001)

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Exhibit 1

ID	Title	Author	Create Date	Published	Folder	Answer
6858	How do I enroll into a Course?	Lucrisha Banford	7/25/2004	Yes	Blackboard Students	ANSWER: Students can either enroll online using WebAdvisor (webadvisor.marygrove.edu) or visit the Enrollment Center located on campus in the Liberal Arts Building.
6986	How do I have prior courses removed from my new course list?	Lucrisha Banford	7/25/2004	Yes	Blackboard Students	This option is not available to students
7466	My course is not showing up when I login.	Lucrisha Banford	7/25/2004	Yes	Blackboard Students	ANSWER:If you are not able to see your course link once you login to Blackboard, this may be due to the course being unavailable. Please check the start date of your course, and keep in mind the course may not be available until that actual date. Your instructor may also choose not to make the course available, please contact your instructor for further information.
7818	Which one of my email addresses is listed in Blackboard?	Lucrisha Banford	7/25/2004	Yes	Blackboard Students	ANSWER: Your mayrgrove email will be used with Blackboard.
8719	How do I delete a Student from my Coursesite?	Lucrisha Banford	7/25/2004	Yes	Blackboard Faculty	ANSWER: All accounts and courses will be loaded from scripts from the Datatel ERP systems to Blackboard, Active Directory. Web Registration etc. Bb Snapshot tool will be run each evening at ~ midnight. During peak registration times the snapshot application will run more frequently (twice a day). Specific times will be determined.
9029	How do I remove or "unenroll" a user (i.e. Student) from a course?	Lucrisha Banford	7/25/2004	Yes	Blackboard Faculty	ANSWER: All accounts and courses will be loaded from scripts from the Datatel ERP systems to Blackboard, Active Directory. Web Registration etc. Bb Snapshot tool will be run each evening at ~ midnight. During peak registration times the snapshot application will run more frequently (twice a day). Specific times will be determined.

The Impact of Web Technology on Nurse Education: A Case Study

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Abstract.

In 2002, IPFW adopted a web application to enhance the recording and reporting of clinical education experiences of nursing students. This web application, known as the Essential Clinical Behaviors (ECB) system, is an on-going, joint effort between the Computer Science and Nursing Departments. It replaced a tedious and error-prone method, based on printed forms and informal reports, for tracking the practice of nursing skills. Since Fall 2005, the ECB has been a mandated part of every clinical nursing course. The goals of the ECB are three-fold: (1) To foster more self-directed learning; (2) To enable clinical instructors to increase the diversity of clinical experiences for their students; and (3) To facilitate the collection and analysis of data for accreditation reviews. In this paper we discuss the progress made in—and some surprising obstacles to--achieving these goals. We also discuss the evolution of the ECB in the last four years to increase its usability, and the impact it has made on the nurse education process itself.

Introduction.

A primary focus in nursing education is to provide the student with a diverse range of clinical experiences. Historically, the collection and assessment of data from the student's clinical experiences has been a paper-and-pencil task that was arduous for both the student and nursing faculty. The volume of collected information made it difficult to produce statistical reports without additional intensive manual labor. But without such reports, it was impossible to accurately assess the frequency and diversity of student clinical experiences. Automation of the storage and reporting of clinical data became a necessity.

Additional impetus for introducing computer technology into the nursing curriculum is the recognition that the technology revolution, with computers at its center, has had a significant impact on health care education, research, and service. The profession of nursing has not been immune to the accelerated changes occurring with this technology. Computers have influenced the profession of nursing by becoming essential tools in hospitals, community health settings, educational institutions, research centers, and all other areas where nurses practice. From computer-generated lab results to computer-controlled monitors and delivery systems to computer-managed patient charting, 21st century nurses are confronted with sophisticated technology in the daily care of patients. It is imperative that nursing students are prepared to enter this technology-rich environment.

Research in nurse education has found that first year bachelor degree nursing students were not as computer literate as they needed to be to succeed in the academic environment. Without additional training in computer technology, this may translate into nurses being less capable in the workplace. The intentional integration of computer technology, especially in the clinical environment, is now identified as essential to nurse education.

In 1999 the Computer Science and Nursing Departments at IPFW began a joint project to develop a web application, named the Essential Clinical Behaviors (ECB) system, to enhance the recording and reporting of clinical education experiences of nursing students. The ECB was aimed at meeting three pedagogic goals: (1) To foster more self-directed learning; (2) To enable clinical instructors to increase the diversity of clinical experiences for their students; and (3) To facilitate the collection and analysis of data for accreditation reviews. In addition, the ECB would provide extensive experience with computer technology similar to that utilized in modern clinical settings. After several prototypes were developed, the ECB was formally released in 2002, and is now utilized in all clinical nursing courses.

The introduction of this technology represented a major change in IPFW's clinical education process by altering how students record clinical experiences in a nursing course. To meet the pedagogic goals it was imperative that both students and faculty accepted the technology and integrated it into their current clinical education process. *Over the past three years progress toward these goals has been steady, but slower than we anticipated.* To gain insights into the reasons for this, we carried out a usability evaluation of the ECB. In the following sections we discuss what we found out and how we are using the results to ensure further progress in meeting our goals.

The Clinical Experience Process.

A touchstone of the IPFW nursing program is the integration of formal education with experiential learning. Students complete weekly clinical activities at local health care organizations such as the Parkview Medical Center. They receive hands-on experience in nursing skills while working with patients under the guidance of clinical instructors. The clinical experience process has been standardized across the curriculum. From the student's perspective, each experience consists of four broad activities.

1. Preclinical Preparation. A student receives a clinical assignment from the instructor. This may be done anytime from one day to one hour before the clinical. The instructor supplies information such as the patient’s medical diagnosis, age, lab results, and medications. Using this information the student fills out a nursing care plan and clinical preparation form. These forms document the expected problems the patient may be experiencing and the anticipated nursing care need to address those problem. Just prior to the scheduled start of the clinical experience, the instructor reports on the patient's current status. The student uses this report to make any changes to the nursing care plan.

2. Initial Assessment. The student performs a head to toe assessment of the patient. After leaving the patient’s room, the student examines the patient’s chart to check medications, orders regarding specific treatments, new lab results, and incorporates this information into the plan of care.

3. Nursing Care. After the initial assessment is completed, the student administers nursing care guided by the nursing care plan. This may involve many different skills (e.g., taking vital signs, changing wound dressings, or administering oral medications) performed once or multiple times over the remaining duration of the clinical experience.

4. Clinical Experience Report. At the end of the clinical experience the student updates the patient's chart and reports to the staff nurse. The clinical instructor meets with the student to discuss any observations made concerning patient care. The student then completes a report that assembles information from the clinical prep sheet, nursing care plan, patient chart and other notes taken during the clinical experience.

The ECB supports the collection of patient demographic information, medical and nursing diagnoses, and nursing skills practiced during each clinical experience. This information is gathered from the clinical prep sheet, nursing care plan, patient chart and student notes. Once recorded, a variety of reports may be generated containing individual and aggregate data across clinicals, patients, courses, and students.

Student Profile and ECB Satisfaction Survey.

We conducted a survey of student users of the ECB. The survey was administered to students in all clinical courses that utilize the ECB. The first part of the survey assessed computer technology experience and attitude in a variety of ways. Though there was a wide age range, 18-45, there was no significant difference in responses due to age. Over 80% of respondents said that they had a moderate or high level of experience with computers. 88% and 75% indicated that they were very comfortable using word processors and search engines respectively. Students also indicated a positive attitude toward working with computers: 65% said they enjoyed while only 5% said they disliked working with computers, and 79% felt that computers made their education easier. About 2/3 had computers at home with an internet connection.

The overall picture that emerged was that a typical nursing student was comfortable with computers, used them in a variety of ways, and believed that computers made their lives easier.

The second part of the survey addressed satisfaction with the ECB system itself. The results were in stark contrast to those associated with computer technology in general. Since all students were required to use the ECB, it was not surprising that over 75% of them accessed it at least once a week. This corresponded with their weekly clinical experiences. Even though only 23% felt it was difficult to use the ECB, more than half expressed a dislike for it. When asked what they liked least about the ECB, the most frequent response (28%) was that it took too much time. When asked what they liked most about the ECB, more than half of those surveyed said "Nothing" or gave no response. Only 22% pointed out that recording of information was valuable to them.

Discussion.

These results were clearly disconcerting and revealed a serious disconnect between the promise of the ECB and the reality. So, what when wrong, and how could it be fixed? To gain more detailed information, several students were invited in for in-depth interviews about their ECB ex-

periences. Their responses exposed a fundamental problem: The need to better align the ECB with the clinical experience process.

The focus of the ECB is data recording and reporting. As expressed in the original requirements documents, the need was to identify the breadth and depth of clinical experiences: what students were treating what kinds of patients, what nursing skills were they practicing, and where and how often were they practicing them. Little attention was given to the context in which these data arose. The resulting application well-addressed these requirements. The data are solicited from the user in a rational, progressive manner, proceeding from patient demographics to diagnoses to nursing care. Furthermore, great care was taken to incorporate two user-interface design principles: Ease-of-use and ease-of-learning. These principles were embodied by uncluttered screen layout, point and click data entry, familiar vocabulary and phrasing, step-by-step task sequencing, and context-sensitive help.

The main fault of the ECB was that the underlying process model did not mesh with the actual clinical experience process. In the latter, the data required by the ECB is dispersed among the four steps of the clinical experience process and among the various associated forms. Students were still required to complete these forms to satisfy clinical requirements and also had to enter their data into the ECB. Furthermore, the forms were strictly paper-based; there was no capability for transferring information from them to the ECB. The ECB also was limited in enabling the student to complete the required clinical report since both the needed data and specified format were not part of the ECB's reporting facilities. These deficits resulted in redundant, time-consuming transcription, leading to the disenchantment expressed in the student survey.

The ECB is a web application, making it widely accessible. The usability survey indicated that almost 2/3 of the students used the ECB at home. While working at home is generally considered a plus, it was not so viewed by these students. Again, the problem was the need to first record the necessary information at the clinical site.

Evolution.

The ECB provided a powerful tool built on the latest web technology, but it was not a usable tool. Changes had to be made. The first of those changes was implemented this semester. The ECB user-interface was ported to a Blackberry. This allows nursing students to record ECB data at the point-of-care rather than at home or in the computer lab. While not eliminating redundant data entry, it does reduce some of the additional note taking and entry time. A more ambitious effort is an overhaul of the ECB design to reflect the clinical experience process. This will lead to an elimination of the current paper forms and a more effective, efficient and satisfying experience for the user.

$$ - Finding It, Using It and Reaping the Benefits

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Abstract

As state budgets are reduced, colleges and universities will need to seek additional sources of funding. At the same time, grant providers are looking for collaborative efforts between different types of educational institutions. In 2004, Asheville-Buncombe Technical Community College received a grant that was in partnership with the University of North Carolina-Asheville and the University of North Carolina-Charlotte. The total grant funding was $600,000 over two years.

This session will focus on the challenges and rewards of collaboration with universities on grants, including issues such as effective communication, shared resources, and collaborative research.

Also the presenters will share the outcomes of the grant including an articulation agreement, work force development, and shared resources such as courses and workshops.

Note: The authors have not prepared a paper for this session. However, copies of the presentation will be available in print, on CD, or in response to an e-mail request.

Technology and General Education: Collaboration for Curriculum Building and Student Learning

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Abstract

As part of a complete revision of its general education curriculum, the University of Saint Francis has developed a partnership among faculty, Education Technology Center staff, and an outside constituent to ensure that our students become MOS certified in Word, Excel and PowerPoint. Furthermore, because the certification will seamlessly align with the general education curriculum, the university will be able to assess students' ability to meet the outcomes of our curriculum by utilizing a nationally accepted technology test. This presentation will describe the process that faculty and technology specialists engaged to develop this component of the general education curriculum. Presenters will illustrate a model for collaborative technology curriculum building and participants will be able to contextualize this process for their institutions through the interactive presentation.

Note: The author has included his powerpoint slides in lieu of a paper.

Catalyst for Change in "Technology" Requirement

- University began discussions of revising general education curriculum in 2000. The curriculum had not been revised since the late 1970's.
- University decided to move from a cafeteria based system, where specific course corresponded to a specific GE requirement, to an outcomes based system.
- In Fall 2002, began to devise overall outcomes based around question "What academic experiences do we want an USF student to leave with"

Role of Technology in General Education Curriculum

- Previous General Education Curriculum asked students to "demonstrate computer competency" through passing a course or a "test out" option administered by the Business Department
- Test and class did not share same outcomes (i.e. the placement test was not the final in course).

General Education Committee and Technology

- Committee believed technology had to be integrated across curriculum, but with a base line entry point.
- Committee also believed that different programs require different technology needs.
- After several all-day committee retreats and several all faculty meetings, the following outcome statement were approved by the faculty in Spring 2004.

Faculty Driven Curriculum Changes

- **Demonstrate competence in applying current and emerging technologies.** (0 cr)
  - **~ Illustrate proficiency in a variety of computer-based communication and presentation applications.**
    - By placement
    - Mandatory reinforcement in major
  - **~ Research, evaluate, and apply information using technology.**
    - English common content course
    - Mandatory reinforcement – writing intensive distribution course
    - Mandatory reinforcement in major
  - **~ Integrate changes in technology within their discipline.**
    - Mandatory reinforcement in major

Highlights of this statement

- 0 credit hours designated---overall package was streamlined from 53-54 to 46-48.
- Does this mean a loss of importance for technology?---Emphatic NO from faculty!
- Mandatory Reinforcement in Major---Committee/Faculty wanted to integrate technology within major.
- However, committee faced with curricular logistics about how to achieve our outcome.

Bring in the Calvary

- Turned to our Instructional Designer (and overall technology guru), Tina Strobel.
- Series of meetings begin in Fall 2005 to work out how to achieve outcomes---focus on collaboration and collegiality
- Tina asked the faculty questions

Expectations

Q. How technology literate do we want USF graduates to be?

- Exposed and familiar with technology for major & critically literate in use of technology.
- Meet Microsoft's core competencies.
- Meet Microsoft's expert competencies and "excel" above other institutions' graduates.

A. Diversity says we want a combination of the three.

Software Importance

- Most courses require some type of assignment that utilizes **Word** processing skills.
- Many courses require **PowerPoint** presentations.
- Few courses require an assignment be completed in **Excel** (a table from Word may be adequate). But spreadsheet concepts can be important for many jobs.
- **Internet research** and **file management** are equally important for successful completion of course work.
- Ability to critically analyze use of technology in all majors fundamentally important to faculty

Goal

In the end, USF's technology goal is to educate each student in technology in order to help him or her be a critically literate student and citizen.

So the question remains, *how* do we educate and assess the technology skills of our students?

Who are our students?

- Beginners-typically non-traditional students who have had very little exposure to *working* on a computer.
- Intermediate-students who can surf the web and check email but haven't used the *features* of a computer.
- Techno Savvy-students who use a computer to *complete* work on a daily basis and are very comfortable with various software's.
- Students with Disabilities.

Break apart CIS 190

CIS 190 currently includes Word, Excel, PowerPoint and basic computer concepts.

- Proposing to break apart the class as follows:
  - Word Core
  - Word Expert
  - Excel Core
  - Excel Expert
  - PowerPoint
- Each counting as 1 credit hour and preparing the student for MOS (Microsoft Office Specialists) Certification-either Core or Expert.
- Depending on the option chosen by faculty, Certification may not be required, but would be available to the student should they choose to take the test.

Course Schema

In-house placement test for all students

CIS 100 for beginners

Series of one hour course to obtain MOS certification

Programs decide which certification needed

Beginning Computer Student

- Offer an *Beginning Computers* (CIS 100) course.
- The course would be *Free* (funded through technology fee) and offered through the ETC, but put into the schedule for student registration.
- 5 week course
- Meet 2x per week for 75 min. each meeting.

Techno Savvy Student

Take the Word, Excel and PowerPoint MOS (Microsoft Office Specialist) exam at a cost of $65 each. (possibly lower depending on quantity of students expected to take it)

Student then have the MOS certifications to add to their resume.

Upon Certification Student will receive 1 cr. hr. for each certification.

If the test isn't passed, the student can take the three Modules of Word, Excel and PowerPoint to better prepare for the next test.

MOS – Skill Standards

Why Certify?
According to Certiport:
For employment seekers, Microsoft Office Specialist certification:
Differentiates and helps job candidates get hired. Research shows not only do Microsoft Office Specialists find work faster, they also earn up to 12% more than individuals who are not certified
Provides a firm measure that validates Microsoft Office training
Gives credibility and substance to work skills.

Microsoft Office Specialist certifications have been recommended by the American Council on Education (ACE) for college credit. Candidates who achieve certification can apply for college credit through participating ACE member institutions.

Where are we and How is it going?

- New General Education Curriculum will roll out in Fall 2007.
- Finalize plans and budget for development of in-house placement in late April of 2006.
- Tina Strobel's movement to a different institution, as with every other small school, is a concern in loss of knowledge and leadership.

Discussion Points and Questions

Lessons Learned

- Why Change General Education Curriculum?---curriculum must be continually updated
- How to Change?---Collaboration & Communication with all parties a key.
- Pace of Change?---Be ready for the long haul!

Enhancing the Learning Experience with Administrative Technology

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Abstract

Providing self-service environments, preserving technology investments and enhancing the campus experience are top issues for institutions. Most institutions are facing the challenge of providing more and better access and are seeking technology solutions to help achieve these goals. Lubbock Christian University recently embarked on an administrative system and portal implementation project to maximize technology to enhance learning at its institution. Lubbock implemented an administrative suite to create a unified digital campus to streamline administrative processes, enhance information access and improve the campus experience. With SCT PowerCAMPUS, students now have access to real-time, accurate, administrative and academic information necessary to make informed decisions. This session will offer best practice guidelines and strategies for:
- Planning a successful unified digital campus implementation
- Maximizing technology investments
- Increasing service levels with anytime/anywhere access to academic information
- Enhancing the overall campus experience for learners

Note: This paper was not received by the time the proceedings went to print. The author will provide written materials at the session or on the web.

A General Purpose Messaging System Used to Coordinate Class and Advising in a College of Business

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Abstract

In recent years, the use of email messaging as a means of reliable workgroup communication has become more and more problematic. In part, this is due to SPAM, phishing, software security updates, etc. This paper (and talk) will discuss (and present) the design, implementation, and use of a web-based messaging system as part of a larger portal system that is used to coordinate class, advising, and faculty messaging activities in a College of Business. The group/member management is XML-based for flexibility and portability. The actual messages are contained in two SQL tables. The messaging system is contained in two main ASP (or PHP) pages (summary and detail view) and several smaller pages (e.g., for file download, viewing as web page, etc.).

Introduction

This paper will discuss some of the design considerations and implementation details of a web-based messaging system that is in the process of being used for class and advising purposes in a college of business.

History

Email goes back to 1971. The author started using email in graduate school at Penn State in 1984. Since the proliferation of the Internet in the 1990's, many people today use email. Email can be used to communicate and share information using what is called a message passing system. The web supports sharing using what is called a shared memory system. Both message passing and shared memory can be intermixed and any one can emulate the other.

The author began accepting student submissions electronically via a submission system on a CMS/VM IBM mainframe using a the author's class management system called Classy starting in 1985 [1], based on a simpler command line system that the author began using in 1984. This worked well at the time. In the 1990's, the author began porting the needed functionality of Classy to the DOS operating system. In the late 1990's, the author moved the system to the Windows platform and began adding the submission functionality that had been missing since the mainframe days. Gradually, more and more of the system has become web-based.

Novell GroupWise did not support email automation very well, but, in 1998, the author began using Microsoft Outlook, which could be automated via the MAPI (Messaging API) interface using VBA (Visual Basic for Applications). Later, using the COM (Component Object Model)

technology, Borland Delphi (i.e., essentially an greatly improved Turbo Pascal for Windows) was used to integrate the class management with email management.

Over the years, as the Internet popularity grew, so did email viruses, Trojan Horses, etc. When Microsoft added security features to an upgrade, it no longer became possible to send outgoing email without either a long delay or a user confirmation for each email. The author switched to using SMTP (Simple Mail Transfer Protocol) to send outgoing email. Then, some Internet Service Providers began introducing delays on outgoing mail. Running VBA macros became more difficult due to security features in Microsoft Office products. And, viruses could always cause problems. In addition, it became hard to make sure that students had and used their email accounts. Some free accounts filtered email, or prohibited certain file attachments. As did some institutional and/or company firewalls. In short, email had become an impediment to inter-organizational communication. The author gradually moved most email functions of the class management software to the web server. This actually worked much better, but some messaging service was still needed.

Workgroup software such as Lotus Notes supports such messaging, but is costly and must be used by the entire organization. The author tried Lotus Notes in 1997 and 1998, but it did not work well without institutional support. Microsoft Exchange and Outlook allow such messaging, but has some of the problems previously mentioned. And, it typically requires institutional support to use Microsoft Exchange.

At the end of 2005, the author decided to add a web-based messaging system to the author's existing web content management system. Such a messaging system has the potential to provide useful, timely, and accurate messaging within the COBA (College of Business). The rest of this paper describes the group and member system, the authentication system, the actual messaging system, and the classroom and advising uses of the messaging system. A brief overview is provided of the rules-based system for prerequisite checks and student advising checks that can be delivered to students and faculty using this system. As such, the messaging system is part of what would be called a portal, but, in this case, localized to the COBA.

Underlying data

The underlying data consists of the following.

- A table of faculty members, including advisor roles.
- A table of students taking COBA classes.
- A table of current classes, teachers, and students.
- A rule/table of advisors for students.

The users are faculty and students. Note that the faculty table actually includes staff support people. The faculty and students are subclasses of larger class of people (i.e., in database terms, an IS-A relationship), but for discussion purposes two separate tables will be used.

XML (Extensible Markup Language) provides a nice way to create and manage much of the user information. XML is quick, easy to work with, and does not require the complexity, overload, licensing, etc., that is needed for a production database. In this case, an off-line database is used to manage the members and groups and the XML is generated when necessary. This is possible

because class rosters and student advisors do not change very often. Automated updates during busy times of the semester are done once or twice daily. Other times updates may be done once or twice a week. Students not taking COBA classes are marked as archived. Students taking a COBA class for the first time are assigned a unique userid and SID (Student Identification Number). For compatibility with the institutional student information system, the SSN (Social Security Number) is maintained locally to match related student information when downloaded but, for security reasons, no SSN is stored on the web server. A SID permits the login name to be changed with propagating changes throughout the distributed database (i.e., local and remote database tables and generated XML).

In the case of the messaging system, two database tables are needed to manage the messages. SQL Server is used as the database. The two tables will be discussed in more detail under the messaging system.

Group and member system

The foundation of any messaging system is the group and member system [3]. A simple approach consists of members with user-created group support. In this case, it is expedient to automatically create some groups from a knowledge of the organization. The class rosters with students and teachers provides one source of groups and members. The advisor assignment rule provides another source of groups and members. Here is an XML fragment for a teacher/advisor.

```
<?xml version="1.0" standalone="yes"?>
<rmsMember
   role="faculty" sid="99974" code="omitted"
   year="faculty" college="COBA" major="MGNT"
   login="smithj" name="Smith, John">
<group groupId="smithj"
 groupName="Smith, John (you)"
 ownerId="smithj"  ownerName="Smith, John"
 type="you" role="you" />
<group groupId="crn-21018"
 groupName="MGNT 3185 MW 2:30 (teacher)"
 ownerId="smithj" ownerName="Smith, John"
 type="class" role="teacher" />
<!--- and so on ... -->
<group groupId="classes-smithj"
 groupName="Students of Smith, John (teacher)"
 ownerId="smithj" ownerName="Smith, John"
 type="students" role="teacher" />
<group groupId="advise-smithj"
 groupName="Advisees of Smith, John (advisor)"
 ownerId="smithj" ownerName="Smith, John"
 type="advise" role="advisor" />
<!--- and so on ... -->
</rmsMember>
```

The XML fragment for a student has a similar structure.

Authentication system

In order to provide security and privacy, a secure login system, here using https, is needed so that the system knows who is accessing the server from the client side [8]. The initial approach is as follows.

- Every user is assigned a login name and hard-to-guess randomly generated password.
- The login names and passwords are distributed.
- Once the user logs in, the user can go to "**Preferences**" and set an easy-to-remember password.

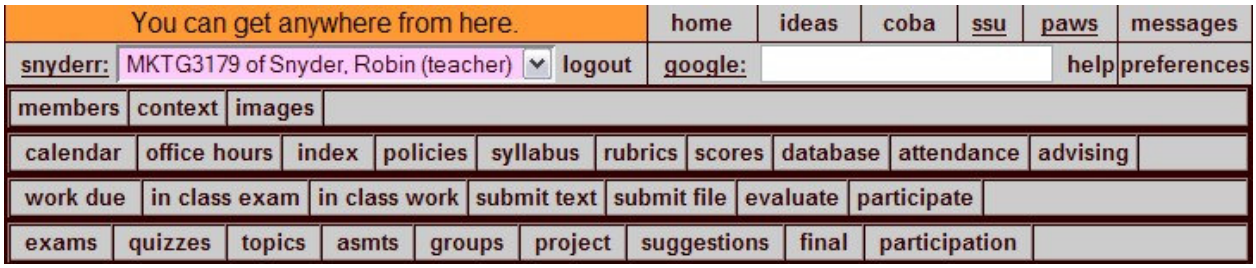
An XML file, whose filename is the login name, stores the mapping to the SID. A missing XML file means that the login name is not valid. An XML file whose filename is the SID stores the user information including password, and group membership. An XML file whose filename is the SID (in another directory) stores the user's preferences, including easy-to-remember password, preferred email address, color scheme, etc.

At the same time as the author's system was implemented, based on the existing login system used by the author, the COBA IT support staff created user login accounts based on LDAP (Lightweight Directory Access Protocol). After creating a mapping between the two user account systems, an extension to the author's system allows the user to use their COBA account to access the author's web-based messaging system, and associated portal features.

For simplicity there is one ASP (Active Server Pages) page that manages the login. For LDAP support, there is an additional page in a directory that requires Windows authentication which, if successful, sets the `LOGIN_USER` server variable which is then mapped to the author's userid.

The delay caused by the two separate login systems caused the messaging system to be used for class and advising purposes primarily by the author's 75 students in the Spring of 2006. All the groups and members and user accounts and passwords were there, but there was no easy way to distribute the login information to the students. Unifying the two authentication systems should ease the transition such that the system should be available to all students soon.

After login, the user is presented with many relevant options at the top of the screen-friendly, as opposed to printer-friendly, page. This appears as follows for students using the author's system.



Once logged in, the user can specify, using a pull-down list, the group to which they wish to be associated with for a given action. Here is a typical group list, with numbers added for reference purposes.

```
0. pick a group
1. Smith, John (you)
2. MGNT 3185 MW 2:30 (teacher)
3. MGNT 3185 MW 6:00 (teacher)
4. MGNT 4200 MW 1:00 (teacher)
5. MGNT 4200 MW 6:00 (teacher)
6. MGNT 3185 MW of Smith, John (teacher)
7. MGNT 4200 MW of Smith, John (teacher)
8. Students of Smith, John (teacher)
9. Advisees of Smith, John (advisor)
10. MGNT major (faculty)
11. COBA faculty (facuty)
```

In this example, option 1 is the default group. Options 2, 3, 4, and 5 are individual classes. Options 6 and 7 include all students of this teacher taking a given course. Option 8 include all students taking a class of this teacher this semester. Option 9 is for advisees of this advisor. Option 10 includes all students whose major is the major for which this advisor advises (usually their primary teaching area). Option 11 is for faculty.

The web system displays different information depending on that group specification. Class groups allow access to student rosters for that class, student images (if available), add/drop snapshot histories, prerequisite violations for that class, etc. Advising groups allow access to student advisees, student advising information, etc., for that advising group.

All of these groups and members are automatically generated from class rosters, rules, etc. Future group support will be added as necessary.

Messaging system

The messaging system is fairly simple and consists of two related tables (messages and targets) and code to manage the tables. The complexity in real-world messaging systems arises in making the system efficient for large numbers of users and a large volume of messages. In the case of this web-based messaging system, there are a limited amount of users and the intended use of the system is for safe and efficient internal messaging of information relevant to faculty, staff, and students of COBA.

Here is relevant structure of the `Messages` table.

```
CREATE TABLE [dbo].[Messages] (
   [MessageId]      [int] IDENTITY (1, 1) NOT NULL ,
   [ParentId]       [int] DEFAULT 0   NOT NULL ,
   [SenderId]       [int] DEFAULT 0   NOT NULL ,
   [MessageType]    [int] DEFAULT 0   NOT NULL ,
   [Status]         [int] DEFAULT 0   NOT NULL ,
   [Recalled]       [int] DEFAULT 0   NOT NULL ,
   [OneToOne]       [int] DEFAULT 0   NOT NULL ,
   [SenderName]     [varchar] (80) DEFAULT '' NOT NULL ,
   [SenderIP]       [varchar] (15) DEFAULT '' NOT NULL ,
   [GroupId]        [varchar] (31) DEFAULT '' NOT NULL ,
   [GroupName]      [varchar] (40) DEFAULT '' NOT NULL ,
   [DateTime1]      [datetime]     DEFAULT GETDATE() NOT NULL ,
   [Subject]        [varchar] (80) DEFAULT '' NOT NULL ,
   [FileName]       [varchar] (80) DEFAULT '' NOT NULL ,
   [FileType]       [varchar] (40) DEFAULT '' NOT NULL ,
   [FileExt]        [varchar] (10) DEFAULT '' NOT NULL ,
```

```
[FileSize]       [int]          DEFAULT 0   NOT NULL ,
[Message]        [text]         DEFAULT '' NULL ,
) ON [PRIMARY]
```

To keep the system simple, the tables are not fully normalized to third normal form. Instead, some copying is done of names to make the system simpler. This is at the expense of later updating, but, in the case of a messaging system, a message, once sent, should not be changed (for audit trail purposes). Most of the field names should be self-explanatory, but here are some remarks.

- Each message has a `MessageId` as a primary key.
- The `ParentId` allows a hierarchy of message threads, such as replies, to be referenced rather than copied when sending message replies (or in discussion threads).
- The `SenderId`, `SenderName`, and `SenderIP` refer to the sender.
- The `MessageType` is the type of the message.
- The `Status` can be active or inactive.
- A `OneToOne` message is a message that appears to the recipient with letting the recipient know who else received the message.
- The `GroupId` and `GroupName` refers to the automatically generated group that was the basis for this message.
- The `Subject`, `DateTime` sent, `Message` body, and `Recalled` fields have the usual/obvious meaning.
- The `FileName`, `FileType`, `FileExt`, and `FileSize` support a single file attachment for each message.

Here are some design considerations.

Rather than let users delete messages, messages are either active or inactive. This lowers support requirements when a user accidentally deletes a message. Each semester, the message system starts afresh from the user's point of view. A future enhancement would allow users to export their messages in a convenient format.

Only single file attachments are supported. Note that the shared memory approach of the system allows one copy of the file to be stored without added complexity. Currently, file attachments are limited to 1MB but that is easily changed. This makes it easy for a faculty member to share a file with the entire class, or all students taking a given course taught by that faculty member. Note: The size limit will be increased for faculty members.

Messages sent `OneToOne` appear as messages from the sender to the recipient. Otherwise, the distribution list can be seen by everyone. Everyone can also see who has opened and who has not opened the message. This is useful in "getting the word out" as everyone can see who has not opened the message. The teacher knows, and students can let their friends who need to know about the message know that they should check their messages.

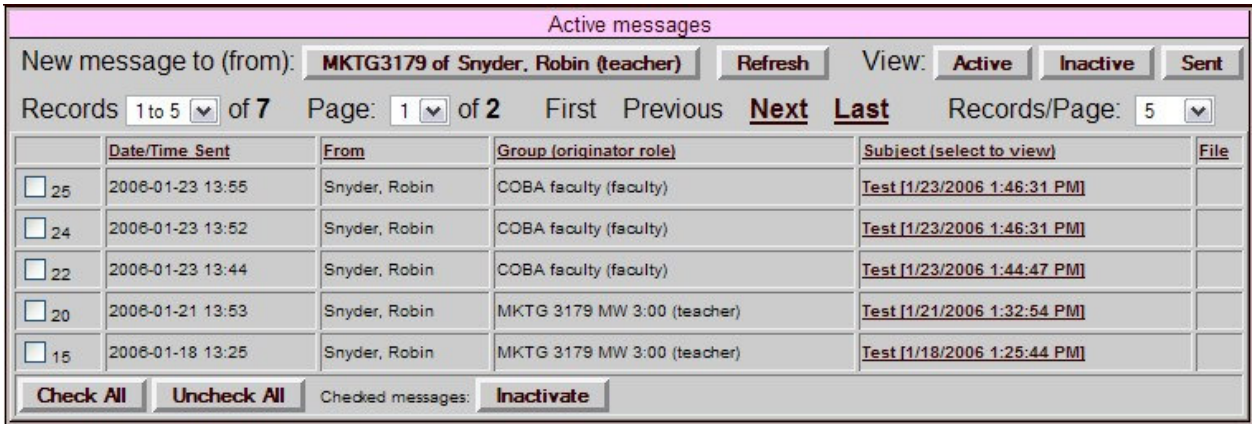
Here is the relevant structure of the `Targets` table.

```
CREATE TABLE [dbo].[Targets] (
   [TargetId]       [int] IDENTITY (1, 1) NOT NULL ,
   [MessageId]      [int] DEFAULT 0   NOT NULL ,
   [PersonId]       [int] DEFAULT 0   NOT NULL ,
   [Active]         [int] DEFAULT 0   NOT NULL ,
   [Opened]         [int] DEFAULT 0   NOT NULL ,
   [DateTime2]      [datetime] NULL ,
   ) ON [PRIMARY]
```

- The `TargetId` is the primary key.
- The `MessageId` is the message to which the target refers.
- The `PersonId` is the SID of the person sending the message.
- A message is either `Active` or inactive.
- The `Opened` field indicates whether the message was opened. If so it was opened at `DateTime2`.

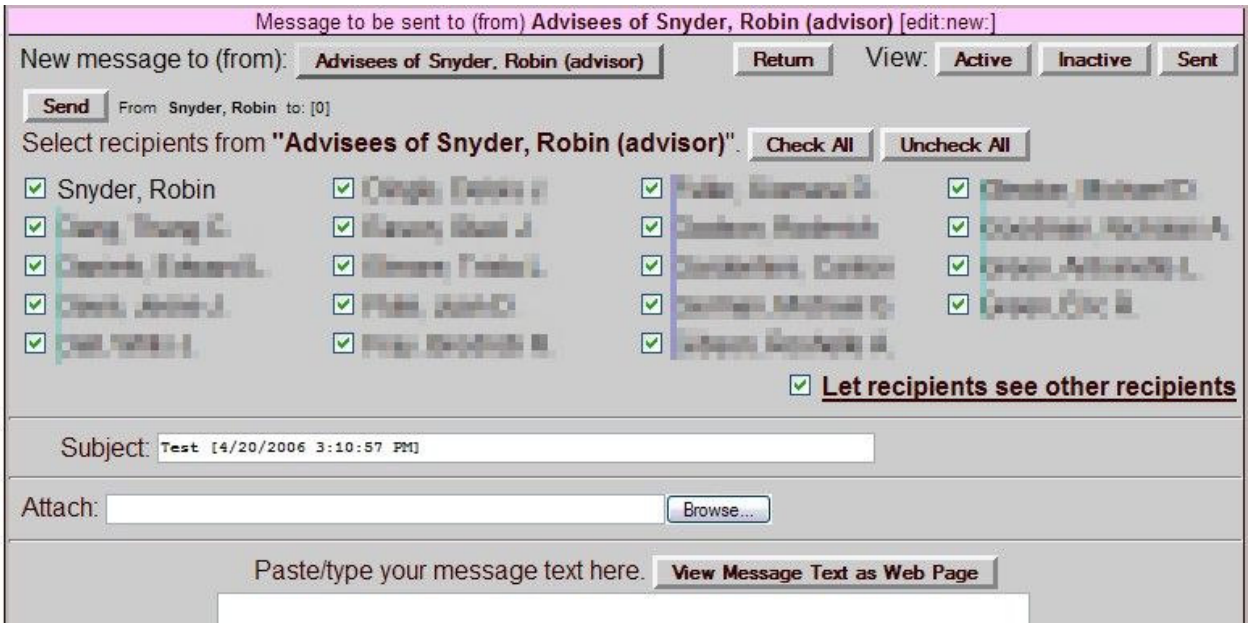
For simplicity, there are only a few ASP pages that manage the messaging system. In principle, an entire system can be put into just one ASP/PHP page, but it is often useful to divide the system into pages representing the logical structure of the system.

The "**Views**" page provide a list of messages in the various boxes. Currently, the boxes supported are the "**Active**" messages, the "**Inactive**" messages, and the "**Sent**" messages. Future support may include the "**Drafts**" messages (currently done by sending the message to oneself) and additional folders. A future improvement will allow filtering based on groups. A paging and caching mechanism is provided to keep boxes from growing too large. Here is how the "**Views**" page appears.



In this and other pages, CSS (Cascading Style Sheets) is used with the HTML (Hypertext Markup Language) and JavaScript to provide bubble hints when the mouse is moved over a field, lowering the learning curve while saving valuable screen space.

The "**Message**" page provides a way to view messages and create new messages. Messages can be sent to anyone in the currently selected group. Users can reply either to the "**Sender**" or to "**Everyone**". Sent and viewed messages are read-only. Here is how a new message window might appear.



Another page provides a way for the recipient to view the message text as a web page. The RegExp object is used to identify http: and https: links in the message body and convert them to actual links in the message viewed as a web page. A future enhancement will provide a way to identify and list and visit these link from the "**Message**" page.

Another page provides a way to return a file attachment to the user.

No attempt is made to use newer techniques such as AJAX (Asynchronous JavaScript and XML) to provide interactivity such as found in desktop applications. Instead, the login system, message system and web portal are used primarily as a messaging and delivery system for class and advising purposes.

A future improvement will, on login, take users directly to the message board if they have any messages that have not been viewed. Another improvement will provide discussion topics for the class notes, requirements, policies, etc.

Advising System

The design and implementation of a prerequisite checking system and an advising system have many features in common (some of the author's previous work on this topic is in [2], [4], [5]). The two types of systems use the same rules, but the rules are applied in a slightly different manner. In a prerequisite checking system, the students in the class are checked to insure that they have met the requirements to take that class. In a simple advising system, a student's transcript is checked with the rules to determine the courses that the student needs to graduate and which of those courses are available in the upcoming term or terms, showing the student the available options for those courses (e.g., availability, days and time, etc.). For example, here is the expanded rule fragment for the course BUSA 4126 (the actual syntax is a little more concise).

```
busa4126
 if (acct2101 also acc211) with "C" since "2005C"
 and (acct2102 also acc212) with "C" since "2005C"
 and (busa1105 also bad105) with "C" since "2005C"
 and busa2105 with "C" since "2005C"
 and (econ2105 also eco201) with "C" since "2005C"
 and (econ2106 also eco202) with "C" since "2005C"
 and (math2181 or math1113)
 and (busa2182 was quan2182 also bad331) with "C" since "2005C"
 and (finc3155 also fin320) with "C" since "2005C"
 and (mgnt3165 also man362) with "C" since "2005C" .
```

There are currently over 70 rules that an advisor must know (almost of 600 lines of rules, including one blank line between rules), and more rules seem to be discovered whenever more students use the system. And, the usual errors in the institutional database (including information only in paper form) add to the problem. But, it is better than nothing and acts as an additional check on the (somewhat incomplete and somewhat unreliable) institutional prerequisite checking and graduation audit system.

The result of using the rules with the transcript or class roster (in a manner similar to, but not exactly like, that of the logic language Prolog) is that not only can a "**yes**" or "**no**" answer be determined, but the actual part of the rule that is causing a "**no**" answer can be displayed to the student/advisor/teacher.

The results for each student can be displayed to the student under an available option.

Other options for advising and class management include class rosters for teachers and individual transcript and check sheet information for students (and advisors).

Summary

In summary, this paper has discussed some of the design considerations and implementation details of a web-based messaging system that is in the process of being used for class and advising purposes in a college of business.

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Using ethical hacking to educate users about secure passwords by cracking insecure passwords using readily available software

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Abstract

Security involves many tradeoffs. For example, passwords are often used for authentication purposes even though a secure password is not convenient while a convenient password is not secure. This paper (and talk) will discuss (and present) what everyone needs to know about passwords, from an end-user to a system/network administrator. Relevant password cracking techniques are covered that can be used, in certain situations, to determine which users do not have secure passwords. A web-based password cracking exercise used to educate students in a general purpose security course is presented. Other related topics covered include a review of password management systems, hash-coding principles, available biometric-based password systems, etc.

Introduction

On Valentines Day at the RSA Conference, Bill Gates said that "passwords don't cut it.". Although security has become increasingly important [7], in many organizations the password is the gatekeeper for user access to critical information systems within the organization. This paper discusses password security, password crackers, an example educational system, and the use of ethical hacking by system administrators to educate and improve system security for which they are responsible.

The fundamental assumption of security is that any adversary has access to all published information. Thus, one should try to keep the adversary from having access to as much information as possible. This goal is complicated by the goal of giving access to users who need such access to do their work. Exactly who is the adversary? "***We have met the enemy and he is us***" [1, p. 224]. Recognized security expert Bruce Schneier says over and over that security is not just a technical problem. Security involves the human factor and is only as strong as the weakest link [3].

Users can be divided into cooperating users an uncooperating users. A cooperating user is not trying to cause problem, but may inadvertently cause problems. An uncooperating user is a user that is deliberately trying to cause problems. In general, policies that rely on ignorance help against cooperating users but do not help against uncooperating users. For example, hiding files will inadvertently keep most cooperating users from accidentally erasing or changing that file. But, the specifications and access to hidden files is public knowledge. An uncooperating user bent on causing problems will not be stopped by hidden files. For scenario gaming purposes, the user will be the cooperating user while the attacker will be the uncooperating user. The goal then is to allow the user access to the system in order to do useful work while denying the attacker the ability to compromise the system.

Authentication

The authentication problem is that of determining if the user is who the user claims to be. Is the user who is attempting to access the system a cooperating user or an uncooperating attacker? This is not an easy question to answer. In real life, one might recognize the person. Or, the user might possess some attribute (e.g., biometric) or object, such as a driver's license, whose possession and matching attributes identifies that person. Again, there are forgeries and other factors that make the general problem very difficult to solve. For example, on the Georgia license application there is a question about whether the applicant is an identical twin. This information appears on the driver's license. There are many hi-tech ways of assuring that a user is who the user claims to be. Many of these methods involve biometrics such as fingerprints, eye retina pattern, DNA match, etc. If the user has certain information that only the user would have, then that information can be used for authentication. That is, as long as any adversary does not have access to the same information.

In a prison camp scenario, for example, one might ask a suspected impersonator questions from home that only a person from there would know. On the phone, for example, you might recognize the person's voice, but still ask the person a question. For example, a student calls and wants to know their current score. One might ask the student, "What did we do in class yesterday?". Of course, one might not have to give out too many scores using this approach (smile).

A typical tradeoff between complex methods and simple methods of authentication is the concept of a password, passcode, pass phrase, etc. A password is a code that is associated with a user name, often called a login name, and should not be easily guessed. For example, the user name might be "**smithj**" and the password might be "**tigers**".

How can the attackers job be made more difficult? One way to make the attacker's job more difficult is to make it hard for an attacker to determine valid user names. In addition, one might make it hard to determine what user names go with what users. In general, this can be difficult as most organizations establish conventions for generating a given login name based on the corresponding user name. For example, the following are common login names for the user name "**John Mark Smith**".

jms jsmith jmsmith smithj smithjm JohnSmith JohnMarkSmith JohnMSmith

When duplicates arise, digits are often appended at the end of the user name. Once a few login names are public, many other login names can usually be guessed. Often, the email name for a site is used as the login name.

When user names are not easily determined by an attacker, the best strategy on a failed login attempt is to not let the attacker know whether the login name or the password was incorrect. This will sometimes confuse cooperating users, but makes an attack more difficult for attackers. Otherwise, the attacker can use a divide and conquer strategy to first guess a valid login name and then guess the appropriate password.

Password properties

Here is the game scenario that illustrates the problem, assuming that a user login name is known to the attacker. A user with a login name chooses a password. The attacker then tries to guess the password. If the attacker succeeds, the attacker gets access to the user's account and can impersonate that user. That is, the attacker can do whatever the user could do once logged into that account.

What is the easiest way to get someone's password? The easiest way to get someone's password is to ask them for it. This is a social engineering attack and is the method of choice for most attackers. Why work harder than necessary?

Another popular method is to get the user to download and run a program or ActiveX control which acts as a key logger, recording all keystrokes of the user and sending promising keystroke (i.e., with user names and passwords) to another site. Such techniques are beyond the scope of this paper.

An attacker should not be able to easily guess the password of a user. Of course, there is a finite probability that any password can be guessed. But, if that probability is kept very low, the attacker will not have much success, may be discovered, may give up and try another attack method, etc. A relevant story in this context is about the two campers who were approached by a hungry bear. The one camper started to put on his running shoes. The other camper asked the first camper, "You can't outrun a bear.". The first camper said, "I don't have to outrun the bear. I just have to outrun you!". This is the case in security. If a security system is more difficult to attack than another site, the other site will, more often than not, tend to get successfully attacked.

The next tradeoff is that easy-to-remember passwords tend to be easy-to-guess while hard-to-guess passwords tend to be hard-to-remember. A dictionary may contain 10,000 words which are fairly easy to remember. On average, an attacker would need to try 5,000 words from the dictionary in order to succeed. If an attack can be automated, and no one is monitoring to respond to the attack, there is nothing to stop the attack eventually succeeding in a reasonable amount of time. And, attackers have lists of words that are used as passwords more often than other words.

A randomly generated password, such as `3tX2$&q!nsP#` is hard-to-guess but also hard-to-remember. If users are forced to use hard-to-remember passwords, most users will write the password down and then keep it in an easy-to-find place. Many users will write their password down on paper and put it under the keyboard, in a desk drawer, or just out-in-the-open. This is similar to putting a key to a door under the door mat. In running races, runners will, not wanting to carry their keys during a race, often put the key somewhere on the car (e.g., on a tire). Thieves who know this will look for where the runner puts the key. Then, while the race is going on, get the key and make an attack.

There are ways to take an easy-to-remember password and make it harder-to-guess but not necessarily harder-to-remember. The strategy of changing, say, "i" to "1", "o" to "0", "E" to "3", etc., is also known to attackers, and automated password guessing sometimes uses this strategy. Another way is to create a phrase, such as "If only I could remember this password" and take the first letter of each word, to get `IOICRTP`. Again, the phrase should not spell an easy-to-guess word.

In a targeted attack, an attacker has a specific target (i.e., user) in mind. In such cases, knowledge about the user can help in the attack. Many users may use the name of their spouse, kids, favorite car, etc., as a password. This can help in targeting an attack. In military history, successful generals often use knowledge of the opposing general to advantage. A well-known example is that of Robert E. Lee in the American Civil War. Lee, as Superintendent of the United States Military Academy at West Point, of which he was a graduate, had occasion to observe the cadets under his leadership. When opposing them in the war, Lee used personal knowledge of what the opposing general would do and would not do to advantage.

If users need to remember multiple passwords, there is little choice but to write them down, unless, of course, all of the passwords are the same. Many organizations try to get a unified password system. This helps users, but then one key unlocks everything. A related issue is that when creating login names and passwords on web sites, many users will use the same user name and password. Thus, a rogue site could allow users to create accounts, and then see if the user has used the same login name and password on other sites.

Understanding lockout

To make it harder for the attacker, a lockout may be used. A lockout happens when a user fails to successfully login after a given number of attempts, and is then locked out from being allowed to login for a given number of minutes. Most ATM's will "eat" a bank card after three unsuccessful login attempts using a PIN (Personal Identification Number) that is one of 10,000 possible 4-digit sequences. Some attackers have tried ATM skimmer technique, whereby an attachment placed on the ATM gets the account number as the card passes through, a small camera watches the PIN being entered, both are sent remotely to the attacker, who can then generate a plastic card with the bank account number.

An important point here is to understand the purpose of the lockout time. If the lockout is set for too long a period, for example, mischievous students could, before class, attempt to login as the teacher and lock the teacher out until the situation can be remedied. If the lockout is for one hour, and a IT support person cannot be located, well, no useful class for today, assuming the teacher needs access to a computer account to use technology in the classroom.

The main purpose of a lock out is not to keep an attacker from guessing, but to slow down an attacker and provide warning to the system administrator that an attack may be in progress. Most attacks are not made by an attacker sitting at a computer guessing passwords. Instead, most attacks are automated by software. A simple example is in order. Assume that passwords are only words in a dictionary of 10,000 words. On average, the attacker must try 5,000 words to succeed on any given account. If the software can try 10 passwords per second, then it would take 500 seconds, or just over 8 minutes, to successfully break into an account. If, instead, a lockout is for 1 minute after 3 unsuccessful attempts, then the same attack would take about 5,000/3 = 1,667 minutes = 27.8 hours. After the first few lockouts, the system administrator should be notified of a potential attack (e.g., via a portable communication device that supports, say, email messaging). With more secure passwords, the scenario becomes less attractive to the attacker. The lockout thus serves not as a barrier to the attack, but as an alarm system that notifies the owner of a possible break-in attempt and that an appropriate response make be needed.

On the web, if a web server is not monitored, an attacker might make many attacks until one succeeds. One example involved weekend access to the web server by an attacker. The attacker attempted to make more than 10,000 purchases, each for $0.05 (i.e., one nickel), using made-up credit card numbers. Most failed. A few succeeded. Some credit card users had their credit card numbers compromised. Those customers had never visited this web site. The owners of the web server ended up with a large bill for 10,000 credit card authentications, each of which was on the order of, say, $0.50. This amounted to about $5,000. Any site that allows unmonitored access can encounter this problem.

Hashing

A hash, or digest, function converts a value into another value such that, given the second value, it is not easy to determine the first value. For example, here are some hashes of the name "**Savannah**" expressed in hexadecimal.

```
hash value
---- --------
none Savannah
MD4  b08f57ef4e1609cf3cf0b00d1fa4a41f
MD5  cef52e4251b1b52e1da23854efbb0849
SHA1 c31ca1b500b60069c3255a5e1607f5f7f2d01020
```

The SHA (Secure Hash Algorithm), version 1 (i.e., SHA1 or SHA-1) is a very popular hash method. Older methods include MD4 and MD5.

Suppose, for example, that the password were "**Savannah**" (a poor choice as it could be easily guessed). Instead of storing "**Savannah**" as the password, the hash is stored. Then, when the user attempts a login, the hash of the password typed by the user is computed. If this computed hash matches the hash value in the database, access is granted (i.e., the user is authenticated. This is why a network administrator can provide you with a new password, but should not be able to tell you your existing password. There is no easy way to reverse the hash without going through every possible password until a match is made.

Hashes can be made of files to insure that a file is not changed (i.e., tampered). For example, if four CD images required for Fedora Core 4 of Linux from Red Hat are downloaded from some site, the SHA-1 hashes are provided by Red Hat. Checking these hashes ensures both that the download worked without problems and that the image had not been changed (i.e., with a virus, etc.). Here is an example.

```
For x86-compatible (32-bit):
FC4-i386-disc1.iso (sha1sum: 3fb2924c8fb8098dbc8260f69824e9c437d28c68)
FC4-i386-disc2.iso (sha1sum: 31fdc2d7a1f1709aa02c9ea5854015645bd69504)
FC4-i386-disc3.iso (sha1sum: 032455cdf457179916be3a739ca16add75b768b7)
FC4-i386-disc4.iso (sha1sum: f560f26a32820143e8286afb188f7c36d905a735)
```

Note that `sha1sum.exe` is a popular and readily available command line program for determining the SHA1 hash of a file. Here is the command line and response for the first file above.

```
[4nt] sha1sum.exe FC4-i386-disc1.iso
3fb2924c8fb8098dbc8260f69824e9c437d28c68 FC4-i386-disc1.iso
```

The checks can be automated with appropriate software.

Off-line guessing of passwords

A password cracker works via a brute force method using the encrypted password passwords. A brute force method goes through every possibility in an attempt to achieve a goal. A brute force password guessing method uses long lists of possible passwords, computing the hash of each, to try to guess the password. This method does require access to the encrypted passwords.

Here is how off-line guessing of passwords works.

- There is a known algorithm for encryption of passwords, `f(x)`.
- The attacker has access to the encrypted password file, list of `y` values for each userid.
- The attacker keeps guessing, via software, an password `x` until `f(x)` is equal to `y`
- Once a match is found, the password works on the first try. There is no lockout.

If passwords are guessed online, most systems would detect this and perform a lockout. But, with access to the encrypted password file, one can guess passwords off-line and then successfully login the very first time. Protecting the encrypted password file is thus essential, because if an attacker has access to the encrypted password file, the system can be susceptible to off-line guessing of passwords. Standard threat monitoring techniques such as lockout will not easily detect on off-line guessing attack that uses the encrypted password file.

Most systems will add a "salt" value to the typed password when hashing. The "salt" value is put in the database which makes it more computationally difficult to guess passwords if the attacker get access to the encrypted passwords.

There are password programs online that can be used to recover passwords for programs such as Word, Excel, Access, etc.

Password cracking

Next to asking for the password, the next best way to get a password might be to find the encrypted password file posted on the Internet. Suppose that one does the following Google search.

```
ext:pwd inurl:(service | authors | administrators | users)
```

Here is one such hit that was found on Tue, Aug 23, 2005.

```
# -FrontPage-
ekendall:bYld1Sr73NLKo
louisa:5zm94d7cdDFiQ
```

Here is another hit that was found on Tue, Aug 23, 2005.

```
# -FrontPage-
cannon:QcbaEg14h4ub.
```

In this case, the site had removed this information. But the information was still in the Google cache, saved from a previous visit.

Note that Google can be used to find search terms that can be used to look for various vulnerabilities on the Internet. To keep such files from being accessed via the Internet one might use the `urlscan.exe` program intended for Microsoft IIS (Internet Information Server) or the `.htaccess` file intended for the Apache web server. In both cases, one would disallow a file with extension `pwd` from being returned by the web server (i.e., being accessible directly from the Internet).

What might be done with an encrypted password file? A password is usually encrypted. But the password can often be recovered. A password cracker is a program that allows you to recover or crack a password.

One such password cracking program is "**John the Ripper**", at http://www.openwall.com/john/ [as of Tue, Aug 23, 2005]. The "**John the Ripper**" program is a command line program. You start the program and type commands at the command line. In the following examples, "`[4nt]`" is the command prompt. Here is the help information for the program.

```
[4nt] john.exe

John the Ripper  Version 1.6  Copyright (c) 1996-98 by Solar Designer

Usage: john [OPTIONS] [PASSWORD-FILES]
-single                   "single crack" mode
-wordfile:FILE -stdin     wordlist mode, read words from FILE or stdin
-rules                    enable rules for wordlist mode
-incremental[:MODE]       incremental mode [using section MODE]
-external:MODE            external mode or word filter
-stdout[:LENGTH]          no cracking, just write words to stdout
-restore[:FILE]           restore an interrupted session [from FILE]
-session:FILE             set session file name to FILE
-status[:FILE]            print status of a session [from FILE]
-makechars:FILE           make a charset, FILE will be overwritten
-show                     show cracked passwords
-test                     perform a benchmark
-users:[-]LOGIN|UID[,..]  load this (these) user(s) only
-groups:[-]GID[,..]       load users of this (these) group(s) only
-shells:[-]SHELL[,..]     load users with this (these) shell(s) only
-salts:[-]COUNT           load salts with at least COUNT passwords only
-format:NAME              force ciphertext format NAME (DES/BSDI/MD5/...)
-savemem:LEVEL            enable memory saving, at LEVEL 1..3

[4nt]
```

Here is the result of running "**John the Ripper**" on the above information that was saved in file `pwd3.dat`.

```
[4nt] john.exe pwd3.dat
Loaded 1 password (Standard DES [24/32 4K])
6496             (cannon)
guesses: 1  time: 0:00:00:23 (3)  c/s: 67959  trying: 6cco - 63ri
[4nt]
```

It took 23 seconds to crack the password for user cannon. The password is 6496. Note that some passwords may take much longer. It depends on the password used.

When restarted, "**John the Ripper**" keeps working on unsolved passwords and does not restart the previous work. Here is one way to confirm what work has been done to this point.

```
[4nt] john -show pwd3.dat
cannon:6496

1 password cracked, 0 left
[4nt]
```

If a password is not cracked quickly, one can let the program run longer, or use additional options to provide additional guidance to the program. One should always make your password hard to crack. One can always run a password cracker on your encrypted password to see how hard it is to crack. Or, one might run the password cracker on the encrypted password file for local users to see who does not have a very safe password. But, do not post the encrypted password file on the Internet where an attacker (e.g., using Google) can find it.

Though not the most efficient, the popular web server processing language PHP (note that it can be used for other things) can be used both to verify the results of John the Ripper and to better see how passwords are encrypted and how a password cracker works.

```
<?
function encode2($pw, $hash2) {
   $salt = substr($hash2, 0, 2);
   return crypt($pw, $salt);
   }

function encode1($user1, $hash1, $guess1) {
   $hash2 = encode2($pw1, $hash1);
   echo "<br>";
   echo " user=[" . $user1 . "]";
   echo " hash=[" . $hash1 . "]";
   echo " guess=[" . $guess1 . "]";
   if ($hash1 == $hash2) {
      echo " [ok]";
      }
   }

encode1("louisa", "5zm94d7cdDFiQ", "trumpet");
encode1("cannon", "QcbaEg14h4ub.", "6496");
?>
```

Here is the output.

```
user=[louisa] hash=[5zm94d7cdDFiQ] guess=[trumpet] [ok]
user=[cannon] hash=[QcbaEg14h4ub.] guess=[6496.] [ok]
```

Note the following for FrontPage password files, which potentially provide access to web site authorship.

- The encrypted password file contains the user name.
- The encrypted password file contains the encrypted user password.

- The encryption algorithm is known, the DES (Data Encryption Standard).

One security problem here is that the encrypted password file is not itself encrypted.

In the case of Microsoft IIS, IIS was designed as a single developer server. Providing any user with rights to create ASP scripts allows that user to see anything on the web server that is accessible from the web server, including databases, other user scripts, etc. [6]. This feature is not easy to remove without crippling the functionality of the web server. Thus, cracking one FrontPage password of a user with ASP create rights provides access to the entire web server, the files it can access, and the databases that it can access. For this and other security reasons, many web servers will not enable FrontPage server extensions.

An actual password cracker would make guesses until the guess hash matches the actual hash. Besides using algorithmic methods, here are some common passwords near the top if the list.

```
12345
abc123
password
passwd
123456
newpass
notused
Hockey
internet
Maddock
12345678
newuser
computer
Internet
qwerty
```

If your password is on this list, it is probably not very secure.

Ethical hacking

When teaching password cracking techniques, it must be stressed to the students that the techniques are for educational purposes and should not be used to attack systems. Password cracking should be used ethically.

In ethical hacking, for example, a network administrator might use the encrypted password file and a "cracking" program to determine who has not picked a good password. The human part is in letting the users whose passwords have been cracked that they should pick another password (e.g., by having their passwords expire). Some systems run a cracker program on a user's selected password and will not let the user pick a password that is easily cracked. This happened to the author in 1988 it the IBM R&D Center. It took several attempts to get an acceptable password. The password "qwerty" did not work. But another "pattern" on the keyboard did work. Apparently that pattern was not forbidden.

Educational system

The author has developed a web-based educational system for password cracking that uses John the Ripper.

The system works as follows from the student point of view. The student starts the exercise with the FrontPage user name and encrypted password. The student uses John the Ripper to crack the password. Once cracked, the student is presented with another password to crack. After 5 successful attempts, the student answers a short answer question about the exercise.

The system works as follows from the teacher point of view. First, an XML file containing the user names, passwords, and encrypted passwords, and actual passwords is created. Here is an example fragment of the XML for a two-step sequence (for just the teacher, for example purposes).

```
<?xml version="1.0"?>
<rmsSecures class="CISM3300" term="Fall 2005">
<account type="teacher" login="snyderr" name="Dr. Robin Snyder">
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# -FrontPage-
mary:Ds81AR.h3maHY
</challenge>
<challenge index="1" done="0" name="mary" code="password">
# -FrontPage-
jenna:DsKvHJgx2b7DI
</challenge>
<challenge index="2" done="1" name="jenna" code="amber6"/>
</account>
</rmsSecures>
```

Each student receives a different sequence of user names and passwords. The author has been using this approach because while students may not mind showing other students their work or answers, they may mind actually doing the work for the other student. Each password is checked to insure that it will actually be cracked in a short period of time. When the student completes the sequence and answers the question, the result is submitted into the author's submission and annotation system, making the submissions easy to grade.

Summary

This paper has provided an introduction to password security and cracking of passwords using readily available software. Hackers have such software and use it when necessary. System administrators should have such software and use it ethically to both educate users and improve the security of the systems for which they are responsible.

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IT Programs in the 21st Century: Techniques to Survive and Thrive in the Changing Environment

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Introduction

Statewide Technology is a structure to deliver Purdue University School of Technology courses and degree programs to locations around the state of Indiana. This program serves approximately 1,500 students at seven locations. Agreements are in place with Indiana University, Ball State University, Anderson University, and IUPUI to serve as host institutions. Purdue offers technical courses and host institutions deliver general education courses. Students enroll as Purdue University students and earn Purdue degrees. Statewide Technology was established to meet Indiana's need for trained technologists and technicians. Associate of Science degrees are offered in nine areas and Bachelor of Science in five areas. Degree areas range from Aeronautical Technology to Mechanical Engineering Technology. Computer and Information Technology (C&IT) is offered at four sites with the BS program offered at two of those sites. Degrees are offered based on the needs of each location. At Columbus, we have approximately 210 students and our host site is Indiana University Purdue University Columbus (IUPUC), a regional campus of IUPUI with approximately 1800 students serving Columbus and eight surrounding counties. C&IT offers an AS and BS at Columbus. Computer and Information Technology prepares students for careers in the application of information systems and technology to plan, analyze, design, construct, maintain, and manage software development, systems integration, data management, and computer networks.

Enrollment Declines

In recent years C&IT have faced declining enrollment at our Columbus site. From a high of 119 students in the first semester of the 2002-2003 year we have declined to 62 students in the second semester of the 2005-2006 academic year. This is a 48% decline. With three full-time faculty and one additional member on leave we have gone from a thriving department to one that is scrambling to survive. With the majority of our students part-time we are not bringing in enough money to break even. The declining enrollment is not just at our department or site. Our program in Columbus has been faced with a loss of 74 students over the past two years. This has led our site to show an operating loss in the past year. Purdue has made it clear that it will not accept these numbers. As stated, one of the goals of a statewide program is to provide technology degree opportunities where the community has demonstrated a need. In the past six months Purdue has had to make tough decisions on programs that are no longer viable. Our South Bend site will no longer offer C&IT degree and our site in Anderson has been given two years to increase enrollment or it will suffer the same fate. If both programs go that would leave sites remaining in Kokomo and Columbus. The question then is will these sites suffer the same fate? In order to answer that question we should first take a look at the cause for the declining enroll-

ments.

Potential Reasons for Decline

The reason for enrollment declines is probably a combination of things. It could be in reaction to the dot com crash, outsourcing, uncertain economy, cost of classes and strong competition. In reality it is probably a combination of all of these things and more. I will briefly discuss some of the likely candidates for our program in Columbus.

Outsourcing continues as an issue for IT programs. The Information Technology Association of America (ITAA), in a recent study states that outsourcing has eliminated nearly 104,000 jobs so far with software engineers being the hardest hit. They also predicted that the demand for U. S. software engineers will shrink through 2008. (Heikens and AP). As I have pointed out in the previous papers I've published in ASCUE in 2004 and 2005 studies by the Gartner Group and others support similar findings. Even with these discouraging numbers there still does not appear to be complete agreement on whether all is gloom and doom with the IT job market. According to the Fastest Growing Occupations Report in the 2006-07 Occupational Outlook Handbook (Bureau of Labor Statistics) three of the top ten and five of the top twenty-five are information technology (IT) jobs. In that same handbook the only IT job on the list of occupations with the largest decline was computer operators which ranked seventh. Even given the information, this good news for IT workers, many Americans seem concerned. A Gallup poll taken during 2004 Presidential campaign found 61% Americans say they are concerned that they (or a friend or a relative of theirs) might lose a job because the employer is moving that job to a foreign country and 41% say they are 'very concerned' about this happening, and another one in five (20%) say they are 'somewhat concerned.' (Rediff)

This is already having an effect on computer programs at universities in the United States. A study published in May 2004 shows the number of declared majors plunged by 23% in the 2002-2003 school year. This is alarming considering the enrollments continued to increase after the dot-com bubble burst earlier in the decade (Schoenberger). In my role of advisor and recruiter I talk with current and prospective students and parents on a regular basis. The conversation of jobs typically comes up. In the first seven or eight years the talk was of potential employers in the area and starting salaries. In the last two or three years the first question is about jobs but now it is will there be a job when they graduate. During my first years with Purdue the C&IT placement statistics were always 100% and salaries in the top two or three in the School of Technology. In the most recent survey which is indicative of the last several surveys, placement was still respectable in the high eighties but not the guarantee it once was. This was a time when bonuses were common and students had job offers well in advance of graduation. A fellow colleague noted that the perception is that all of the jobs are going away. Besides the reports appearing in the media he tells the story of a parent that approached him with evidence of jobs going away by noting that the newspapers were once filled with pages of IT jobs and now it is just a fraction of that. The parent was appeased when my associate explained that many jobs are now listed on websites like Monster.com as opposed to advertising in local papers.

Outsourcing is a major concern for IT programs. Another reason for decline can be attributed to increased competition. As I mentioned most of the C&IT programs until recently were Associate of Science programs. Columbus was the first statewide site to offer the Bachelor of Science in C&IT and last year Kokomo was granted permission to offer the BS. A major source of com-

petition is Ivy Tech Community College. Ivy Tech is a statewide community college that has grown into the second-largest post-secondary institution in Indiana. Their programs lead to two-year associate's degrees and one-year technical certificates. They have over twenty campuses in the state and in Columbus they are literally next door to our host university IUPUC. Their enrollment has increased 75% over the last ten years. Why is a nationally known university having trouble competing with a community college? Our main campus does not compete directly because they are generally out of the business of AS degrees but that is not true for statewide sites. AS degrees have been the bread and butter for statewide sites catering to non-traditional students and traditional students preferring to stay in the area for a variety of reasons. The state of Indiana has pushed the community college system with strong financial support in the past few years. Some of the things have led to Ivy Tech advertising heavily on TV, radio and newspapers. What is a larger blow is the tuition at Ivy Tech is less than one-half of the IUPUC campus ($83 vs. $187 per credit hour). We are not doing a good enough job of differentiating our product from theirs. In some cases their classes will transfer into our program so it is hard to argue with paying $250 instead of $560 for a class that will count the same in our program. Ivy Tech is also far ahead in the number of distance education classes offered along with their efforts in providing industrial training and preparation classes for many of the certifications in networking and Microsoft products.

Besides Ivy Tech in the Columbus area we are in recent years getting more competition from our host university IUPUC. The campus is a regional campus of the Indianapolis regional campus of Purdue and Indiana University. Although they do not have their Computer and Information Technology program in Columbus they have other programs and classes that compete for students. Several specific items that potentially hurt enrollment include:

- Adding BS in Business with a concentration in Computer Information Systems
- Advertising an Informatics program out of Indianapolis. Although students cannot get their BS in Columbus they can start the program.
- Offering Computer Science classes as support classes for other programs like the School of Science where we have traditionally provided support classes.

Besides these courses IUPUC has made a much more determined effort to increase enrollments by developing a marketing plan, hiring an Enrollment Management Director and providing high school advisors with scholarships to hand out to local high schools. Also, IUPUC has agreements in place for six of Ivy Tech's programs (C&IT does not have an articulation agreement in place).

CHANGES NEEDED TO COMBAT DECLINE

As evident from the previous section the decline in C&IT can be attributed to factors that many small universities with programs like ours face. The globalization of our economy with US firms engaging in outsourcing will affect programs across the country. Also increased competition among universities is a certainty.

Some ideas that have been started or discussed include: our dean is hoping to get permission from the Higher Education Commission to become more "nimble." In other words some programs are being dismantled (as is the case with our C&IT in South Bend) while other programs may grow. As Dean Michael O'Hair, Associate Dean of Statewide Technology and Engagement stated we need to get the right products for each area. He also feels the Dean's and Director's

need to "break down the doors" with industry so that we can get our faculty in to engage industry. We are cutting costs, by eliminating adjuncts and location directors. Purdue has made several efforts to increase publicity, press releases, and the associate dean hosted directors and staff on tactics for improved publicity. Purdue has also paid a firm to work up a campaign.
Following I will briefly discuss some of the efforts that have occurred or discussed. One of the changes mentioned in my paper at last year's ASCUE conference deals with a change in curriculum specifically to our C&IT 180 (formerly CPT 180) Introduction to Systems Development. C&IT 180 is a class our normally taken by freshman in their first semester. For years this class focused on the programming side. The class was completely revamped and more time was spent on topics of Use Case, UML, Activity Diagrams, Class Diagrams, and Context Data Flow Diagrams along with Entity Relationship Diagrams. There is still use of Microsoft Access to develop and use databases. More time is also spent on communication whether it is the traditional "soft skill" or some of the tools just mentioned. As I mentioned in the 2005 paper the C&IT 180 topics are very similar to topics covered in a program that was developed in conjunction with Purdue faculty, Cummins employees and Cummins offshore contractors (although the dept of the material covered is greater for the Cummins program). That program developed and delivered for Cummins in the United States and United Kingdom is called the Business Analyst program. The purpose was to retrain staff, typically programmers to become Business Analyst. Cummins goal was to retrain as opposed to laying off programmers when the programming positions were outsourced. Evaluations from students have generally been positive. Besides C&IT students we have worked with the Organizational Leadership and Supervision (OLS) Department and they are now encouraging their students to take that class. Also, we have been in discussion with the Business Department in an effort to see if there is a place in their curriculum for the class (their CIS students take C&IT classes for their program).

A second thing that we are working on is articulation. Last fall Ivy Tech and Purdue's OLS Department signed an articulation agreement. This spring we have resumed negotiations again between Ivy Tech and C&IT. In an interview Michael O'Hair, Associate Dean of Statewide Technology and Engagement stated articulation is a priority for Columbus. His view is that we need to be out of the business of providing AS degrees and concentrate on BS and graduate degrees. There have been talks in the past that have stopped because of political issues. In the past Ivy Tech has wanted a 2+2 meaning Ivy Tech students with an AS would come in as a junior. Purdue's stance has been they will look at articulation in a class by class example. Currently, there are only a few classes in their program that will transfer in (English, Communications but typically not their information technology classes). We are in the process of reviewing classes at Ivy Tech and Purdue. Although, this may seem to cause additional decline and it may at the freshman and sophomore level because students will just go to Ivy Tech. What we are hoping to do is get some of their students to continue on for the BS. They currently have over one hundred students in their program. If we can build a relationship with Ivy Tech an articulation agreement it could be a win-win scenario. Ivy Tech advertises heavily and to be able to say that their program articulates with Purdue should be a plus from them. For Purdue we can recruit from Ivy Tech our next door neighbor (we actually have a shared building now called the Columbus Learning Center where all three institutions, offer services) and to some degree piggyback on their strong advertising campaign to get them in the door and then recruit students to continue on with their degree. This will only be successful if we get an articulation agreement that will allow Ivy Tech students to use most of their credits at Purdue.

One of the issues we in C&IT (and Columbus programs in general) are trying to address is cater-

ing to our students needs. We have a dichotomy of traditional and non-traditional students and many times their needs are different. Our traditional students prefer their classes C&IT classes be scheduled during the day because many of the classes provided by IUPUC are also scheduled during the day and this means one trip to campus and time for part-time jobs during the evening. In the past we have for the most part ignored this and offered most classes in the evening. In the past year we have attempted to put more of our classes in the three to five p.m. time period to catch traditional students at the end of the day and get some of the non-traditional students early. Some of the larger employers seem to be a little more flexible in allowing students to leave a little early a couple days a week but it still presents a problem for some of our non-traditional students with less flexible work schedules. In some cases we have been able to pull some of the third shift employees into the daytime classes. At this point it is probably too early to see if this is a success because in a couple instances we have had to run classes below our normal limits to let the class run.

For non-traditional students the key from talking to students and student services is flexibility in scheduling. These students generally work full time jobs during the day and have kids to run to soccer, basketball, band, etc. The day classes that work well for the traditional students are not an option for many of the non-traditional students. In some cases it is difficult to commit to a couple times a week on campus. We have experimented with different formats in scheduling over the years from having classes meet one night a week (instead of the general two day week – one lecture and one lab) to running weekend classes that meet the entire semester and classes that meet for eight weeks. To varying degrees these classes have been successful. They provide alternatives that the non-traditional students need.

An area where we have not kept in step at Columbus and specifically in C&IT is distance education. Although many automatically think internet, other methods include one-way and two-way videoconferencing, and videotape and cable. We have several alternatives to provide this to our students. On way is to utilize the Indiana College Network (ICN) and another is development of our own distance education classes. In the past year we have increasingly utilized the Indiana College Network. The ICN is a cooperative service of Indiana's colleges and universities. It's operated by the Indiana Higher Education Telecommunication System (IHETS), and is a "virtual university consortium" of public and private universities in the state of Indiana with a goal of providing technology supported course alternatives to students around the state. The growth of the ICN deliveries is impressive and enlightening. It appears to be a trend that is not limited to Indiana. Figure 1 is a look at enrollment growth of different types of distance learning in ICN:

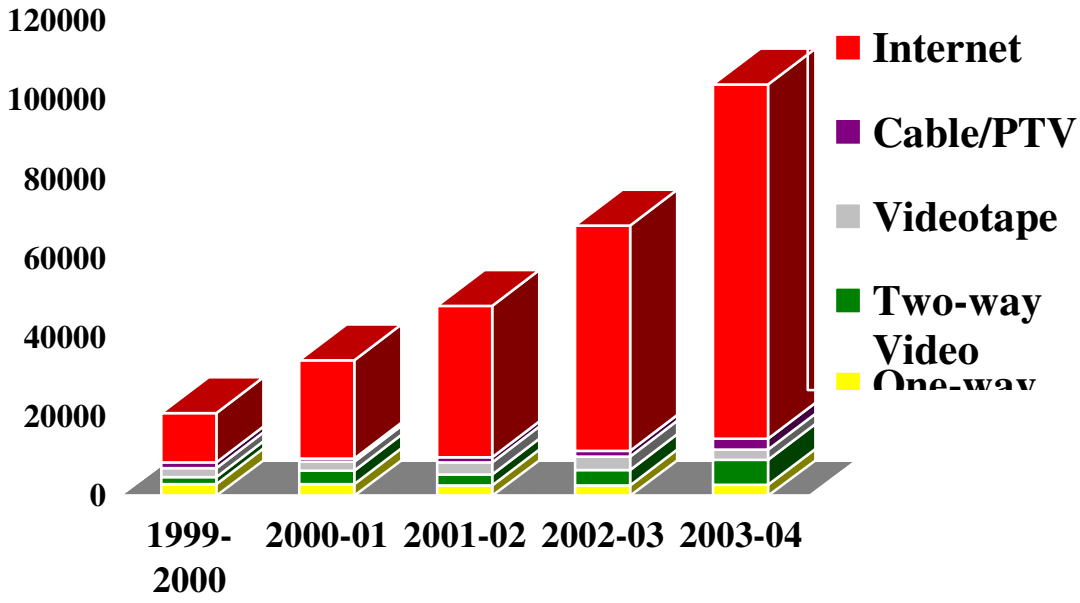

Figure 1 courtesy of IHETS

According to ICN's 2003-04 Enrollment Report, enrollments for Internet based classes were up 57% and two way video classes were up 65%. 83% of the classes were Internet classes which come to over 103,000 enrollments over the year (IHETS). Looking at the enrollments at the major participants in the state of Indiana in Figure 2 you notice that Purdue University while showing good growth being up 15% over 2002-03(and that figure is up 60% over the 2001-02 year) is still a relatively small player in the state (Scott). Our neighbors and largest competitors in Columbus, Ivy Tech and Indiana (IUPUC) are part of institutions that represent the two largest participants in Indiana (IHETS) An interesting note about ICN enrollment from the 2003-04 report is that only 9% of enrollments are in the Technology/IT courses with the majority in General Education (35%) and Business (22%). Unofficially, in the past year approximately 10% of our C&IT students have utilized ICN distance education courses and although there are no statistics available to document this, that is up from previous years.

Enrollment Increases

Institution	Enrollments	Increase
Ivy Tech	35,835	+26%
Ball State	3,560	+26%
Indiana	24,275	+35%
Indiana State	7,092	+ 7%
Purdue	**2,786**	**+15%**
Southern Indiana	5,928	+19%
Vincennes	10,273	+249%

Figure 2 courtesy of IHETS

The other option for distance education is to develop and deliver distance classes. As demonstrated in Figure 2, Purdue in general is not a major player in the area. Statewide C&IT has developed a few classes in our curriculum to be delivered via distance. In general in the past there has not been a push to utilize distance education. The majority of Purdue students in the School of Technology are on the main campus in West Lafayette and departments have not pushed for distance classes. Recently, there are indications that might be changing. Last year there were a number of faculty given grants to develop and deliver distance classes. Statewide administrators have in general been supportive of development of e-learning. It appears to be a way to share resources by having faculty teaching classes in their area of expertise while giving students more options. There appear to be a few issues to deal with offering classes in our statewide system. The main one is who gets credit (i.e. money) for a student who enrolls in a distance class. Also, sites typically don't want to list a distance education class that might compete with a traditional class offered at the local site and risk having that class cancelled. Finally, what courses are appropriate to be delivered via distance education. Looking at the numbers from the Indiana College Network, technology/IT classes are not delivered nearly as often as other courses. The question has come up among statewide faculty about what classes could we deliver via distance. The main problem being most C&IT classes involve labs. Statewide faculty members met recently to discuss the issue and all C&IT statewide faculty were polled about the classes they teach and if they believed those classes would be good candidates. The result of the informal survey was that many but not all of our classes are possibilities and to do it successfully will require work. This definitely appears to be an area that will help build enrollment numbers if the political issues can be resolved.

Finally, one of the items that will help enrollment is a curriculum that will attract students. The curriculum has to avoid becoming stale and irrelevant. This is particularly true in information technology where changes are occurring daily. In general our department is tweaking the curriculum on a regular basis. In last years ASCUE paper I mentioned the inclusion of classes to the C&IT curriculum. These courses are in areas such as: cyberforensics, biomedical information, IT healthcare, information security and wireless networking. These additions have been made in the last several years and are providing a lot of excitement on the West Lafayette campus. At this time these classes are not being offered at the Columbus site. There has definitely been interest, especially in the cyberforensics, security and IT healthcare courses. If we can find a way to offer some of these classes it would be a boost. The biggest issue for some of the classes is the requirement for specialized equipment in the labs. Certificates are another area that many people believe would help enrollments. They bring in students for classes in a specific area and some times allow you to recruit students into the program. The main issue with formal certificates is that they have to go through a lengthy approval process at the university. Informal certificates would not need to go through that process and if you have a popular one it can be a big boost as evidenced by our Advanced Information Technology Program (AITTP). They had roughly 20% of Cummins information technology employees worldwide participating in a program in which participants enrolled in six C&IT classes.

Conclusion

The Computer and Information Technology Department in Columbus has faced a soft market in enrollment in recent years. This is not unique to our site or our institution as nationwide programs have seen similar declines. Our site has also faced strong competition from a growing community college system in the state of Indiana and our universities. There is no "silver bullet"

to solve the problem. What we feel like we need to do in Columbus is a variety of things that will best serve our diverse clientele. Among the actions that we believe can help is to continue to develop a flexible schedule that will cater to traditional as well as non-traditional students. We must also embrace the technology and not only utilize the Indiana College Network when appropriate but also do a better job to develop and deliver distance education classes. We must also continue re-working old courses so that they are relevant to today's needs and addressing curriculum needs for developing new classes and certificates that will keep our program fresh.

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Student Participation Patterns in Asynchronous Distance Learning Courses

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Abstract

The discussion area is a major component in many asynchronous distance learning courses. This study analyzed the participation patterns of students from two different asynchronous distance learning graduate courses taught by the researcher over a five year period (2001-2005). The longitudinal data were drawn from actual student participation statistics in the courses and from the course evaluations (59.8% response rate) over the five years. The study found distinct patterns of student participation in discussions in several areas, including distribution of postings among multiple discussions, when postings were submitted each day, on which day of the week (relative to the start and end of a given week of class) entries were posted, and in student overall appreciation of the value of the discussions. Distance learning instructors should take the participation patterns into account when developing and teaching asynchronous courses so that they can adjust such courses accordingly to maximize their students' participation.

Introduction

As noted in a recent Sloan Consortium survey (Allen & Seaman, 2005), student registrations in distance learning courses are increasing in colleges and universities. The results from the survey indicated that in fall 2004 there were almost 2.4 million higher education students taking one or more distance learning courses. Those enrollments were an 18% increase from 2003. That a growing mass of students of such magnitude are enrolling in distance learning courses is cause for notice.

As distance learning course enrollments climb, many such online courses incorporate a discussion component that encourages or requires a student to submit postings to discussion forums or boards created by the course instructor. Blackboard, a leading distance learning course management system, funded a study that included data from more than 830 institutions of higher education from the spring 2003 semester to the fall 2005 semester.

> Online discussion among students related to course materials and/or educational topics also expanded substantially. In the first semester of operation (analyzed in the data sample), spring semester 2003, the site saw 988,597 unique postings on its discussion boards; in spring semester 2005, there were 9.1 million postings. In the first weeks of the current academic term, there have already been 1.5 million postings by users tracked in this data sample. (http://blackboard.com/company/press/release.aspx?id=762348)

So since enrollments are increasing in distance learning courses and since many distance learning courses include discussions, the number of students participating in discussions also is increasing. With online discussions becoming more in use, instructors would be wise to know as much as possible about discussions. That need for knowledge would include how, when, how much, etc. that students participate in discussions in their distance learning courses.

Courses in Study

The courses that were part of the study were 100% (not blended or hybrid) distance learning graduate courses in the Division of Continuing Education at the University of San Diego run with the assistance of OnlineLearning.net (see http://www.onlinelearning.net/), which is part of the Online Higher Education division of Laureate Education, Inc. (formerly Sylvan Learning Systems, Inc.). Both of the two courses in the study – Mainstreaming: Teaching Individuals With Special Needs in the Regular Classroom and Computers for Educators Level I – are two semester unit graduate courses usually taken due to being requirements for California teachers to "clear" (earn) their teaching credentials.

The Mainstreaming: Teaching Individuals with Special Needs in the Regular Classroom course seeks to give general education teachers the knowledge of how to successfully work with special education students in a mainstreamed or inclusive K-12 classroom. The course includes such areas as special education laws, terminology, and research; explanation of IEP meetings; classroom accommodations and modifications; and classroom management techniques. The course meets the mainstreaming/special education requirement for the Ryan Professional Clear Credential in California. The Computers for Educators Level I course provides K-12 teachers with an introduction to integrating technology into the K-12 classroom. Such topics as spreadsheets, multimedia, and use of the Internet are incorporated in a practical approach to using technology to improve teacher effectiveness and efficiency, as well as improve student academic achievement. The course enables the students to complete the Level I technology requirement for the Ryan Professional Clear Credential in California.

Both distance learning courses are asynchronous in that they do not operate in real time. The students do not have to be online at a specified day or time. In effect, the courses are 24/7. Both courses are six weeks in length with students having weekly assignments that include readings in a textbook and discussions. Additionally, both courses include two quizzes and a final exam. Different course sections start continually throughout the year, and are not tied to the traditional semester or academic calendar. Course sections start and end on different days of the week in that a course might start on a Wednesday and finish on a Thursday six weeks later, or a course might begin on a Monday and end on a Tuesday. Different starting and ending days of the week combined with multiple sections being available throughout the calendar year provides flexibility for the students, especially when also using a 24/7 online learning methodology.

The researcher teaches these two courses as an adjunct instructor. Prior to becoming an adjunct in 2000, the researcher had to successfully complete a rigorous six week online training program. The Blackboard course management system was used to teach the course from 2000 until 2005 when a switch was made to the eCollege course management system. Initial and subsequent instructor training was provided in using eCollege upon changing to that system. Both Blackboard and eCollege allow the instructor and students to do approximately the same things (e.g., threaded discussions, online quizzes), but each does it slightly differently.

While most of the students in these two courses live in California, the courses have included students from various states (e.g., Louisiana, New Jersey) and different countries (e.g., Columbia, Japan, Germany). The vast majority of the students taking these courses are either current California teachers, former California teachers making sure to solidify their teaching credentials in case they return to the teaching profession in California, or those who aspire to be California teachers but who do not have prior or current teaching experience. The smallest class in the study had eight students, while the biggest class had 30 students, with the average being in the mid 20's. In any given course section there were 4-5 students who were new to distance learning (so-called "newbies"). There also were a same number of students who were changing professions to become teachers. For example, a nurse or retired Air Force officer would take the courses as part of their goal of becoming a K-12 teacher. Some students were on their second or third career change. Also, classes usually had at least several students who were stay-at-home mothers and were taking the online courses because they could not travel, sometimes far distances, to a traditional college classroom.

Overall Student Participation

The two courses – Mainstreaming and Computers – are six week asynchronous distance learning courses for those professionals wanting to be K-12 teachers in California. Being asynchronous, the instructor did not set a specific day or time for the students to "meet" online. Early on in teaching the courses the instructor set aside evening office hours on two days (Monday and Thursday) for students to participate in real time virtual chats. Although advertised and promoted, these meetings were not mandated. Attendance would be 3-5 students (out of maybe 25-30 in a course) for the first few sessions, but then would diminish to no participants in a matter of a few weeks or less. The instructor was online at the appointed days and times but no one else was. So the real time meetings were discontinued in favor of on-demand office hours in that students could request a specific appointment to discuss course matters. Over the five years of gathering research data, only a very few students have ever requested such a meeting. Instead, if a student had a question, he/she sent an e-mail to the instructor. On a much more infrequent basis a student might have telephoned the instructor as the instructor included his cellphone number in the course material. But only a few students have called the instructor.

The bulk of the student participation occurred online within the courses, usually inside the threaded discussions. The students might also avail themselves of using a social board that is included in both courses. The social board is set up for discussions that are not related to the assigned discussions and is strictly for general comments and questions - kind of a "social" board (or a "Class Café") for informal, non-course specific communication. For example, a student might pose a question if he/she was thinking about taking another course and wanted some input from someone who had already taken it. It would not be appropriate to pose such a question in the regular discussion forums but it could be posted and discussed in the social board. However, the social board has not gotten much participation in most courses. For example, the researcher is teaching a Mainstreaming course as this article is being written that has the maximum 30 students. It is near the end of the fifth week and there have only been 14 postings in the social board, and that number is higher than in most previous courses. One reason for the low participation might be postings in the social board do not count toward the students' weekly participation requirements in the assigned discussions. As with the weekly "live" course meetings, social board participation is probably affected by not being mandated. One common element in discus-

sion exchanges with students over the years is that unless something is mandated (e.g., participation at certain levels in assigned discussions), monitored, and enforced, then even the most well meaning and well intentioned student will fall short of the instructor's expectations. "Life" often intrudes and the students' best intentions are not fulfilled. Based on the students' own admissions and suggestions, instructors are advised to mandate a minimum level of participation through earning points toward a course grade, which serves to motivate those students with insufficient self-motivation.

So given the necessity to mandate participation, weekly discussions have set requirements in the two courses. These mandates were modified over the span of the five years of this study. Today, there are set requirements for course participation in the discussions. Over the six weeks of each course, students can receive a maximum of 84 points (out of a possible 200 total points for the course) for their participation in the weekly online discussions. So participation in the discussions can account for 42% of their course grade. Typically, there are a minimum of two discussions and a maximum of four discussions (besides the ongoing social board discussion) each week. Weekly point tallies are posted in the online gradebook after each week ends. Additionally,

- The expectation is to submit a minimum of 42 acceptable discussion postings during the courses with a minimum of seven "acceptable" postings each week, including at least one in each discussion, as either original postings or in response to another student or the instructor. "Acceptable" does not mean replying, "I agree" or "ditto" or "Thank you." Postings need to be thoughtful, insightful, and pertinent to the discussion topic.
- Not submitting at least one acceptable posting in a discussion results in a loss of two participation points per such "empty" discussion. This requirement forces students to submit postings in all the discussions, instead of loading up on only one or two and skipping the others. This is one mandate that was instituted beginning in 2005.
- A maximum of 14 points (seven acceptable postings at two points each) can be earned in any given week. So submitting 42 replies to discussions in the last two days of the course is not the expectation nor will a student earn more than the 14 possible points for that week.
- Replies must be done by the end of each week in order to receive credit. Postings submitted after a given week ends are not credited toward participation points. The instructor has resisted mandating a minimum number of postings by a specified time during the week (e.g., before the fourth day) because both Blackboard and eCollege would require the instructor to manually monitor whether or not students had met such a goal. That would necessitate much more work for the instructor. However, he does do that in other online courses that he teaches that use the State University of New York (SUNY) Learning System (SLN) course management system. It is much easier to keep track of student participation in that system, plus he uses graduate students as course assistants in those SLN courses.
- Students are advised to check their course site daily. The minimum expectation is for students to log in at least four out of every seven days. Otherwise, students would fall behind and find it difficult to participate in the discussions in a timely, coherent manner. However, this requirement is not monitored due to the extra time burden that would be placed on the instructor. As a result of not being mandated and checked, this voluntary requirement goes unheeded by many students, even after requests for voluntary compliance by the instructor. It is another instance in which the instructor has to consider the

adage, "That which gets measured, gets done" and weigh the benefits of improved student participation against the added time pressure that would result for the instructor. The instructor usually checks the discussions at least once or twice a day during each of the seven days in each week.

Patterns of Student Participation

Students in the two distance learning courses have demonstrated some general participation patterns in the discussions. Generally, students have tended to respond to participation "mandates" better than voluntary or suggested participation. For example, as noted above, without the two point penalty involved in skipping discussions, there are students who would concentrate their postings in fewer discussions than are available. Skipping discussions adversely impacted on the quality of those discussions as fewer postings and interchanges were occurring among students and between students and the instructor. The problem was most evident in the sixth and final week of the courses, especially if students had completed their final exam early in the week and then calculated their course point totals. If the students discerned that they could cut back on their discussion participation and yet still earn their desired course grade, their participation levels dropped in the last week of the course. This pattern was noted for several years before the instructor instituted a one point penalty for each discussion that was skipped (an erstwhile "empty" discussion). While this change had some positive impact, a switch to a two point penalty seems to have proven more of a deterrent. The change has had a significant positive impact on reducing the problem of empty discussions.

Getting students to continue to participate at appropriate levels throughout the entire course is important because "in a learning situation the primary goal of any discussion is to promote thinking" (Peters, n.d., ¶ 6). It is difficult at best to encourage thinking and communication if the students exercise their option of not participating in a given discussion if that participation is voluntary.

Regarding maintaining a consistent level of participation during the week leads to an additional pattern, which is observed in the amount of student postings per a given discussion when there are several (two to four) active discussions. Specifically, it was observed that when students were given four discussions, for example, with all things being equal, there were often more discussion postings in the first discussion than in the last listed discussion. Human nature? Perhaps. Student interest and subsequent participation seems to wane in the later discussions. It also seems that when asked to submit at least seven postings per week there are students who keep close accounting of how many postings they have contributed so that they meet the minimum and not much, if anything, more. These seven postings more often than not get distributed more in the first few discussions than in the last few discussions. One implication for the instructor is to position the more important discussions at the beginning or the top of a list of discussions so that they get more attention and more postings, although this action itself might serve to reinforce the disparity between the numbers of postings in early versus later discussions.

One variable to consider for future research is the impact of instructor postings on the distribution of student postings. For example, will student postings increase in later discussions in direct proportion to the amount of instructor postings? Can instructors make adjustments to overcome the propensity of students to "use up" their postings requirement in early discussions? Certainly

there are a number of variables to take into consideration, such as the quality and type of instructor postings.

Another pattern emerges when analyzing when the students submit their discussion postings during each day. This pattern concerns the time of day when the students go online and post their discussion entries. As judged by when the postings are occurring, graduate students in these two distance learning course do a lot of their online discussion postings at work. Why? Most students relate that is because of the faster Internet connection found in the workplace (e.g., T1 line), as opposed to using a 56KB or DSL connection at home. However, contrary to having faster Internet connection speeds at work, according to the course evaluations, the most cited time to do coursework was 8-9pm, with 9-10pm being the second most cited timeslot. It would appear that the students preferred to do their online discussions at home rather than at work.

One more pattern of participation concerns the day of the week in which discussion entries are posted. With these two courses, the "day of the week" is not a specific day of the week, like a Tuesday, but rather a function of when a given instructional week starts and ends. As noted previously, these six week courses do not always start and end on the same days. That is, some course sections start on a Monday and end on a Tuesday six weeks later, while other sections begin on a Thursday and stop on a Friday. The study findings show that absent a mandatory requirement to submit postings by a certain time during the week, there are a disproportionate number of student postings in the last day or two of the week, regardless of which day of the week it is. When the online discussions last a week, there can be more than 40% of the postings occurring in the last two days of the week, especially the last day. For example, the study statistics indicated that when a course week started on a Wednesday, 44.58% of the weekly postings occurred on Monday and Tuesday (week ended on Tuesday). When a course week started on a Friday, 44.45% of the postings happened on Wednesday and Thursday (with the week ending on Thursday). The patterns were fairly consistent also in showing little activity in the first few days of the week, perhaps indicating that the students were taking a breather from all their postings in the last few days of the just concluded week and/or that the students wanted to do the textbook readings first before doing the discussions.

What is the reason for this pattern? The flip answer might be to say that students procrastinate. But another reason might be that not all online students have sufficient internal self-motivation or self-discipline. Yet another reason could be related to the assigned course reading, where students might feel an obligation to do the reading prior to participating in the discussions, whether or not the discussions have any direct connection to the reading. An inordinate number of late postings might satisfy a requirement for a minimum number of postings for the week, but does little to engender communication among participants when too many students are more concerned with meeting the letter of the requirements instead of the spirit of the requirements.

One other overall student pattern relative to their online discussions is that the students appreciate their participation in the discussions. While individual students might suggest particular modifications to the discussion requirements (e.g., mandate fewer postings), the vast majority of students enthusiastically endorse the use of discussions. When asked in the two course evaluations to compare their online learning experience to a traditional classroom, 60.45% of the student respondents indicated "better than usual" (i.e., traditional classroom) while 28.75% saw no difference, and only 5.05% thought their online learning course was "worse than usual" (5.75% had no opinion). Additionally, 91.64% indicated that they would take another online course from

the University of San Diego. These statistics are over the time period of 2001 through 2005 from 574 student respondents (representing a 59.79% response rate) who took either the Mainstreaming or the Computers course with the researcher. These statistics would seem to indicate an approval of the asynchronous distance learning courses. However, there are other factors to consider, such as the quality of the performance of the course instructor, in a future study.

To better understand why the students in these two courses preferred online learning, here are some selected student quotes that are representative of their views on discussions.

- "I agree that we learn so much more through our discussions than through projects and research reports. It is very insightful to read what others are learning and to use suggestions and ideas from others in our own teaching experience."
- "It's good to have a lot of input from people from different districts. I enjoy reading posts because it allows all of us to have a forum to discus and share ideas. Being able to get input and feedback from teachers at other schools is also very helpful, since the dynamics of a school can vary so much...and that can provide a lot of different viewpoints that might not be thought of at other schools. I really do like this collaborative approach much better."
- "I really really like the opportunity to discuss the different viewpoints and opinions! It's great to see what other teachers are doing in their classroom and what works best. It is also confidence building when you see that other people have similar game plans as you."
- "The discussions have been great. The sheer volume was overwhelming at first, but I would say that it is much better than the alternatives. I am taking another online class that involves two projects. I've gotten more out of our discussions than my other projects."

The five year study found recognizable patterns in how students participated in their asynchronous online discussions. Additional study is indicated that would dig deeper into these patterns to find their root causes, rather than rely on speculation on the part of the instructor or researcher. For now it is sufficient to know that students evidence distinct patterns of participation in discussions in several areas, including distribution of postings among multiple discussions, when postings are submitted each day, on which day of the week (relative to the start and end of a given week of class) entries are posted, and in their overall appreciation of the worth of the discussions. One of the often cited advantages of taking asynchronous distance learning courses is their inherent flexibility -- anytime and from anywhere there is Internet access. Balancing the student's desire for maximum flexibility (e.g. being able to submit discussion postings anytime during the week) with the instructor's need to employ a workable course format and methodology (e.g., leveling out the volume of postings) is an issue.

Summary

Several noteworthy student participation patterns have been observed in the two graduate distance learning courses - Mainstreaming: Teaching Individuals with Special Needs in the Regular Classroom and Computers for Educators Level I – offered by the University of San Diego. As taught by this researcher, these 100% online asynchronous courses include a discussion board component. As enrollments in distance learning increase and as distance learning courses incorporate such discussions, the importance of understanding how students use (i.e., participate in) these discussions assumes more importance. Distance learning instructors need to be aware of such patterns of student participation when designing and delivering their courses.

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Telephony Upgrade at a Small Institution – Lessons Learned

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Abstract

Young Harris College recently went though a telephony upgrade. Some of the reasons driving this where; a coming increase in OPX charges from the phone company, increase in student Cell phone usage, and decrease in resident hall phone increase, rising maintenance costs, needing to expand the administrative phone system, and freeing up some of the fiber network.

Note: This session is a panel discussion and no paper is expected. The presenters may provide handouts or web reference.

Easy Surveys, Polls,and Quizzes

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Abstract

Surveys are a valuable and popular tool in higher education. Many institutions require HTML or PERL programming knowledge to develop an effective online survey, poll or quiz. Have you ever wanted to put together a quick quiz for your class -- how about a survey for your department, division, or entire campus? There are several very good online survey options, however the desire to keep collected data confidential and 'on-campus' with no additional costs usually means utilizing existing resources.

This software demo will illustrate how to build a survey, poll or quiz utilizing Microsoft SharePoint® Portal Server. You can easily compare responses, export to excel, or get a quick graphical summary displaying an at a glance compilation of responses.

Note: This session is a software demonstration and no paper is expected. The presenter may provide handouts or web references.

Individual Group and Campus Collaboration Using Microsoft SharePoint Portal Server

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Abstract

This session provides an up front view of the Loras College Portal with emphasis on usages of SharePoint as a document repository and how individual, group, and campus information sources publish, approve, organize and streamline information. Microsoft SharePoint® Portal Server is a scalable portal server that can connect faculty, staff, students, administration and knowledge across academic processes, facilitating collaborative solutions. Campus perception, usage and expectations will be discussed.

Note: This paper was not received by the time the proceedings went to print. The author will provide written materials at the session or on the web.

Wikis, and Podcasts, and Blogs, Oh My! (Lessons Learned)

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Introduction

We were inspired by a Will Richardson (Richardson 2006 and http://www.weblogged.ed.com) presentation in August 2005 to begin exploring pedagogical potentials of using new Web technologies in our classes at the University of Indianapolis. We observed the ubiquitous iPod earphones traveling silently across our campus. The iPod has been called the Swiss Army Knife of electronics. We also watched students in our computer labs checking e-mail and visiting blog and chat sites. What is currently referred to as Web 2.0 is a shift in use of the Internet to allow students to use Web applications and save files online, to share ideas and files with other users, and to create original graphic, text, audio, and video content (Bull, 2006). We became aware of the anywhere, anytime delivery of content, emphasis on writing, reading, speaking, and critical listening that were possible (Alexander, 2006). We were also aware that the iPod gives students with special needs something to hold, a useful feature for special education students (Blaisdell, 2006). And most of our students are aware of the one famous wiki site, the wikipedia (at http://www.wikipedia.org).

The specific Web 2.0 applications we explored were blogs, wikis, and podcasts. We emphasize that we lacked support to explore these technologies. The university Information Systems staff approved what we did with the understanding that they would supply neither resources nor support, and they have been true to their promise. Therefore, we found free resources whenever possible and bought meager equipment to allow this pilot to begin.

The pilot was used with an educational technology class offered to first and second year teacher candidates at the University of Indianapolis. Our purpose was to integrate the technologies fully into one assignment, not merely to use podcasts, for example, as a way to deliver class lectures online.

The next section is a discussion of the resources we explored. The final section of this paper discusses the actual pilot and its successes and challenges.

Resources Used

We spent considerable time gathering and reading educational technology publications and Web posts related to our plan. From that and some time-consuming trial and error we determined that the following free Web resources would form the basis of our plan:

Blogs: Free blogs are easy to find, and they have a notorious reputation. Misuse of blogs and the negative reporting of inappropriate blogging activities made this an important decision. In the end we settled on using what is generally considered to be the dominant and easiest-to-use free blog, Blogger at http://www.blogger.com. We created blogs with one administrator, the instructor. Students could reply to any post created by the administrator, but in order to save their reply, they were required to log in to blogger with their user name and password. Although this took a bit of time for each student, the result was that it was clear which student was responsible for which reply

Wikis: We tried several free wikis and settled on seedwiki at http://www.seedwiki.com. It is extremely to use and presented no problems for us. Accounts can be created very quickly, and it is not necessary to have a seedwiki account to use the wiki once it has been created. The result was that unless a user who changed the wiki added their name, it was not clear who posted what.

Podcasts: This was clearly the most problematic issue, especially since we had no financial resources at first. A podcast is just an audio file in mp3 format posted to a Website that is downloaded to a computer automatically by the computer's podcast software, that in some cases may be the free and cross platform Apple iTunes. We will discuss the process and results further in a later section of the paper, but the resources we used included purchasing a USB microphone (Samson C01U USB Studio Condenser Microphone, about $80), the only purchase we made. We used free, cross-platform Audacity sound editing software to record and edit the files. This worked but was sometimes a problem. Mac users will enjoy using GarageBand 3, part of the iLife 06 software suite. It has robust podcasting and sound editing tools for the Mac. (See Johnson 2005 for a detailed description of creating a podcast.)

We needed a Web site to store our sound files and settled on the free site at http://ourmedia.org. Other more costly solutions include purchasing a .Mac account for Mac users or a subscription account to Liberated Syndication (LibSyn for short) at https://www.libsyn.com. The cost is presently $5 per month for 100MB of storage each month. Ourmedia did the trick for us. We continue to explore finding local server storage on campus, but they aren't returning our calls!

In order for the podcast to work properly, we needed to have the OurMedia files linked from a blog. We used a free site at blogger.com.

Finally, podcasts need an RSS (Real Simple Syndication) enclosure in order to work properly with podcast software. Had we paid for a LibSyn account, this would have happened for us more-or-less seamlessly with that product alone. But we didn't have money, so we used the free Web-based FeedBurner at http://www.feedburner.com. It proved to be only a little complicated to use, and the results, once we figured our how to use it, have been very good and reliable. Mac users can choose to purchase a .Mac account to solve this issue also, and there are other solutions. FeedBurner is often mentioned in the literature and seems to be a reliable solution.

Our Department of Teacher Education purchased a second Samson USB microphone for us to use with our classes. Other than that, to date we have spent nothing.

The instructor created hyperlinks in Blackboard and TaskStream to the blogs, wikis, and podcasts created for the class. Students used these resources as they completed their assignment to create a new lesson using innovative technologies.

Internet Safety

We teach technology courses for teacher education candidates. One of our concerns was to make our approach something that could be applied in the K-12 sector as well as in our college classes. We developed and piloted an acceptable use agreement to which all of the students agreed and signed. We had no problems related to inappropriate use of the applications other than occasional silliness that could be expected from 20-something students. The document we used follows:

The following statements apply only to external blogs, wikis, and podcasts on the Internet used for this class. They do not apply to your use of Blackboard and TaskStream, both of which are securely password protected.

I agree to the following terms of use for shared communication resources on the Internet for this class:

1. I will not post inappropriate material to blogs, wikis, or podcasts shared for this class.

2. I will not provide my full name, e-mail address, photo, or personal information about myself to areas shared for this class.

3. I will not reply to any inappropriate material that may be posted.

4. I will report any inappropriate material posted to Internet resources used by this class to the instructor.

5. I understand that inappropriate use of shared Internet resources for this class will result in a lowering of my grade and other possible action.

Your signature below indicates you agree to abide by these statements.

Name _____

Date _____

We also had concerns about copyright considerations in the classroom and attempted to follow the law with our student projects. (For more information on the Copyright law as it applies to classrooms, do a Google search for “TEACH Act.”)

The Pilot:

We created a new assignment for the class EDUC220/586, Technology in Education I, ordinarily taken during the first or second year. Students were told on the first day of class there would be a new and experimental assignment they would help to shape. We thought part of the experience would be to use a wiki as a vehicle for the instructors and students to design cooperatively assignment guidelines for this class and for subsequent classes. The instructor started it with only skeleton guidelines. The assignment divided the class into groups of three or four roughly assigned by content area interest and elementary education major versus secondary education major. It became evident as the assignment began that the instructor needed to be a little more specific. Students contributed several good ideas. The final assignment statement reads as follows:

Collaborative Learning Assignment
EDUC 220/582
Spring 2006

The intention is to use the group assignment as an exercise in exploring new media such as blogs, wikis, and podcasting and relate them to instruction based on the ISTE NETS-S standards for students. For this assignment you will be divided into small groups by the instructor. Each group will have its own blog space and its own wiki space.

Guidelines:

The group leader should convene your group during class. Choose a name for your group.

The instructor will create a blog and a wiki for your group and share the URLs with your group.

Read the National Educational Technology Standards for Students (NETS-S) on the inside front cover of your textbook, or find them at http://www.iste.org.

Decide and agree upon a topic for your group activity. It should have some relation to the NETS-S standards, but you will be given considerable freedom by the instructor as to exactly what you will do.

Some possibilities might include:

1. Create and use a blog site and a wiki to create a presentation for our class. It might result in a PowerPoint presentation or a Podcast on a topic related to NETS-S standards

2. Create and use a blog site and a wiki to create a lesson plan for a given subject and age level resulting in a WebQuest or podcast

3. Create and use a blog site and a wiki to create a lesson plan for a given subject and age level resulting in a video production.

4. Create and use a blog site and a wiki to create a presentation for our class that could be shared with others.

Present your project to the class.

Send the instructor TaskStream e-mail with the URL of any blog, wiki, or website you used.

Send the instructor TaskStream e-mail in which you describe your contribution to the group in relation to contributions of the other members.

Attach additional files, such as a PowerPoint slide show, to the instructor through TaskStream e-mail.

You will be graded using the rubric for this assignment.

You may be asked to complete a written evaluation of this assignment.

East student's grade for the assignment was based on two parts: a group grade was given to all students in the group and assessed the quality of the final product. The second individual grade was given to represent the individual's contribution to the group activity. Students created the following rubric using TaskStream for the instructor to use when determining the individual portion of the grade:

Group Project Rubric-use this — Created with www.taskstream.com

Levels / Criteria	Unsatisfactory (1)	Satisfactory (2)	Excellent (3)	Your Score
Participation	Student was excessively absent, and did not participate while gone, or did not participate while present.	Student often contributed while present, with few absences and acceptable amount of work.	Student frequently contributes more than is expected; no absences.	
Group Grade	Group's work is sloppy and contains multiple errors, and there is little creativity in the assignment.	Group worked together to create an assignment that is somewhat creative, and contains minimal errors.	The Group Project is unique and creative, and contains no errors.	

Results:

No group chose to create an original podcast, though they had all participated in an instructor-created podcast. They indicated it would be too complicated and time-consuming. In a lesson created by one of the groups, they indicated that their own students would use a podcast as the final project of the unit plan. Apparently more instructor assistance or urging is necessary for the teacher education candidates to enter into the podcast realm. Each group used their own blog and their own wiki to some degree of effectiveness. Most effective was use of the wiki. They used it to divide their work efforts and as a part of the lesson they created for their hypothetical class.

The blogs were used, but they were not popular with the students in this pilot. When asked later why this was, comments related to their common use of blogs to share personal interests, hobbies, or thinking on a number of issues. They were not as comfortable using that medium as they were with the wikis.

In a survey administered by the instructor to all class members, they indicated they would use blogs and wikis with their own students. They might consider using podcasts. They were generally positive to the use of these tools for instruction.

Lessons Learned:

We will use these technologies in our classes again, and we have a plan to expand them into our advanced educational technology classes, but we have learned a few things and will ask ourselves the following questions:

1. How much time will be required to use a new technology? We devoted considerable time in this effort. Much of that time was very late at night and over vacations.

2. Are the new Web-based resources safe for students? Our local media reported widely, and on more than one occasion, the misuse of blogs where adult men communicated with underage girls in inappropriate ways. Though our teacher education candidates were all over age 18, we made them aware of potential dangers and asked that they report them to the instructor immediately.

3. Will adequate support be provided to the instructor from the institution? We had practically none, and we succeeded despite this. We must note that our institution was aware of our efforts and blessed them.

4. Will there be rewards from the institution for instructor efforts|? We discovered that although the institution was not willing to provide much in the way of support, there was some recognition that the effort was useful and might eventually be applied by other instructors in their classes

5. Will student learning improve sufficiently to warrant spending time and money in this effort? Our student survey of attitudes toward using these technologies was encouraging. Casual observations of students engaging in learning using the new resources suggest that there was greater motivation to complete a successful assignment. The ability to share information with others seems to be a factor in the success of the assignment.

6. Can parents/students be expected to have iPods and computers with fast Internet Service Providers at home? We believe this may be a difficult problem in some situations. Home access to Web-based technologies, especially podcasts, depends on a fast connection. Podcasts once downloaded don't require an iPod. They can be heard directly from the computer, but the "cool factor" may be diminished. On our university campus everyone has access to computer labs to participate in these media. This benefit may not be available universally.

7. In a K-12 setting might some of the Web resource sites be filtered and therefore be unavailable to students even in school computer labs? This is potentially a large problem.

8. Are these passing fads that will fade in a short time? Time will tell, but other Web developments such as Yahoo, Google, online chats, Web-based course management systems, and eBay seem to have established as permanent and useful technologies.

Conclusion:

Pilot use of blogs, wikis, and podcasts with a course in instructional technology for preservice teacher education candidates at the University of Indianapolis was successful. Student group projects using the new Web-based media were of generally high quality. A brief survey of student attitude toward using blogs, wikis, and podcast technologies in their own teaching showed a general willingness on a part of the class members to employ them. Difficulties such as steep learning curve and large time commitment by the instructor, lack of campus technology support for the effort, and concerns for Internet security and Web filtering continue.

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Where is my Forensic Replicator (Lessons Learned in Developing an Information Technology Lab

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During the past 3 years, there has been a growing career in computer forensics. There are many reasons why the field is growing so fast. One of the reasons is that there are many shows on television that glorify the field of forensics. Another reason is that there is also a need because of the growing problem of Identity thief and child predators on the Internet.

With the growing need for individuals with a degree in Computer Forensics, American InterContinental University decided to add a Computer Forensics concentration to its Bachelor of Science in Information Technology degree. Since adding the Computer Forensics concentration, the School of Information Technology enrollment has grown by 20 percent. This in only the beginning, it is expected that this growth will last for the next 3 years.

As a result of the growth, it was very important that the School of Information Technology built a lab with the state of the art equipment in the Forensics' field. The Dean of the program researched many different companies and organizations to determine what was the best equipment for the program. Below is some of equipment that is being used in the School of Information Technology Forensics Lab.

PARABEN'S P3 POWER PACK

Forensic Replicator
Electronic media can be the key to a case and nothing is more important than acquiring that data. Paraben's Forensic Replicator duplicates exact copies of drives and media.

Paraben's Lockdown
Paraben's Lockdown is an advanced Firewire or USB to IDE **write-blocker** that combines speed and portability to allow IDE media to be acquired quickly and safely in Windows. Write-blockers prevent changes from being made to the suspect media.

P2 eXplorer
Paraben's P2 eXplorer allows you to mount your forensic image and explore it as though it were a drive on your machine while preserving the forensic nature of your evidence. This means that an image isn't just mounted to view logical files, it is mounted as the actual bitstream image, preserving unallocated, slack, and deleted data. P2X is easy to use.

Forensic Sorter
Sorting through data is an effective way to find exactly what you are looking for. Forensic Sorter classifies data into over 14 different categories, recovers deleted files, and filters out common

hashes, making your examination easier to manage, faster to process, and easier to find what you're looking for. Paraben's Forensic Sorter saves hours of examination time through this efficient classification and sorting process.

E-mail Examiner
E-mail Examiner doesn't just recover e-mail in the deleted folders; it recovers e-mail deleted from deleted items. With the ability to examine AOL 9.0, PST files (Microsoft Outlook), and ability to examine over 14 other mail types, you'll have the right tool for e-mail examination in your toolbox.

Network E-mail Examiner
With Network E-mail Examiner, you can now thoroughly examine Microsoft Exchange (EDB), Lotus Notes (NFS), and GroupWise e-mail stores. Network E-mail Examiner is designed to work hand-in-hand with E-mail Examiner and all output is compatible and can easily be loaded for more complex tasks.

Text Searcher
Text Searcher is a fast, comprehensive, and feature-rich text searching tool that will make any examiner more effective and more efficient. Text Searcher includes an indexing wizard, file libraries, supports multiple languages, and supports over 200 different file types.

Case Agent Companion
Paraben's Case Agent Companion is designed to optimize both the time of the examiner and the agent working the case. Built in viewers for over 225 file formats, searching, and reporting make Case Agent Companion the most comprehensive tool of its kind.

Decryption Collection Enterprise
Paraben's Decryption Collection is an advanced password recovery suite. Recover more passwords in a shorter amount of time. Everyone needs as many tools as possible in their toolbox. It loads a password cache for quick recovery of repeat passwords. English password recovery of 90% and higher.

PDA Seizure
The most advanced forensic tool for Palm, Windows CE, & BlackBerry devices. As an examiner you know better than anyone that the difference between making a case and losing a case is hard evidence. And with more bad guys going high tech, obtaining that evidence is becoming more difficult than ever. Paraben's PDA Seizure is a comprehensive tool that allows PDA data to be acquired, viewed, and reported on, all within a WindowsTM environment. You can also analyze Palm data that is stored on a PC.

PDA Seizure Toolbox
The PDA Seizure Toolbox was designed as a collection of the items that would be needed in different scenarios for PDA Seizure. The items in this toolbox in combination with the appropriate software allow for acquisitions of over 42 different PDAs.

Cell Seizure
Cell phone forensics is not to be compared with traditional bit stream forensics. Cell phone data storage is proprietary, based on the manufacturer, model, and system. Paraben's Cell Seizure was designed to allow forensic acquisition of user entered data and portions of unallocated storage on some devices. It also performs a forensic acquisition on all data stored on GSM Sim Cards including deleted data. Each device is unique and should be dealt with caution as each phone has unique considerations. Continual advances will be made to Paraben's Cell Seizure in reference to acquiring of proprietary data.

Paraben's Cell Seizure currently supports certain phone models from the following manufacturers: Nokia, Sony-Ericcson, Motorola, Siemens, Samsung, GSM SIM Cards

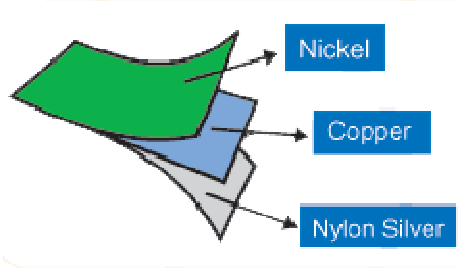
- Supports GSM as well as TDMA/CDMA phones
- Acquires text messages, address books, call logs, and more
- Acquires complete GSM SIM card information including deleted data
- Recovers deleted data
- Multi-language (Unicode) support for languages such as Arabic, Russian, Chinese, etc.

Cell Seizure Toolbox
The cell seizure toolbox contains connections and cables for GSM SIM Cards, Nokia, Ericsson, Siemens, Motorola, Samsung phones, and a Remote Charger for all types of Nokia, Motorola, Ericsson, Siemens, and Samsung phones.

StrongHold Bag
Build a fortress around your wireless evidence and keep unwanted wireless signals out.

Paraben's Wireless StrongHold Bag (Patent Pending) is the perfect evidence bag for any type of wireless device. First responders can use this bag to ensure proper wireless procedures are kept and that the evidence is protected from potential case killers - after seizure wireless communications.

The special tri-weave material used in the Wireless StrongHold Bag is made of a Nickel, Copper, Silver Plated Nylon plain woven fabric. This fabric is key in preventing unwanted signals from your evidence. Each StrongHold Bag comes with a clear evidence bag to allow for proper evidence handling.



Chat Examiner
Chatting online is not just a passing phase. More and more people are communicating through chat. And that means loads of digital evidence. As an examiner, you need a specialized tool to perform a thorough analysis of chat logs. Paraben's Chat Examiner is another specialized component of Paraben's P2 Forensic Collection that adds one more powerful program to your toolkit. Whether you're case has ICQ, Yahoo, MSN, Trillian, or Miranda you'll be able to handle whatever comes your way. Please note that AOL Instant Messenger (AIM) does not have traditional data stores or logs and therefore will not be supported by Chat Examiner.

NetAnalysis
Forensic examinations can consist of gigabytes of data that can make or break a case. However, one of the most pivotal pieces of evidence is sometimes overlooked, internet cache and history. NetAnalysis is the ideal tool for dealing with this data. The powerful searching, filtering and evidence identification make this tool not only feature rich, but the perfect tool to add to your arsenal for dealing with internet related data.

Supports Internet Explorer 3, 4, 5 & 6, Netscape Communicator / Navigator up to 4.79 & Apple Mac Netscape Bookmark, Netscape up to 6.2 and the new Netscape 7, Mozilla Browser, Opera
Support for AOL ARL History Files
Recover Deleted Internet History from Unallocated Space
Cookie and URL Viewer/Decoder
Filter to identify Google Desktop searches

ImageMASSter Solo III Forensic

Use:

- Forensically duplicate a suspect's data – identical bit by bit copy.
- Wipe data from a drive – removing all traces of the data. Meets U.S. Department of Defense specification DOD 5220-22M for sanitization of hard drives.

Benefits:

- Can make two evidence drives – identical copies for examining.
- Fast – data can be seized at speeds exceeding three gigabytes per minute.
- Built in hashing capabilities – makes sure that the new evidence drive matches the suspect's drive exactly.
- Built in Write Protection – so the suspect's data will not be overwritten by accident.

- Provide an Audit Trail and report Log for tracking what was done.

REMEMBER: Delete does not mean gone!

AccessData's Ultimate Toolkit ™

Includes:

- **Forensic Toolkit® (FTK™)**
  - Find, Organize, & Analyze Computer Evidence
  - Generate audit logs and case reports.
  - Automatically recover deleted files and partitions.
  - Target key files quickly by creating custom file filters.
  - Identify and flag known child pornography and other potential evidence files
- **Password Recovery Toolkit™ (PRTK™)**
  - Recover Lost or Forgotten Passwords
  - Recovers all types of passwords regardless of password length.
  - Analyzes multiple files at one time.
  - Recovers multilingual passwords.
- **Registry Viewer™**
  - Analyze & Decrypt Registry Data from AutoComplete "form" data from Google, Yahoo, and more; Internet Explorer account login names and passwords; Outlook and Outlook Express account information including servers, users, and passwords
  - View files individually without reconstructing the full Registry
- **100 Client Distributed Network Attack® (DNA®)**
  - Uses the power of machines across the network or across the world to decrypt passwords.
  - Easy to read Statistics and Graphs
  - Optimization for password attacks for specific languages
- **WipeDrive™ Home & Small Office Solution**
  - Completely Eliminate Hard Drive Data
  - Securely overwrite and remove ALL of your data. DoD 5220.22-M Approved.
  - Verifies your data has been erased.

REMEMBER: Formatting your hard drive DOES NOT erase your data!

Because of the success of the Computer Forensics concentration in the School of Technology, other schools have started looking into adding a concentration in Forensics. The School of Business is in the process of adding a concentration in Accounting Forensics. The School of Criminal Justice is also in the process of adding a concentration in Field Forensics.