ASCUE

ASSOCIATION OF SMALL COMPUTER USERS IN EDUCATION

"Continuing Second Quarter Century of Service"

Proceedings of the 2010 ASCUE Summer Conference

43rd Annual Conference

June 13 - 17, 2010

North Myrtle Beach, South Carolina

Edited by Peter Smith, Saint Mary's College, Notre Dame, IN

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Association of Small Computer Users in Education
"Our Second Quarter Century of Resource Sharing"

Proceedings of the 2010 ASCUE Summer Conference
43rd Annual Conference
June 13 – 17, 2010
Myrtle Beach, South Carolina
Web: http://www.ascue.org

ABOUT ASCUE

ASCUE, the Association of Small Computer Users in Education, is a group of people interested in small college computing issues. It is a blend of people from all over the country who use computers in their teaching, academic support, and administrative support functions. Begun in 1968 as CUETUG, the College and University Eleven-Thirty Users' Group, with an initial membership requirement of sharing at least one piece of software each year with other members. ASCUE has a strong tradition of bringing its members together to pool their resources to help each other. It no longer requires its members to share homegrown software, nor does it have ties to a particular hardware platform. However, ASCUE continues the tradition of sharing through its national conference held every year in June, its conference proceedings, and its newsletter. ASCUE proudly affirms this tradition in its motto: "Our Second Quarter Century of Resource Sharing"

ASCUE's LISTSERVE

Subscribe by visiting the site http://listinfo.ascue.org and follow the directions. To send an e-mail message to the Listserve, contact: members@lists.ascue.org Please note that you must be a subscriber/member in order to send messages to the listserve.

NEED MORE INFORMATION

Direct questions about the contents of the 2010 Conference to Dave Fusco, Program Chair, ASCUE '10, Juniata College, Huntington, PA 16652, 814-641-3684, fuscod@juniata.edu Web: http://www.ascue.org

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Keynote Speaker

Will Richardson is known internationally for his work with educators and students to understand and implement instructional technologies and, more specifically, the tools of the Read/Write Web into their schools, classrooms and communities. A former public school educator for 22 years, Will's own Weblog (Weblogg-ed.com) is a leading resource for the creation and implementation of Web 2.0 technologies on the K-12 level, and his is a leading voice for re-envisioning learning and teaching in the context of the fundamental changes these new technologies are bringing to all aspects of life.

His critically acclaimed, best-selling book Blogs, Wikis, Podcasts and Other Powerful Web Tools for Classrooms (2nd Edition, July 2008, Corwin Press) has sold over 50,000 copies and is already being used by tens of thousands of teachers to reinvent their practice, and his keynotes, presentations and workshops to audiences in China, Australia, Europe and throughout North America communicate a fresh and inspiring vision of what schools can and must become. Through the Powerful Learning Practice Network which he co-founded with Sheryl Nussbaum-Beach, he works with schools and teachers around the world to re-envision their learning cultures and communities

He is also a national advisory board member for the George Lucas Education Foundation, a member of the 2010 Horizon Project advisory board, a columnist for District Administration Magazine, and has published dozens of articles in various professional and mass market journals and magazines.

Will lives along the Delaware River in beautiful Western New Jersey with his wife Wendy and his children Tess and Tucker, all of whom are bloggers.

Pre-conference Workshops

Pre-conference Workshop 1
Principles of Project Management
Presented by: Craig Gray, Lee University

In this half-day workshop you will learn all the key elements of successful project management, including how to build a working project plan using Microsoft Project. You will be introduced to key principles, the PMBOK (Project Management Body of Knowledge); you will be given a small booklet entitled: Quick PJM Principles and full set of usable deliverable templates including: Project Charter; Communication Plans; Test Plans; Change Orders and more. These templates are not the 36 page complex object models, but rather working templates designed specifically for use in a small college environment. They will help you become more organized, have a better handle on small and large projects and provide the framework for successful project conclusions.

About the Presenter: Craig Gray began his career working as an office manager, but then moved on to product development working in the embryonic hybrid digital imaging industry. While working for Beattie Systems, he cut his teeth on technology projects, working with teams of software developers, optical and electronic engineers building cameras and software for professional studios. During this time he developed a turnkey software system for digital studios, and part of the software was published in the VB Programmer's Journal. This work opened up an opportunity to take the Vice President of System Administration at a retail photographic company in Michigan. After several years Craig left the digital imaging world to work on large Enterprise Resource Planning systems implementations and lead support teams for CMS Energy. While there, Craig's teams developed and supported software in 4 countries (US, UK, Argentina & Singapore). Craig came back to Lee in the fall 2003 to assume the role of Director of Information Services and Technology. He has used his background to begin leading upgrades of Lee's support and technology infrastructure, including the construction of a new Data Center and the 2 year project implementing Datatel's Colleague system. In addition to his job at Lee and teaching in the classroom, Craig also serves as a consultant on IT Best Practices, Leadership and Organizational Development. He is a regular contributor to the Asian studies leadership forum, and Tennessee Independent Colleges and Universities Association procurement committee. Craig is the father of six children, Lindsay, Anna Corinne, Caleb, CJ, Connor, and MiCayla. The oldest, Lindsay was recently married, and MiCayla will enter kindergarten next year..

Pre-conference Workshop 2
Screencastings 101: A Hitchhiker's Guide
Presented by: Steve Anderson, University of South Carolina Sumter

In this hands-on pre-conference workshop, participants will learn how to create their own screencasts using free or inexpensive software. We will learn how to create and produce narrated flash-based multimedia learning modules from "screen capturing" and also transform PowerPoint slides into a narrated flash video. Small projects can be nicely handled utilizing free software, while more extensive power can be had with less than a $200 investment. All of these can be published to your CMS, a blog, or a site like screencast.com.

About the Presenter: Steve has been presenting numerous papers and workshops in the area of screencasting for over 17 years. He has been attending ASCUE for 17 years as well. He appreciates sessions where the participants walk away with something useful, at a price that does not require an NSF grant. He also makes some mean beef jerky!

New Organization for the Proceedings

ASCUE initiated a refereed track for paper submissions to the conference in 2008. In fact, at the 2008 business meeting, the membership approved three different presentation tracks: refereed with 3 blind reviews for each paper, regular where the author submits a paper but it is not reviewed, and software demonstration where no paper is submitted and only the abstract is included in the proceedings. To reflect this division, we will divide the proceedings into three sections. The first, up to page 58, will contain the refereed papers, the second, from 59 to 180, will hold the regular track papers, and the last will list the abstracts for the software demonstration track.

ASCUE BOARD OF DIRCTORS FROM 1967 to 2010

At this conference we celebrate the 43rd anniversary of the founding of ASCUE at a meeting in July, 1968, at Tarkio College in Missouri of representatives from schools which had received IBM 1130 computers to help them automate their business functions and teach students how to use computers. They decided to form a continuing organization and name it CUETUG, which stood for College and University Eleven-Thirty Users Group. By 1975, many of the member schools were no longer using the IBM 1130, and were requesting to be dropped from the membership lists. At the same time, other small schools were looking for an organization that could allow them to share knowledge and expertise with others in similar situations. The name was changed from CUETUG to ASCUE at the 1975 business meeting and we opened membership to all institutions that agreed with our statement of purpose.

Our historian, Jack Cundiff, has collected the names and schools of the officers for ASCUE and its predecessor CUETUG for the last forty years and we have printed these names on the following pages.

ASCUE BOARD OF DIRCTORS FROM 1967 to 1972

	1967-68	1969-70	1970-71	1971-72
President				
	Ken Zawodny St. Joseph's College	Howard Buer Principia College	Jack Cundiff Muskingum College	Wally Roth Taylor University.
Program Chair				
	Wally Roth Taylor University	Jack Cundiff Muskingum College	Wally Roth Taylor University	James McDonald Morningside College
Past President				
	Al Malveaux Xavier, New Orleans	Ken Zawodny St. Joseph's College	Howard Buer Principia College	Jack Cundiff Muskingum College
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Secretary				
	John Robinson	Dorothy Brown South Carolina State	Dorothy Brown South Carolina State	Dick Wood Gettysburg College
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At Large				
	Don Glaser Christian Brothers C.	Don Glaser Christian Brothers	Don Glaser Christian Brothers	N. Vosburg Principia College
Public Relations				
				Dan Kinnard Arizona Western
Librarian				
				Jack Cundiff Muskingum College
Equip. Coordinator				
Web Coordinator				
Location:	Tarkio College	Principia College	Muskingum College	Christian Brothers

ASCUE BOARD OF DIRCTORS FROM 1972 to 1976

	1972-73	1973-74	1974-75	1975-76
President				
	James McDonald Morningside College	Dan Kinnard Arizona Western	T. Ray Nanney Furman University	Larry Henson Berea College
Program Chair				
	Dan Kinnard Arizona Western	T. Ray Nanney Furman University	Larry Henson Berea College	Jack McElroy Oklahoma Christian
Past President				
	Wally Roth Taylor University	James McDonald Morningside College	Dan Kinnard Arizona Western	T. Ray Nanney Furman University
Treasurer				
	J. Westmoreland U. Tenn Martin	J. Westmoreland U. Tenn Martin	Jim Brandl Central College	Jim Brandl Central College
Secretary				
	Ron Anton Swathmore College	Ron Anton Swathmore College	Harry Humphries Albright College	Harry Humphries Albright College
Board Members				
	John Orahood U. of Arkansas, LR	Al Malveaux Xavier, New Orleans	Sister Keller Clarke College	Sister Keller Clarke College
At Large				
	N. Vosburg Principia College	Wally Roth Taylor University	Wally Roth Taylor University	Mike O'Heeron
Public Relations				
	Dan Kinnard Arizona Western	Dan Kinnard Arizona Western	Dan Kinnard Arizona Western	Dan Kinnard Arizona Western
Librarian				
	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College
Equip. Coordinator				
Web Coordinator				
Location:	Georgia Tech	Morningside	Furman	Berea

ASCUE BOARD OF DIRCTORS FROM 1976 to 1980

	1976-77	1977-78	1978-79	1979-80
President				
	Jack McElroy Oklahoma Christian	Harry Humphries Albright College	Fred Wenn Caspar College	Doug Hughes Dennison University
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Past President				
	Larry Henson Berea College	Jack McElroy Oklahoma Christian	Harry Humphries Albright College	Fred Wenn Caspar College
Treasurer				
	William Roeske Houghton College	William Roeske Houghton College	James Foit Central Ohio Tech	James Foit Central Ohio Tech
Secretary				
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Public Relations				
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Librarian				
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Web Coordinator				
Location:	OK Christian	Albright College	Casper College	Dennison University

ASCUE BOARD OF DIRCTORS FROM 1980 to 1984

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Public Relations				
	Sister Keller Clarke College	Sister Keller Clarke College	Sister Keller Clarke College	Sister Keller Clarke College
Librarian				
	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College
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Web Coordinator				
Location:	U. Tenn Martin	Coe College	Chatham College	Taylor University

ASCUE BOARD OF DIRCTORS FROM 1984 to 1988

	1984-85	1985-86	1986-87	1987-88
President				
	Dudley Bryant	Paul Pascoe	Jack Cundiff	Keith Pothoven
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	Vincennes University	Horry-Georgetown	Central College	Union College
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	Taylor University	Western Kentucky	Vincennes University	Horry-Georgetown
Treasurer				
	Harry Lykens	Harry Lykens	Maureen Eddins	Maureen Eddins
	Mary Institute, St. L	Mary Institute, St. L	Hadley School Blind	Hadley School Blind
Secretary				
	John Jackobs	John Jackobs	John Jackobs	Dudley Bryant
	Coe College	Coe College	Coe College	Western Kentucky
Board Members				
	Keith Pothoven	Keith Pothoven	Robert Hodge	Robert Hodge
	Central College	Central College	Taylor University	Taylor University
At Large				
	Bob Renners	Carol Paris	Carol Paris	Ann Roskow
	Kenyon College	Goshen College	Goshen College	Ister CC
Public Relations				
	Dough Hughes	Wally Roth	Wally Roth	Wally Roth
	Dennison University	Taylor University	Taylor University	Taylor University
Librarian				
	Jack Cundiff	Jack Cundiff	Jack Cundiff	Jack Cundiff
	Muskingum College	Muskingum College	Horry-Georgetown	Horry-Georgetown
Equip. Coordinator				
Web Coordinator				
Location:	W. Kentucky	Vincennet	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 1988 to 1992

	1988-89	1989-90	1990-91	1991-92
President				
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Program Chair				
	Tom Warger Bryn Mawr College	David Redlawsk Rudgers University	Bill Wilson Gettysburg College	Carl Singer DePauw University
Past President				
	Keith Pothoven Central College	David Cossey Union College	Tom Warger Bryn Mawr College	David Redlawsk Rudgers University
Treasurer				
	Maureen Eddins Hadley School Blind	Maureen Eddins Hadley School Blind	Tom Pollack Duquesne University	Tom Pollack Duquesne University
Secretary				
	Dudley Bryant Western Kentucky	Kathy Decker Clarke College	Kathy Decker Clarke College	Dagrun Bennett Franklin College
Board Members				
	Kathy Decker Clarke College	Dagrun Bennett Franklin College	Dagrun Bennett Franklin College	Mary Connolly Saint Mary's College
At Large				
	Ann Roskow Ister CC	Rick Huston South Caolina/Aiken	Rick Huston South Caolina/Aiken	Rick Huston South Caolina/Aiken
Public Relations				
	Wally Roth Taylor University	Wally Roth Taylor University	Wally Roth Taylor University	Wally Roth Taylor University
Librarian				
	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator				
Web Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 1992 to 1996

	1992-93	1993-94	1994-95	1995-96
President	Carl Singer DePauw University	Rick Huston South Carolina/Aiken	Mary Connolly Saint Mary's College	Paul Tabor Clarke College
Program Chair	Rick Huston South Carolina/Aiken	Mary Connolly Saint Mary's College	Paul Tabor Clarke College	Carl Singer DePauw University
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Treasurer	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University
Secretary	Dagrun Bennett Franklin College	Dagrun Bennett Franklin College	Dagrun Bennett Franklin College	Dagrun Bennett Franklin College
Board Members	Mary Connolly Saint Mary's College	Gerald Ball Mars Hill College	Gerald Ball Mars Hill College	Rick Huston South Carolina/Aiken
At Large	Tom Gusler Clarion University	Tom Gusler Clarion University	Tom Gusler Clarion University	Tom Gusler Clarion University
Public Relations	Don Armel Eastern Illinois U.	Don Armel Eastern Illinois U.	Don Armel Eastern Illinois U.	Peter Smith Saint Mary's College
Librarian	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator				
Web Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 1996 to 2000

	1996-97	1997-98	1998-99	1999-2000
President				
	Carl Singer DePauw University	Carl Singer(acting) DePauw University	Bill Wilson Gettysburg College	Dagrun Bennett Franklin College
Program Chair				
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	Mary Connolly Saint Mary's College	Mary Connolly Saint Mary's College	Carl Singer DePauw University	Bill Wilson Gettysburg College
Treasurer				
	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University
Secretary				
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At Large				
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	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College
Librarian				
	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
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				Rick Huston South Carolina/Aiken
Web Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 2000 to 2004

	2000-01	2001-02	2002-03	2003-04
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Program Chair				
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	Grove City College	Sinclair CC	Baptist Bible College	Saint Francis College
Past President				
	Dagrun Bennett	Carol Smith	Fred Jenny	Nancy Thibeault
	Franklin College	DePauw University	Grove City College	Sinclair CC
Treasurer				
	Tom Pollack	Tom Pollack	Tom Pollack	Tom Pollack
	Duquesne University	Duquesne University	Duquesne University	Duquesne University
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	Nancy Thibeault	Kim Breighner	Kim Breighner	Kim Breighner
	Sinclair CC	Gettysburg College	Gettysburg College	Gettysburg College
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	Saint Francis College	Saint Francis College	Saint Francis College	Pikeville College
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	Saint Mary's College	Saint Mary's College	Saint Mary's College	Saint Mary's College
Librarian				
	Jack Cundiff	Jack Cundiff	Jack Cundiff	Jack Cundiff
	Horry-Georgetown	Horry-Georgetown	Horry-Georgetown	Horry-Georgetown
Equip. Coordinator				
	Rick Huston	Hollis Townsend	Hollis Townsend	Hollis Townsend
	South Carolina/Aiken	Young Harris College	Young Harris College	Young Harris College
Web Coordinator				
			Carol Smith	Carol Smith
			DePauw University	DePauw University
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 2004 to 2008

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Program Chair				
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Past President				
	Barry Smith Baptist Bible College	George Pyo Saint Francis College	Jim Workman Pikeville College	Lisa Fears Franklin College
Treasurer				
	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University
Secretary				
	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College
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	Lisa Fears Franklin College	Blair Benjamin Philadelphia Bible	Blair Benjamin Philadelphia Bible	Janet Hurn Miami U. Middleton
At Large				
	David Frace CC Baltimore County	David Frace CC Baltimore County	David Fusco Juniata College	David Fusco Juniata College
Public Relations				
	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College
Librarian				
	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator				
	Hollis Townsend Young Harris	Hollis Townsend Young Harris	Hollis Townsend Young Harris	Hollis Townsend Young Harris
Web Coordinator				
	Carol Smith DePauw University	David Diedreich DePauw University	David Diedriech DePauw University	Blair Benjamin Philadelphia Bible
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

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	2008-09	2009-10
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	Miami U Middleton	Juniata College
Past President		
	George Pyo	Fred Jenny
	Saint Francis College	Grove City College
Treasurer		
	Tom Pollack	Tom Pollack
	Duquesne University	Duquesne University
Secretary		
	Kim Breighner	Kim Breighner
	Gettysburg College	Gettysburg College
Board Members		
	Dave Fusco	Thomas Marcais
	Juniata College	Lee University
At Large		
	Andrea Han	Andrea Han
	Miami U Middleton	Miami U Middleton
Public Relations		
	Peter Smith	Peter Smith
	Saint Mary's College	Saint Mary's College
Librarian		
	Jack Cundiff	Jack Cundiff
	Horry-Georgetown	Horry-Georgetown
Equip. Coordinator		
	Hollis Townsend	Hollis Townsend
	Young Harris	Young Harris
Web Coordinator		
	Steve Weir	Steve Weir
	Philadelphia Bible	
Location:	Myrtle Beach	Myrtle Beach

Cyber Defense Competitions - Educating for Prevention

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Abstract

Information security remains a critical topic in today's information driven societies. Societies, and especially educational institutions, have been called to action to help raise information security awareness. Cyber Defense Competitions are an attractive option for raising awareness and interest in information security while simultaneously educating for prevention. Different approaches exist to implement Cyber Defense Competitions but the goal remains the same – to educate. Universities are ideally positioned to orchestrate such competitions for the betterment of current and future students and to contribute to the best preparation of future information workers and leaders. The purpose of this paper is to clarify the importance of information security and the role education organizations have been called to play, identify the goals and benefits of Cyber Defense competitions within this context and especially with respect to educating for prevention, and share the advantages/disadvantages of different approaches to implementing such competitions.

Introduction

Information security remains a critical topic in today's information driven societies. Our educational organizations and nation are collectively facing increased risk resulting from the prolonged dearth of information security practitioners and low level of information security awareness in our general population. Educational organizations are, however, "… uniquely and ideally positioned to significantly contribute to the best preparation of future information workers and leaders through the advancement of safe and sensible educational computing practices" (Albert, R., 2009, p. 1). Through better education, personal and "… community involvement, appropriate information security practices will supplant those that are inappropriate and society will be better for it." (p. 8)

Societies, and especially educational institutions, have been called to action to help raise information security awareness. In early 2009, President Obama ordered a 60-day, comprehensive, "clean-slate" review to assess U.S. policies and structures for cybersecurity. One of the observations contained in the report that resulted from the review was that changes are needed in education, among other sectors, that require strong vision and leadership. The relationship between what must be done and which organizations should be involved is clearly portrayed in the report.

"The United States should initiate a K-12 cybersecurity education program for digital safety, ethics, and security; expand university curricula; and set the conditions to create a competent workforce for the digital age… To help achieve these goals, the Nation should:

- Promote cybersecurity risk awareness for all citizens;
- Build an education system that will enhance understanding of cybersecurity and allow the United States to retain and expand upon its scientific, engineering, and market leadership in information technology;
- Expand and train the workforce to protect the Nation's competitive advantage; and
- Help organizations and individuals make smart choices as they manage risk. " (NSC, 2009, p. 13)

The report includes specific near- and mid-term action plans including initiation of "… a national public awareness and education campaign to promote cybersecurity." (p. 37), expanding "… support for key education programs and research and development to ensure the Nation's continued ability to compete in the information age economy… [and development of] …a strategy to expand and train the workforce, including attracting and retaining cybersecurity expertise in the Federal government. "(p. 38)

The importance of securing the cyberspace world of the 21st century is underscored by the change in the United States Air Force (USAF) mission statement. On December 7, 2005, the USAF changed its mission statement to include the cyber security concept. It now reads, "The - mission of the United States Air Force is to deliver sovereign options for the defense of the United States of America and its global interests -- to fly and fight in Air, Space, and Cyberspace." (USAF, 2005)

The private sector too has acknowledged the considerable and growing need for skilled information security practitioners. For example, the Center for Strategic and International Studies (CSIS) has established "a national talent search and skills development program. Its purpose is to identify 10,000 young Americans with the interests and technical computer skills to fill the ranks of cyber security practitioners, researchers, and warriors. In particular, the search is looking for the people who can become the top guns in cyber security" (CSIS, 2010). When the government and private sector needs are combined, the impetus for educational organization action becomes very clear. The question that naturally follows is, 'Exactly what can educational organizations do to respond?'

The authors' experience in this field has yielded anecdotal evidence consistent with that of others (e.g., Jacobson, D. & Rursch, J.) that supports the notion that Cyber defense competitions are an attractive and effective option for raising awareness and interest in information security while simultaneously educating for prevention. Of the competitions reviewed in this paper, there are two major categories that can be distinguished based on their goals. For the first type of competition (e.g., CyberPatriot and NetWars), achievement of the competition goals naturally leads to prevention of the negative consequences associated with the United States being unable to adequately defend its cyber infrastructure and resources (hereafter referred to as defense-based competitions). For the second type of competition (e.g., IT-Adventures and NCCDC), achievement of the competition goals naturally leads to prevention of the negative consequences associated with the US being unable to adequately compete in an increasing technological global marketplace (hereafter referred to as development-based competitions). Thus, education for prevention is a theme that all approaches share in common.

Universities are ideally positioned to orchestrate and host such competitions for the betterment of current and future students and to contribute to the best preparation of future information workers and leaders. The structure of most cyber defense competitions fosters the establishment of working relationships between industry partners and participating schools and these relationships are most often enhanced through university involvement. Industry partners often provide support in the form of sponsorship and/or human resources in exchange for the opportunity to meet and converse with top performers. Participating universities often provide information security curricula and degree options in addition to hosting those competitions not conducted entirely online. The effectiveness of such educational programs is greatly enhanced by the excitement and enthusiasm that is nearly universally experienced by competition participants.

Cyber-Defense Competition Goals and Benefits

The history of cyber-defense competitions is often cited as starting around 2001, with early information warfare exercises within and between military academies. The goals of these defense-based competitions remain in large part the same as those of subsequent competition formats that evolved after an early-2004 meeting of academicians and others in San Antonio, -
Texas. One outcome of that meeting was the 2005 establishment of a collegiate cyber-defense competition (CCDC) by the University of Texas at San Antonio. The success of the CCDC competition in attracting participants has led to its evolution into a regionalized national competition (NCCDC). Other competitions have since been established based on the success of NCCDC model and now involve secondary education students.

The current incarnations of cyber defense competition formats differ in their degree of offensive tactics and level of network configuration involvement. At one end of the spectrum are capture the flag competitions (e.g., NetWars) where teams of students attempt to gain access to specific flag files on competitor computer systems. This type of competition favors those teams who employ significant offensive tactics. At the other end of the spectrum are purely defensive competitions (e.g., CyberPatriot, NCCDC) wherein teams of students compete to quickly remove as many vulnerabilities as possible from the preconfigured virtual machines and/or networked computer system they are provided. This type of competition favors those teams who employ significant defensive tactics. Between these two formats are competitions that are primarily defensive in nature but include an element of network configuration (e.g., ISU IT-Adventures). This type of competition requires students to build their own network and subsequently defend it during the competition while being simultaneously charged with supporting end users.

The competitive element of these events drives and compels all participants to more enthusiastically commit to and engage in active experimentation and learning. According to Conklin

(2006), “Participating students learn in a true active learning environment. Instructors are able to evaluate the thoroughness of their curriculum in its intended setting…In the end, everyone feels they had learned important lessons.” (p. 1) This level of commitment and drive are essential to most successful educational endeavors. The more motivated the student the more likely the educational goals will be achieved.

Since these competitions are relatively new and are enjoying significantly increasing levels of participant interest, assessment of their effectiveness in meeting their goals has for the most part not been formally pursued. This paper attempts to broach this subject by both providing a brief overview of each competition and identifying common traits and unique characteristics that may be considered (dis)advantages depending upon the context and goals of the host institution. The authors acknowledge that the identified traits are not the only ones available and that each institution must decide for itself that approach best matching its goals and ability to commit resources to successfully host such a competition.

Cyber-Defense Competition Approaches

There are fundamentally three types of approaches for cyber defense competitions involving post-secondary education participants. The first approach is focused mainly on offensive tactics where the students configure their own network environments and hack into competitors' machines to capture the “flag”. The second approach is a purely defensive competition wherein teams of students remove vulnerabilities and harden their preconfigured systems before professionals attack them. The third approach is a hybrid approach which is defensive in nature but the teams must build and configure their own networks and provide end users with various services (such as email, web mail and web site) while thwarting off attacks. This section covers - some of the most successful implementations of cybersecurity competitions; what type of competition is it and how they did it. Table 1 summarizes a few key attributes.

Cyber Defense Competition Approaches

Approach	Competition/Organization	Environment	Host University Resource Demand	Participating School Resource Demand
Defense-based competitions - prevention of the negative consequences associated with the United States being unable to adequately defend its cyber infrastructure and resources				
Defensive Remove Vunerabilites	CyberPatriot/AFA	Pre-configured Virtual Machine Images or Remotely Accessed Computer Network	Time: Medium Cost: High	Time: Medium Cost: High
Offensive "Capture the Flag"	NetWars/SANS	Pre-configured Virtual Machine Images used to Access Online Environment	Time: Low Cost: Low	Time: Low Cost: Low
Development-based competitions - prevention of the negative consequences associated with the US being unable to adequately compete in an increasing technological global marketplace				
Hybrid Offense and Defense	IT-Adventures/ Iowa State University	Remotely Configured Computer Network with User Support	Time: High Cost: Medium	Time: High Cost: Low

Table 1: A few key attributes of predominant cyber defense competition formats.

CyberPatriot

CyberPatriot (http://www.highschoolcdc.com/) is a defense-oriented cybersecurity competition recently sponsored by the Air Force Association (AFA) in 2008 and technically offered by Science Applications International Corporation (SAIC). The AFA created a "truly national high school cyber defense competition" in an attempt to meet the growing need for cyber security talent in the United States. The initial phase (called CyberPatriot I), was designed to prove that a "National High School Cyber Defense Competition could excite and motivate students…" (AFA, 2009). The CyberPatriot I culmination competition was held in conjunction with the Air War Symposium in Orlando in February 2009, and included AFJROTC (Air Force Junior Reserve Officer Training Corps) and CAP (Civil Air Patrol) high school students in the state of Florida.. The Air Force Magazine reported on the success of CyberPatriot I and remarked "One thing CyberPatriot is not meant to be is a training ground for hackers. Hackers are searching for one chink in a computer system's armor; defenders have to mount a broader effort that takes into account all the different ways hackers might work." (Grier, P., 2009)

The participants in the first CyberPatriot competition were so excited and motivated by the activity-based real world scenarios of the competition that the AFA implemented CyberPatriot II during the 2009-2010 academic year. This competition was open to all AFJROTC and CAP units. Of the 225 participating units across the United States and overseas DoD high schools, -

eight teams advanced to the finals and competed on February 18-19, 2010 in Orlando. This was an important phase as it proved that a geographically diverse competition could successfully be orchestrated to narrow the field down to the final competitors. The third phase has as its goal, to open the CyberPatriot competition to any high school student.

The AFA accomplished their success through the help of the Center for Infrastructure Assurance and Security (CIAS) of the University of Texas – San Antonio. This partnership provided them a link to the National Collegiate Cyber Defense Competition through the CIAS director, Dr. Greg White and gave them access to educational resources that had been previously created by the graduate students from the university. The AFA also worked with the Science Applications International Corporation (SAIC) – developers of the CyberNEXS Cyber Defense Trainer. Through SAIC, the Air Force Association only needed minor modifications to an established and proven industry leader in cybersecurity training software. This saved them valuable time and money in creating an environment that would support their needs for multiple rounds of competition.

For CyberPatriot II, any high school with an AFJROTC or CAP group was encouraged to register. Once the team registered, they gained access to the training materials (videos, website links, training manuals, etc.) and the schedule of rounds. The student teams studied for the competition by reviewing the training materials and investigating how to secure a network by focusing on the task of removing operating system vulnerabilities. SAIC through their CyberNEXS (pronounced cyber nexus) software offer two options for game day.

The first option is a distributed game, where the contestants connect remotely and download VMware images to their own equipment. All teams receive the same image on the same day. After downloading and installing the VMware image, it connects to the CyberNEXS server and the teams view a real-time scoreboard of the vulnerabilities that they have removed. The major processing burden is on the local machines, so this distributed option is very scalable and thus a great way to conduct qualifying rounds for the final competition.

The second option is a centralized game where the teams interact with the CyberNEXS environment. The teams connect to the server and assume control of their systems where they need to quickly begin hardening their system by removing vulnerabilities. They are given a window of time to fix as many problems as possible before a team of hackers tried to take over their system. The teams are expected to document all trouble tickets and the status of their systems throughout the competition. This option is usually reserved for the final round of competition (8-10 teams) as it does not scale well as it is resource intensive (centralized processing and hackers).

The major potential benefits of the Cyber Patriot II approach to the AFA are that the software and resources already exist to begin this type of regional competition in your area. This competition format still requires that it be orchestrated (organized, publicized and managed), but the technology aspects are virtually a turnkey solution. Aside from the logistical benefits, this defensive approach mirrors the real world situations these students are likely to face. CyberNEXS is a professional training and evaluation system used to train cybersecurity professional and as such can be used to provide certifications in various areas of security. The -

practice rounds give students the experience and confidence they need to compete during the final rounds. All students who participate in any of the rounds will benefit from the awareness of cybersecurity measures. The final round fosters application of critical thinking skills as the students are protecting their systems from live and dynamic attackers trying to break into their systems.

NetWars

NetWars (http://www.sans.org/netwars/) is an offensive-oriented cybersecurity competition that is conducted entirely online and made available to high school students through post-graduate students. It is an online game where the purpose is to break into systems to gain access to a file or files (the flag) to prove that you successfully penetrated the defenses. The NetWars game is conducted by SANS Institute. It is a major player in the training and certification of cyber security professionals in the United States. SANS claims they "develop, maintain, and make available at no cost the largest collection of information security research documents and whitepapers about various aspects of information security and operate the Internet's early warning system - the Internet Storm Center." (SANS, 2010) Besides the training materials, they provide links to other resources. Participants may play the game either as individuals or as members of a team. NetWars might lend itself to building bridges between the high school students and the universities if utilized to the fullest. In and of itself, NetWars is not as well suited to being hosted by a college or university. SANS has regularly announced the availability of a new round of the competition for participants to engage in. Participants work in an offensive fashion to break into systems and capture flags for points.

Perhaps the greatest potential benefit of the NetWars approach is that it requires the least time and monetary resources of all of the competitions. This is due to that fact that no host organization, other than SANS of course, need be involved. Individuals and teams are free to participate at no cost and they only need access to an Internet attached computer in order to play the game.

Iowa State University's IT-Adventures

IT-Adventures Cyber Defense competition (http://www.it-adventures.org/cdc.html) is a hybrid defensive- and offensive-oriented cybersecurity competition that Iowa State University (ISU) developed and created for Iowa State high school students. IT-Adventures was created in response to the realization that enrollments are continuing to drop in the science, technology, engineering, and mathematics (STEM) disciplines while the need for information technology workers increases yearly (especially in the area of information and cyber security). The creators realized that in Iowa, many high schools do not offer computer science or networking classes and counselors were steering students away from careers in information technology. To combat this phenomena, the computer science department created an after school extra-curricular activity to allow students to "explore information technology in a non-threatening, non-graded environment." (Jacobson, D., 2008, p 60)

ISU's approach encourages inquiry-based learning. It began in 2006, when they sponsored a cyber defense competition for the high schools in the state of Iowa. In 2007, they included the -

formation of extra-curricular high school clubs that met for several months before the competition. This enabled the students to study and learn together before having to compete, much like a sports team has months of training before their first competition. The clubs discuss security issues and work through hands-on learning modules.

This type of competition begins with the formation of a team of high school students managed by a team advisor with access to a mentor (who is typically an IT professional). For this approach, the high schools had little out of pocket costs as ISU provided each club with the necessary equipment and training materials to participate in the program. The schools needed to form a club with an advisor to receive the equipment. ISU undergraduate and graduate students developed most of their training materials including demonstrations and lectures.

High schools received their equipment several months before the competition to ensure ample time to learn about cybersecurity concepts. The clubs in the ISU competition had to configure and setup their own network to support end users and their needs. The specifications were sent to the teams one month before the competition. Teams participated in attack and defend competitions while simultaneously maintaining their network services (e.g., email, file sharing, web) for their clients.

The competitions are held at the university where students bring their equipment and set up their networks. During an 18-hour competition, the teams try to defend their networks while minimizing downtime of services for their customers and plan capture the flag attacks on other competitors' networks.

In more recent years, ISU has expanded the venue to include robotics and game design, but have retained cyber defense as the predominant component of the competitions. This year the culmination of the IT-Adventures experience is a two-day competition called IT-Olympics situated on the ISU campus. In an attempt to attract more young women to the competitions, ISU also added an information technology community service project for all competing teams. In reply to a reported overwhelmingly positive response, the "Community College Cyber Defense Competition (CCCDC) was created as a bridge between Iowa State University and the 15 community college districts in the state of Iowa." (Rursch, 2010, p. 1)

One of the major potential benefits of this approach is the considerable emphasis on educating all participants through a well-crafted organizational structure and collection of educational resources. An equally important potential benefit is the establishment of post-secondary and university partnerships that help to raise awareness and interest of students in information technology as well as other STEM disciplines.

Experience with all of these competition formats has confirmed their ability to pique students' interests in STEM disciplines and more specifically the fields of information technology and information security. Less apparent however, is which approach is most appropriate to implement given the goals of the host university and intended participants. Any university desiring to implement their own cyber defense competition should carefully consider the resource demands of each approach, explore partnerships with other organizations for funding and other assistance, and ensure their goals are clearly identified.

Conclusion

Given the spotlight that the government and private sectors currently shine on cybersecurity, the number of organizations desiring to form partnerships that avail cyber defense competitions to high school students is expected to continue to grow. Colleges and universities are ideally positioned to foster such partnerships. The popularity of cyber defense competitions among high school and college students is evident. The growth reported by some universities borders on becoming viral in nature. It is acknowledged that competitions can be categorized in many ways. Three predominant competition formats were presented and contrasted along with potential advantages respective to each.

If your post-secondary institution is searching for a way to raise interest and awareness of students in STEM disciplines with relevance and excitement, then serious consideration should be given to stepping into the world of cyber defense competitions. Given that there are several cyber defense competition formats, it becomes a matter of determining which format will best help your organization to achieve its goals with the resources that are available.

While the golden standard of these formats, in terms of educational emphasis, is the Iowa State University IT-Adventures model, it is clearly the most resource demanding option for both the host university and participating high schools. While the least resource demanding and easiest approach to implement is clearly SANS NetWars, it does not have a development focus that helps to nurture the development of critical thinking skills essential to long-term success. CyberPatriot, on the other hand, may be the best format to utilize to host your inaugural year competition as it offers a moderate degree of education in exchange for a moderate investment in time and money. Overall, be sure to regularly check for changes in the formats of all of these cyber defense competitions as they are continuing to rapidly evolve.

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Is That a Wiki in Your Classroom?

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Background

A wiki was defined as "the simplest online database that could possibly work" by Ward Cunningham, who is credited with coining the term and creating the first wiki, The Portland Pattern Repository, in 1995. Ward chose the Hawaiian name Wiki Wiki Web, which means "very quick" or "quick quick". Wikis are accessed via a web site, thus providing access to everyone. Wikis stand apart from other Web 2.0 tools such as blogging, as they are developed collaboratively by many authors. Wiki users can create, modify and delete the content of the wiki.

The creation of these open source, moderated, web based documents started with a few small wikis and expanded into larger concepts, including Wikipedia, MeatballWiki, and MetaWiki. Today wikis have experienced a high rate of growth with many specialized applications. Using wikis in the classroom provides students with exposure to this important collaboration tool. As Tapscott and Williams, the authors of Wikinomics (2008) note:

> A power shift is underway and a tough new business rule is emerging: Harness the new collaboration or perish. Those who fail to grasp this will find themselves ever more isolated - cut off from the networks that are sharing, adapting, and updating knowledge to create value (p. 268-271).

Wikis have made the transition from stand-alone online databases, to being components of other applications, such as content management systems. Many commercial and open source content management systems exist. Some popular commercially available content management systems include Blackboard, eCollege, Desire2Learn and CyberExtension; while, some common open source content management systems such as Moodle, Dokeos, and Sakai are very popular. Other popular packages included WebCT and Angel, however, these were recently acquired by Blackboard. Whether a commercial or open source content management system is implemented, most share similar functionality, including wikis.

Wiki Project Goals

Wikis used in the classroom usually support a teaching objective, and Phillpson (2008) classified instructional uses of wikis into "five stages of inquiry". These included: 1) a resource wiki, a knowledge form that is created collectively; 2) a presentation wiki, or using a wiki to communicate an individual's work to a group; 3) a gateway wiki, or using a wiki to develop a discussion of data; 4) a simulation wiki, or using a wiki to simulate an environment for exploration; and 5) an illuminated wiki, the use of a wiki to jointly develop a group document including print, graphic, audio and video hyperlinks. Nielsen (2009) suggests other reasons to use wikis in teaching, including: 1) decrease disruptions of instructional time, 2) make meetings more efficient, 3) collaborate on important documents, 4) enhance professional development; 5) share and collaborate on curriculum maps; 6) save trees and time; and 7) a portal for collaborative teaching. Ferriter's (2009) research also supported these collaborative uses of wikis for educators.

The wikis presented could be classified as either resource or presentation wikis. The importance of using technology effectively in the support of instructional goals should be recognized. The primary teaching objective was to further enhance the learning process by using wikis as an auxiliary teaching tool in a face-to-face class environment. Using a wiki: 1) provided a tool to reinforce basic skills, 2) promoted student responsibility for their own learning via collaborative learning techniques, and 3) taught students peer review concepts.

Reinforcing basic skills included these goals: 1) develop student research skills; and 2) enhance student technology skills. Engstrom and Jewett's (2005) research noted that developing students thinking and decision making skills with the use of information literacy skills was a key benefit of using wikis collaboratively. They further recommend that teachers participate in professional development to provide them with the resources and practice in prompting students critical thinking. (Mackenzie's Questioning Toolkit is recommended as a resource (http://questioning.org/Q7/toolkit.html; Engstrom and Jewett, 2005, p. 15). Student technology skills were enhanced through the use of a wiki to develop materials that could benefit their own study objectives as well as those of their peers. Students learned what a wiki was; how to develop a wiki, rather than just use a wiki; and how to effectively add to or correct other student postings.

The wikis presented here promoted student responsibility for their own learning via collaborative learning techniques. Students were charged with the responsibility to develop a student maintained resource via the use of wikis. Students were provided with the opportunity to work with others in a collaborative written forum, and to benefit from the results of this work through their study and ultimate understanding of the material. Ajjan & Hartshorne (2008) note that researchers have documented the value of this type of collaborative writing in terms of increased motivation, positive attitudes, and greater achievement.

The final goal of this project was to teach students peer review concepts. Wikis are by definition a user developed resource; other users must review the information posted for reliability. Students may not be familiar with the concept of peer review. A definition of peer review is to "referee: evaluate professionally a colleague's work" (Princeton, 2010). Peer review in this learning environment included students reviewing postings on the wikis; determining if the posting was accurate, and making corrections or additions to the wiki.

Implementation

The wikis were designed to have three levels of user access. First the instructor, or wiki designer, has complete access to the entire wiki. The role of the designer is to create the wiki hierarchy and templates that could be implemented by the wiki moderator, or builder. Once the moderator has received training from the designer, the role of the moderator is to implement the wiki design and to then moderate the content posted. The wiki designer may also function as a moderator for the wiki; however, the moderator is typically a student worker or research associate that has previous knowledge of the wiki design concepts. Like the wiki designer, the wiki moderator also has complete access to the wiki pages. Finally, the current students supply the information to the wiki and perform peer review on wiki concepts and course content. Students only have limited access to the wiki and can only modify certain portions as specified by the designer or moderator.

The main entry page to the wiki mimics a table of contents to provide a top-level access to the rest of the wiki. The moderator or wiki designer provided the names of topics on this page for the students. The entries to this page serve as links to secondary pages within the wiki that contain further, more specific information on each particular topic. Students do not directly edit this page

The next page provides further, more specific information on the topic chosen. This is essentially the second tier in the hierarchical structure of the wiki. As with the top page in the wiki, each entry is a link that will navigate to the third level of the wiki. Only the wiki designer and moderator have full access to this page, students cannot edit the links on this page.

The final level of the wiki, the third level, contains the pages that are editable by the students directly. Because of this, the moderator must strictly monitor these pages for accuracy. This page contains very specific information that each student can acquire through a number of different sources and post their findings. Students are free and encouraged to verify and re-verify the postings on the wiki with their own information. When discrepancies are identified, students are encouraged to post the differing findings and a discussion typically takes place as a result. This process has the added benefit of teaching the students the necessity and value of reproducibility and validation of work. Data posted on this section of the wiki is validated three ways: 1) by peer review; 2) moderator review and 3) if necessary, review by the designer. The most effective validation technique is peer review. Here students are encouraged to review the current postings to check for discrepancies. When a discrepancy is identified, discussion can ensue and if necessary, the moderator or wiki designer can provide final approval. When students post their information in this section of the wiki, they are required to cite a reference where they found their information so that the moderator may quickly eliminate inconsistencies. By default, students do not have the ability to delete or modify other student's posts, but they do have sufficient privileges to delete or modify their own posts. As with other pages in the wiki, the designer and moderator have complete access to this wiki page.

This hierarchy approach has proven to be very effective, allowing students a consistent method to access specific information stored within the wiki.

Business Wikis

Wikis were used in two different business courses at the university: 1) a traditional classroom course, business management, and 2) a service learning course in entrepreneurship, Students in Free Enterprise. The wikis differed in that the former was a very basic addition to the learning process, while the later wiki was critical to sharing and developing information for the class activities.

The wikis used in the business management course were used to study the new vocabulary in each chapter. The wikis were organized in a hierarchical manner as described previously. A table of contents for the wiki guided students to a wiki for each chapter. Students were encouraged to add “terms to know” identified in each chapter to the wiki every week. Students were also encouraged to review other student entries on the wiki vocabulary page and make additions or suggest corrections. This encouragement was provided in a class participation grade that included a review of student wiki contributions.

In contrast, the wikis used in the service learning course, Students in Free Enterprise, were critical to the development of each service learning project. This course worked on eight projects in the community that involved discovering, teaching others, and practicing free enterprise in the community. Students developed the projects based on needs identified in the community. They then used technology tools and community resources to develop the project. The use of wikis facilitated students collaborative work on different projects that made it easy to share files. The instructor developed a template wiki as described previously. Students used this template to add their own project material. The wikis were organized by project, and project material included the following: 1) project needs analysis, 2) project target audience, 3) learning objectives, 4) project goals, and 5) identified project resources. Students also used the wikis to share and jointly develop project documents such as: 1) publicity documents using Publisher, 2) Power Points used to facilitate delivery of projects, 3) pre and post quizzes used to measure increases in learning; 4) Excel worksheets develop to measure project effectiveness and attendance and 5) Word documents that documented and summarized the projects.

Organic Chemistry Wiki

To prepare the moderator, the instructor (designer) created a template for a sample molecule. The wiki designer then instructed the moderator to build a skeleton for each molecule that included: 1) the molecule name entry on the main wiki page that linked to the second page; 2) the second page that contains a skeleton for the Material Safety Data Sheet information that links to the final pages; and 3) the final pages that contain the information that students update.

The main wiki page consisted of each molecule’s name that only served as a link to the molecule’s second page. The second page for each molecule was identical. It contained links to pages for: 1) Identity and Physical Properties, 2) Hazards, 3) National Fire Protection (NFPA) Codes, 4) Handling and Storage, and 5) Toxicological Information. Students then update the pages for each of the above sections as shown in Figure 1.

For example, from the main wiki page, the entry 1-Propanol linked to a table of contents page for 1-Propanol that contained links to the five sections above, as shown in Figure 1. Each of the 5 links from the previous page linked to a unique MSDS section for 1-Propanol that students updated with information gathered from external sources. Section 1 for 1-Propanol contained information on the Identity and Physical Properties of 1-Propanol. Students updated this wiki page by adding a Description, Synonyms, CAS Number, Molecular Formula, Molecular Weight, Boiling Point, Melting Point, Vapor Pressure, and Specific Gravity. Section 2 for 1-Propanol contained information on the Hazards for 1-Propanol. Students updated this page by adding 10 laboratory hazards for 1-Propanol which included first aid measures. Section 3 for 1-Propanol contained information on the NFPA codes for 1-Propanol. Students found that 1-Propanol was highly flammable but had very little other health risks. Section 4 for 1-Propanol contained information on the Handling and Storage of 1-Propanol. Students found that since 1-Propanol is highly flammable it should be stored, both long and short term, in fire retardant containers inside of appropriate cabinets with proper ventilation. Finally, section 5 for 1-Propanol contained Toxicology Information for 1-Propanol. Students gathered exposure limits and organs targeted by both acute and chronic exposure to 1-Propanol.

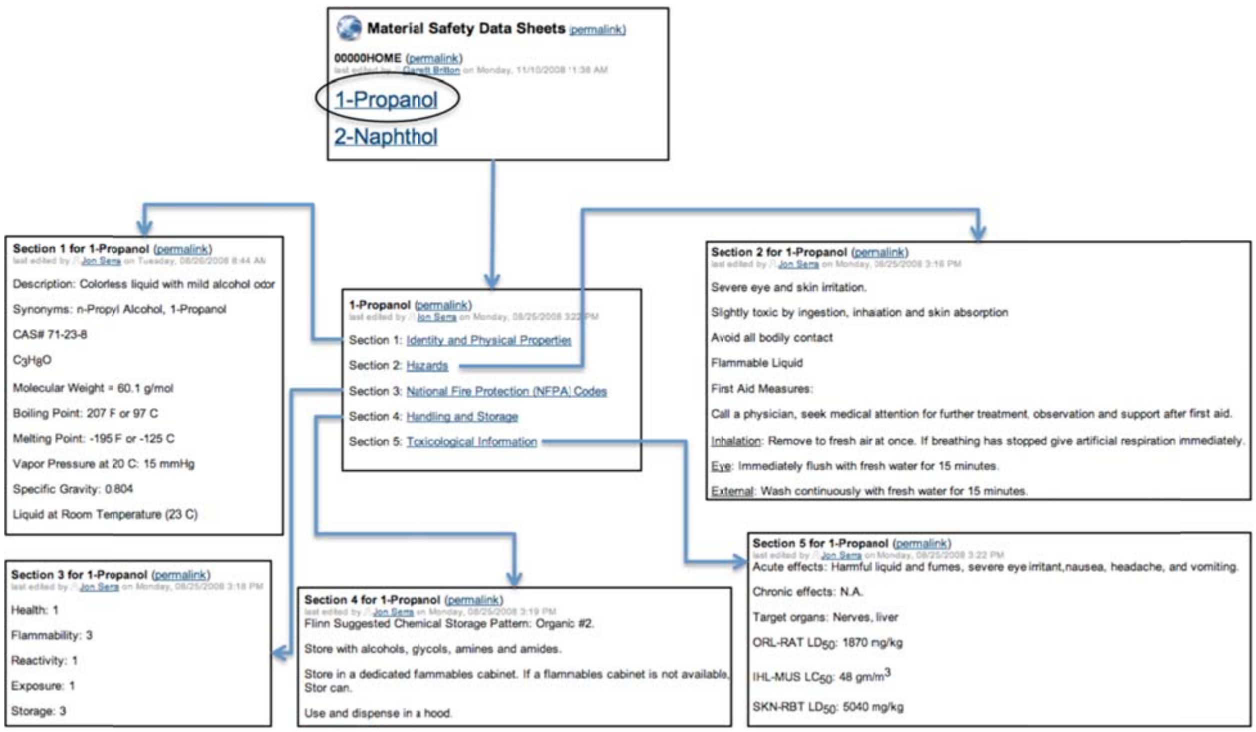

Figure 1. Example wiki pages for 1-Propanol for the Organic Chemistry Laboratory Wiki.

Conclusion

The business wikis have proven to be a useful reference tool for the management class. The Students in Free Enterprise course found wikis to be an invaluable collaborative tool for their projects. The Organic Chemistry Wiki has also proven to be quite effective for students both prior to and during the laboratory session. Students maintain a comprehensive, consistent wiki for the major safety information for all chemicals used in the organic chemistry laboratory sessions. Informal feedback from students confirms that once the wiki structure is learned, it is "a very handy place to find safety information when preparing for lab" (student comment, 2009). Overall, the laboratory wiki has proven to be very effective as a student maintained receptacle for organized safety information on each chemical used in the laboratory.

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Teaching Novices Online: Does Presentation Order Matter?

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Abstract

Studies of expertise development have found that novices begin by learning surface features, progress to competence, and then undergo a unique reorganization of their knowledge before becoming experts. This study directly compared three instructional sequences presenting identical content to different groups of programming novices: beginning with basic skills and progressing in a hierarchical order; beginning with abstract plans for novices to match to problems; and spiraling through both basic and abstract topics. Learning was measured by performance on a Programming Assessment given immediately after the instruction, and effort and difficulty were self-rated during the instruction. There was no significant difference among the groups in Programming Assessment scores, and overall self-rated effort and difficulty of the instruction did not vary simply by rearranging the presentation order of the major elements. However, instructional units that covered programming syntax skills and structures were rated by all groups as requiring significantly less effort and difficulty than units covering plans, and participants in all groups scored significantly higher on syntax skills and structures than on plans. These results help identify the order in which introductory programming instruction should be presented to novices for maximum learning efficiency: syntax first, then structures, and finally programming plans. By extension, novices do not benefit by starting them with overviews and strategies, but with fundamentals.

Instructors, with their years of expertise, may feel the urge to present to novice students their accumulated body of knowledge in a way that "jump starts" them on the road to expertise. They may do this through topic organizers, overviews, and "big picture" strategies that they hope novice students will use to guide them through their initial steps in the domain. But does this kind of high-level overview make a difference to novices' learning?

Review of the Literature

Expertise from Mental Organization and Perception

The knowledge structure that ultimately forms within an expert is a direct result of the memory structure of the human brain. Cowan (2000) saw strong evidence for dividing human memory into a long-term and a short-term component. Based on his comprehensive review of memory studies, Cowan (2000) estimated the capacity of short-term memory at four elements when mnemonic devices are discounted. For expertise to develop, the limited capacity of short-term memory must be overcome using the mind's other resources, principally perception. By enhancing perception, what one sees and the way one sees it can be fundamentally changed.

Such a prioritized shift in perception as a means to increase efficiency goes to the heart of expertise. For example, Boschker, Bakker, and Michaels (2002) found that expert wall climbers were better able to identify usable wall holds in the upper and middle areas of the climbing wall than novices. Experts further characterized these affordances as coming in varying levels of detail or grain with affordances of courser grain emerging from those of finer grain. The expert climber's mind used this perceptual organization as a recall mechanism, each higher level affordance a collection of lower level affordances that allowed easier retrieval of the entire climbing wall.

The source of this heightened perception lies within the perceiving mind. Miller (1956) in a study comparing the discrimination ability of the senses determined that the human mind -- enhances perception by distilling sensory information into 7 ± 2 (i.e., from 5 to 9) different natural levels. Chase and Simon (1973) explored the ability of chess experts to recall pieces on a chessboard and found that the number of pieces chess experts could correctly recall was far above the Miller's seven-element limit. They concluded that the experts' long term memories must have organized conceptually-related groups of pieces into clusters that they named chunks, so that the number of total pieces the experts' short-term memories could perceive at one time became the sum of all the pieces contained in all the chunks. Thus, expertise means mastering the complex by making it simple. Rather than *dividing* and conquering a domain, in overcoming the limitations of short-term memory the mind *combines* and conquers it.

It is common to ask people to "think outside the box" when a seemingly intractable problem is encountered. Experts, on the other hand, spend many years studying their field to build such a "box" around it that for them makes the field both predictable and controllable. It seems that chunks are the means by which the attention of short-term memory is sharpened, increasingly leading experts to anticipate the elements they expect to perceive within the domain and so build their "box."

Acquiring Expertise

Zeitz and Spoehr (1989) focused on this evolving internal knowledge organization as a three-stage process. The novice in the first stage learned to recognize perceptual features and then gradually inculcated them into long-term memory as chunks. As the essential components of the chunks themselves were still being learned and interconnected, learning was by rote, organization was poor, and the chunks were difficult to recall. In the second stage, the basics of the lowest level chunks had been mastered as well as the organization of the domain as presented. The learner now had internalized a cognitive replica of the content and organization of the domain. In the third stage, continued interaction with the domain reworked the cognitive organization by adding unique content within the chunks and unique horizontal and vertical associations among the chunks to produce complex, personalized, and difficult to verbalize expertise.

Developmental stages in expertise suggests that the instruction used at each stage must be tailored to the special strengths and challenges of each stage. Novices are focused on surface features and rules. They want step-by-step solutions and tend to memorize specific solution algorithms to match the surface feature of the presented problems. They also need to have filled vast holes in their knowledge about the domain, and that domain is generally well defined with fully developed facts, principles, and algorithms. An additional complication is that novices come to the new domain with a variety of knowledge and skills, some relevant to the domain.

Novices are best served by a direct approach to instruction, a model that takes into account differences in entry skills and aptitudes, is efficient, and is focused on achieving discrete learning objectives based on skill mastery (Huitt, Monetti, & Hummel, 2009). Using a direct approach, novices have a ready-made mental structure of the domain on which to build their competence.

Developing Programming Expertise

This study focused on the programming domain. Previous programming studies (Adelson, 1981; Bonar & Soloway, 1985; Corritore & Wiedenbeck, 1991; Davies, Gilmore, & Green, 1995; Spohrer & Soloway, 1988; Wiedenbeck, (1986) showed that novices focus on learning surface features that let them differentiate among the varieties of syntax and semantic elements each language offers. Their approach to program problem solving is to match those -surface features to problem requirements. As programming expertise develops, attention gradually shifts from the surface features to the functional features of a programming language. Ultimately, programmers depend less on backward and bottom-up designing from scratch and more on top-down forward design based on schemas retrieved from memory and adapted to the goal as needed (Rist, 1989).

It is these schemas and strategies that experts, now instructors, see as the key to their expertise and which they want to teach to their novice students as they explain to them how they themselves write programs. But their own programming expertise resulted from years of acquiring their skills and knowledge as chunks which they combined and organized as themes were discovered. Can plans and strategies that took years of study and practice to master be taught directly to novices? If so, in what sequence?

Several instructional sequences have been suggested. Like many expert teachers, Soloway (1986) would begin with generic plans for solving problems and teach students to modify and combine those plans to solve problems. On the other hand, Gagné, Briggs, and Wager (1988) would sequence skills in a hierarchical fashion so that all prerequisite skills are acquired before subsequent skills are attempted. Reigeluth and Stein (1989) would center the sequence on epitomes that would be gradually elaborated. Knowing the answer to this question is especially important in online instruction as learners are seldom given a choice of sequences for presenting the content to be learned.

Methodology

This study employed a three-group experimental design to examine which of the three instructional sequences would best improve the programming skills of novice programmers. A Web-based instructional program designed as a series of Web pages was used that covered the basic programming structures of sequence, selection, and repetition in Visual Basic. To provide uniform content, this one program was arranged in three sequences: an *elements-to-plans* (or *elements*) sequence based on Gagné, Briggs, and Wager's (1988) hierarchical skill sequencing, a *plans-to-elements* (or *plans*) sequence derived from Soloway (1986), and a *spiral* sequence modeled after Reigeluth and Stein (1983). Each sequence was divided into three units to provide two short breaks and so avoid overtaxing the participants.

The design of a basic presentation page is shown in Figure 1. Navigation links were provided at both the top and bottom (not shown) of each page. The text in each page was set to present a single topic without requiring the learner to scroll. The Web page shown in Figure 1 is typical of pages focused on the syntax of the language, in this case explaining the rules for using data types.

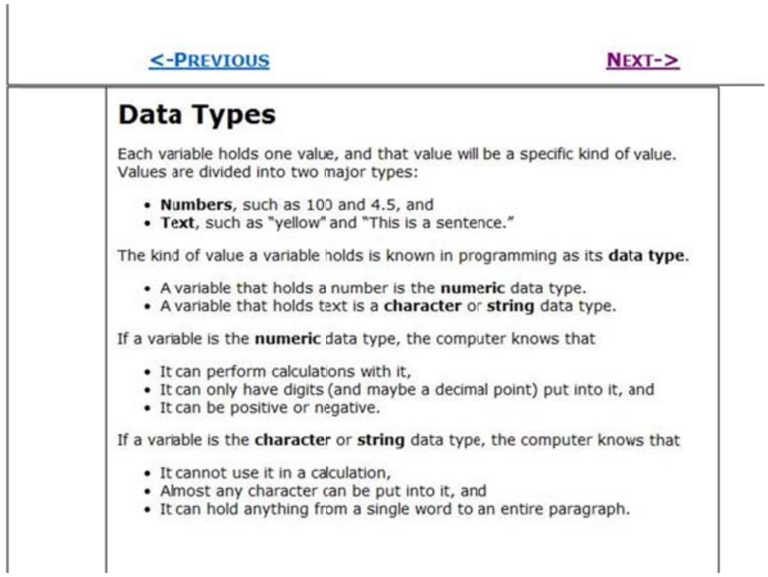

Figure 1. Layout of a Web page used for syntax units in the instructional sequences.

Two types of interaction were provided. The first allowed the participant to insert values into text boxes and select an operator in the programming statement at the top of the page. When the participant clicked the "Run" button, the statement would be executed using the values inserted by the participant. Questions that let the participants check their understanding of the concepts were provided at the bottom of most pages. Free play with practice programs was encouraged to give participants experience with structures without requiring the frustration of writing and correcting the entire code. They could enter limit values and operators to see the behavior of the structure without concern that unexpected results were due to an error in the program. The units discussing program plans provided text boxes for participants to use to write their answers to the self-test questions.

The study sample (*N* = 34) was recruited by personal solicitation from entering nursing and Computer Information Systems (CIS) students. These two groups were used because it was assumed that their career interests and preparation would give them sufficient math background to learn programming successfully. In addition, nursing students were recruited to represent students who were naïve to computer use beyond word processing and other widely-used applications. Participants were randomly selected to use one of the three sequences. To insure that the groups were statistically equivalent, measures were taken of general mathematical competence, programming self esteem, and hours spent playing computer games, factors shown by Bergin and Reilly (2006) to be important preconditions to success in programming courses.

Mental effort and mental difficulty were self-rated on a 9-point scale by the participants at the end of each of the three instructional units in each sequence, with 1 being the lowest rating and 9 the highest. Mastery of the syntax, structure, and plan skills taught in the units was measured with a Programming Assessment divided into three sections. The first section of nine items assessed participant knowledge of programming syntax elements, the second of six items participant knowledge of programming structures, and the third of ten items participant knowledge of programming plans. Table 4 shows the mean percent or questions correct for each question type for all three instructional sequences.

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Table 4. Descriptive Statistics for Programming Assessment Subtotals

Subtotal	N	Mean	Std. Dev.	SEM
Syntax Subtotal Percent	34	60.6862	22.73545	3.89910
Structure Subtotal Percent	34	45.7838	22.40216	3.84194
Plans Subtotal Percent	34	30.8235	22.08588	3.78770

Results and Discussion

Learning versus Effort

Participants as a group received significantly lower scores ($p < .001$) on average on the Programming Assessment as they passed from the syntax to the structure and finally to the plan items with no significant difference in item scores among the three learning sequences, indicating all learning sequences resulted in a similar drop in score as participants moved from the simpler syntax items to the more complex plan items. No learning sequence produced a significantly better performance on the assessment as a whole or on any part of it. Rather, all learning sequences produced the same drop in score as participants moved from the simpler syntax items to the more complex plan items. All of the instructional sequences in the study appeared to yield equal development of programming expertise for novice programmers.

When the three unit measures of effort and difficulty are averaged over the entire instruction, an ANOVA by instructional sequence reveals no significant difference among the sequences for mean effort ($p = .152$) or mean difficulty ($p = .261$). When the units are examined individually, however, a different picture emerges. Figure 2 shows graphically the mean unit effort ratings for the three learning sequences and, hence, the intrinsic load produced by each unit (DeLeeuw & Mayer, 2009). Unit 1 of both the elements and spiral sequences contained content related to syntax elements and were rated at about 5, but the remaining spiral sequence units saw intrinsic load increase rapidly, while the elements sequence did not have a significant increase in intrinsic load until Unit 3. The plans sequence began with high intrinsic load in Unit 1, which contained exclusively strategic planning content, then dropped significantly for the remaining units that contained syntax elements and structure content. For all three sequences, intrinsic load was high for units containing content related to plans as reflected by a mental effort rating of 7 or more, while it was near the ideal middle level of 5 for units with content related to syntax elements. Thus, syntax elements material was consistently perceived as requiring less effort and as less difficult than program plan material.

The self-rated difficulty scores shown in Figure 3 show almost the identical mean ratings by sequence and unit as self-rated effort. The difficulty ratings indicate that more germane load was experienced in units with program plan content than unit with syntax elements content. There was also a high degree of correlation between the effort and difficulty ratings for all three units ($p < .001$).

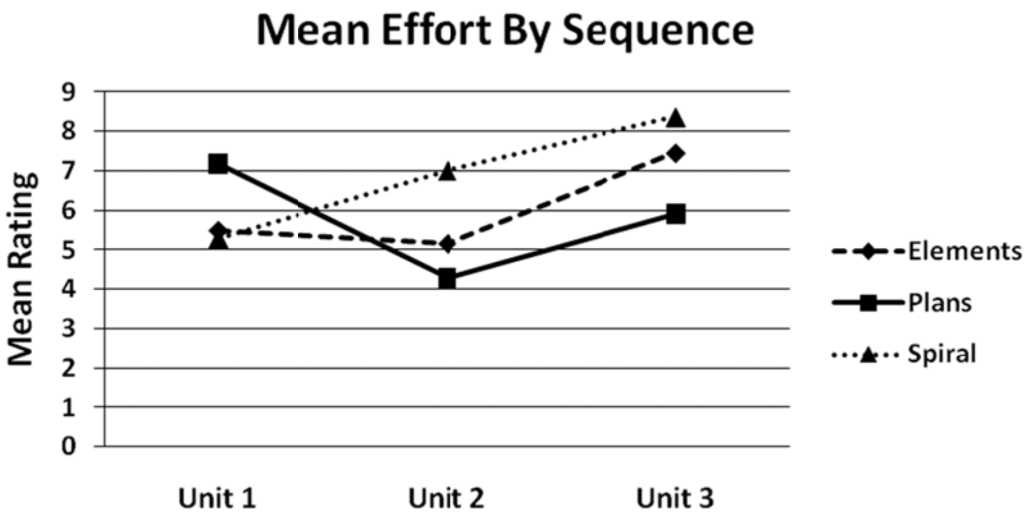

Figure 2. Mean effort reported by participants in the elements, plans, and spiral sequences for the three instructional units.

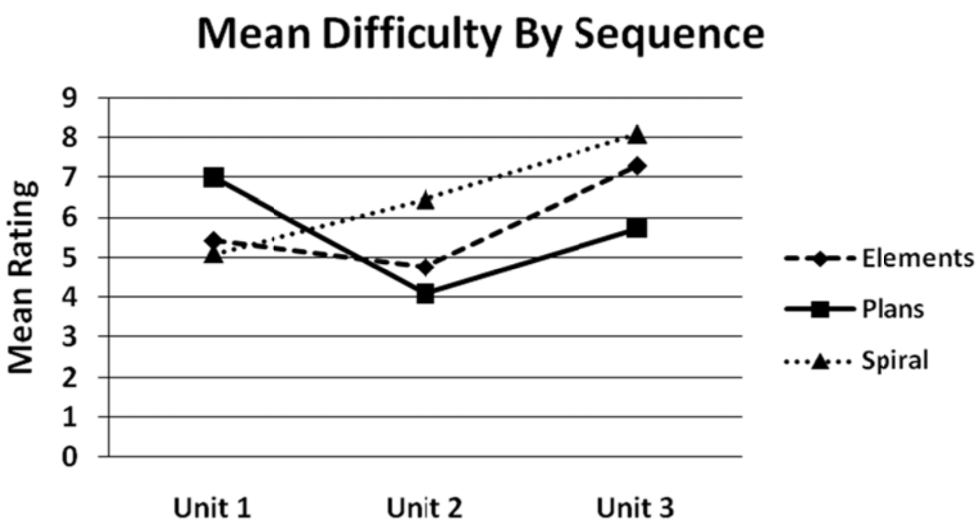

Figure 3. Mean difficulty reported by participants in the elements, plans, and spiral sequences for the three instructional units.

Difficulty Unaffected by Sequence

Evidence of a relationship between content and effort/difficulty can be seen by comparing the mean effort scores for the elements and plans sequences. Both sequences contained identical material in their units but presented in opposite order. The elements sequence progressed from syntax elements to structures to plans, while the plans sequence progressed from -plans to structures to syntax elements. The content of unit 2 in both sequences was identical. Figure 4 presents the same effort means as Figure 3 but with the effort means for units 1 and 3 reversed for the plans sequence so that units with identical content are placed in the same relative locations on the graph. The similarity of the means for the two sequences is clearly visible, and there is no significant difference between effort or difficulty scores for any of the units in the elements and plans sequences. Perceived difficulty and effort followed the content no matter which sequence was used. These nearly identical results also rule out the mental tiredness as a cause for increased effort and difficulty as program plans were covered last in the elements sequence and first in the plans sequence.

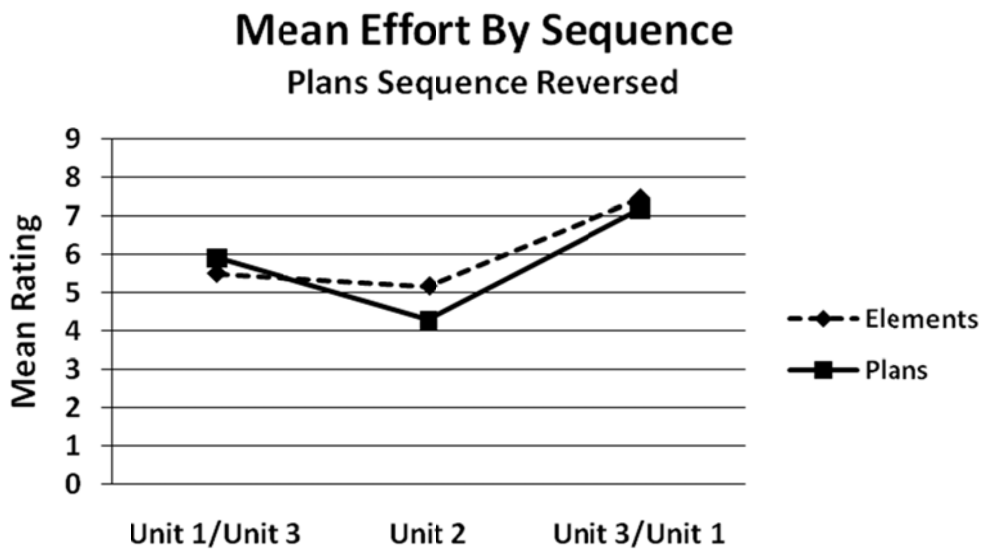

Figure 4. Mean effort reported by participants in the elements and plans sequences for the three instructional units, with effort in units 1 and 3 reversed for the plans sequence.

Effort and difficulty, though measuring the different constructs of intrinsic load and germane load (DeLeeuw & Mayer, 2009), are tightly intertwined. Units containing syntax elements were significantly lower in effort and difficulty than units containing planning content, a pattern that was evident no matter how the content was sequenced. This result supports the contention that novices find working with plans and strategies much more difficult than with the basic elements of syntax and structure.

While the units in which the complex materials was presented were rated individually as higher in effort and difficulty, none of the strategies used to present the complex material moderated overall the participants' ratings of effort or difficulty for the instruction. Averaged over all three units, effort and difficulty were rated the same by participants in the three instructional methods, showing that changing the order in which easier or more challenging information was encountered did not alter the perceived effort or difficulty of the material. Neither moving the difficult material nor increasingly contextualizing it resulted in any change in participant ratings.

Difficulty Dependent on Content

There were, however, significant differences among the overall mean scores for different content items, with participants on average achieving the highest scores on the syntax items, middle scores for structure items, and lowest scores for plan items. The implication is that novice programming learners master more of the foundational material than the advanced material regardless of the order in which the material is presented to them, whether from simple to complex, complex to simple, or intermixed. Since novice learners focus first on the surface characteristics, syntax elements should be easiest for them to learn, with feature-laden structures nearly as easy. Participants appeared to focus on and learn the same material regardless of the order in which they were presented, to selectively attend to the material and block out any that was not understood. Where there was no understanding, it seems there also was neither attention nor chunk formation.

Selective attention to content did not come without a price. The effort and difficulty ratings of the elements and plans sequences both indicated that the units containing syntax and structure material were perceived to be easier than the unit containing programming plan content. The spiral sequence, on the other hand, had programming plan content distributed through all three units and they were all rated at about the same high level of effort and difficulty. This may reflect the increased cognitive load required to separate the syntax and structure material from the programming plan material and subsequently attend to the former and ignore the latter (Chandler & Sweller, 1991). If material that is out of scope of the learner's current knowledge is acknowledged to be extraneous for that learner, then slowing learning without having any effect on cognitive organization is a plausible result.

The plans sequence discussed programming plans first and seemed to experience detrimental effects from it. Soloway (1986) advocated teaching novices programming plans from the beginning as a way to jump-start their expertise; however, participants learning from the plans sequence did not seem to benefit from this. Rather, the entire learning sequence was described as seeming to "jump around" with no apparent order. Such confusion was not evident in the comments about the spiral sequence, which mixed programming plans throughout all its units in the simple-to-complex spiral presentation recommended by Reigeluth and Stein (1983). It may be that a little incomprehension is tolerable to learners but that, once a threshold of incomprehension has been crossed, learners pass a summary judgment on the entire instructional sequence.

Conclusion

What do these findings mean for teaching novices, especially in online courses? Two important design guidelines can be drawn from them. First, it is critical to determine what novice learners can comprehend in the domain. The novices in this study demonstrated little learning of topics beyond what made sense at their level. In the same way, online learners will pass over topics too advanced for them with little or no comprehension. Second, learners do not just ignore topics for which are not ready; they expend increased effort to learn what they can understand, which simultaneously increases the difficulty of the lesson. The effort and difficulty may be so great that the learners conclude that the lesson is simply too difficult to continue. This is where thorough knowledge of the domain and thorough field-testing of the online units become critical. Rather than providing an advance organizer to the field or shortcuts to competence, the novices in this study found high-level summaries and strategies confusing and the most difficult to learn. By extension, novices do not benefit by starting them with overviews and strategies, but with -- domain fundamentals. The most accurate way to determine what topics novices are ready to learn is by measuring accurately what they have learned and letting them rate the effort they expend and difficulty of the lessons. Doing this will go a long way to ensuring that online lessons are well suited for novice learners.

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Strategic Information Systems Planning

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Abstract

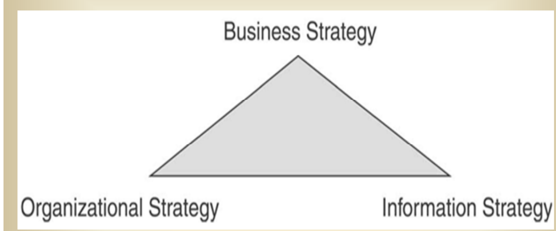
Strategic Information Systems Planning has been a topic of considerable importance and interest to IS professionals in both the business and academic communities since the 1970's. Planning is recognized as a critical competitiveness issue. Today, because information systems serve as the driver of many organizational transformations, there is increased pressure on organizations to leverage their investments in technology and information systems. Success usually occurs when an organization is able to achieve congruence between IS and organizational planning, and this is achieved when the technical and general managers of an organization work collaboratively. The strategic information systems planning process is intended to ensure that technology activities are properly aligned with the evolving needs and strategies of the organization. This paper will examine the research on this ever-important topic and suggest a process that will assist in the achievement of planning success.

Introduction

Over the years, many organizations have made technology decisions and acquisitions that impact organizational information systems (IS) on the basis of what they believe or recommendations from vendors or colleagues from other organizations. The end result of this approach toward decision making and expenditure of funds has been quite unpredictable. The pervasive nature of IS in today's organizations coupled with increased pressure to leverage technology assets has dramatically increased the importance of strategic information systems planning (Bechor, Neuman, Zviran and Glezer, 2009). Today, most organizations insist that technology and IS-related decisions be made with a clear understanding of business and organization strategy and direction.

Hoque, Sambamurthy, Zmud, Trainer, and Wilson, (2005) in *Winning the 3 Legged Race* define alignment as "the situation in which a company's current and emerging business strategy is enabled, supported and unconstrained by technology." Piccoli (2008, p. 155) states that organizations "achieve a high degree of fit and consonance between priorities and activities of the IS function and the strategic direction of the firm" when they are able to achieve this so-called strategic alignment. Alignment has become one of the top issues and concerns of IS management executives (Gutierrez, Orozco, and Serrano, 2009).

A framework that helps to clarify the importance of information systems in today's organizations is the Information Systems Strategy Triangle. The message conveyed by the triangle is that it is - important for the three elements of the triangle, namely Business, Organizational and Information Systems strategies to align with and complement each other. It is important to note that Business Strategy resides at the top of the triangle. The triangle is depicted as follows (Pearlson and Saunders, 2010, p.23).



The Information Systems Strategy Triangle

Pearlson and Saunders defined the three elements of the triangle as follows:

- Business strategy starts with a mission and is a coordinated set of actions to fulfill objectives, purpose and goals and serves to set limits on what business will seek to accomplish (p. 23).
- Organizational strategy deals with the people, work processes, structure, hiring practices and plan that allows for achievement of business goals (p. 380).
- Information systems strategy is the plan an organization uses in providing information services (p. 379).

The direct or implied suggestions about strategy that are derived from the framework include the following (Pearlson and Saunders, 2010, p.23):

- "Successful firms have an overriding business strategy that drives both organizational and information systems strategy."
- "IS strategy can, itself, affect and is affected by changes in a firm's business and organizational strategies. Changes in the IS strategy must be accompanied by changes in the organizational strategy and must accommodate the overall business strategy."
- "IS strategy always involves consequences, intended or not, within business and organizational strategies."

It is no coincidence that the emphasis on a more structured approach to planning for information systems occurred simultaneously with an increased emphasis on the role of the chief information officer (CIO). The CIO position evolved into prominence in the late 1980's when "technology grew from an expensive necessity to a strategic enabler" (Pearlson and Saunders, 2010, p. 220). The days of the CIO simply helping to control costs and reporting to the chief financial officer (CFO) evolved into a requirement to be aware of both the technical and business aspects of the -

organization, be on the same level as the CFO, and report directly to the top executive of the organization (p. 221). At the same time, organizations were entering an era where technology was also changing very rapidly, thus further complicating the strategic information systems planning process. "Strategic information and technology planning differs from planning that primarily focuses on user demand and financial justification. …Strategic information systems and technology planning reflects a convergence of means and ends. As means, information systems and technology have become so important to achieving objectives, they must be weighed as part of the process of selecting objectives, not merely as a means to accomplishing objectives already identified" (Reed, 2001, p. 4).

The Planning Process

There are no shortcuts to the strategic planning process. Preparatory steps that ensure that business, organizational and information strategies are aligned in a complementary fashion, are extremely important. Internal and external assessments need to be addressed, and the overall role of technology and information systems within the organization must be determined. A sense of how much should be spent on technology initiatives is also mandated. The most important point to remember is that the planning process for technology must be part of the overall business plan.

Practically speaking, strategy states the direction we want to go and how we intend to get there, and a plan depicts a view of the future that guides current day decision making (McNurlin, Sprague, and Bui, 2009). Organizations need to develop a strategic plan in order to provide a context for decision making.

Deciding on the type of tools to use in the planning process is neither straightforward nor simple. The planning process is complex, there is not a single best approach, and arriving at a single best methodology for a specific organization is nearly impossible. As a result, many organizations utilize a combination of approaches.

The planning process can become a lengthy and rigorous ordeal. In analyzing the process, some feel that it unfolds in five phases. The overall five phase breakdown is as follows (Piccoli, 2008):

1. Strategic Business Planning – Prerequisite to systems planning and consists of mission, future direction, targets and strategy.
2. Information Systems Assessment – Evaluation of current IS resources and how well they are serving the organization.
3. Information Systems Vision – Ideal role that should be pursued for use of IS resources.
4. Information Systems Guidelines – Set of statements that articulate use of organization's technical and IS resources.
5. Strategic Initiatives – Three to five year long-term proposals that stipulate new initiatives for IS organization.

The iterative strategic IS planning process can be summarized graphically as follows (Piccoli, 2008, p. 159):

Strategic information systems planning was previously the work of technology and systems professionals. It has now changed to be a collaborative planning challenge of parties including top managers, business unit managers, technology and systems professionals, and sometimes external stakeholders such as customers and alliance partners (Ruohonen, 1996).

Thus, planning becomes a partnership among those with technical skills, the information systems group, and the general and functional managers of the organization. The planning process requires discussion, clarification, negotiation and the achievement of a mutual understanding (Piccoli, 2008; McNurlin, et al., 2009).

With today's rapidly evolving technology advances, along with the somewhat unpredictable emergence of new competitors brought about by the Internet, organizations do not have a year to develop a plan, several years to implement the plan, and a three to five year useful life for the plan. Everything that is technology-related moves at a rapid pace and change is inherent in the adoption of new technology and ISs. Due to the rapidly changing technology environment, many feel that a "sense and respond" approach to planning is appropriate. When apparent opportunities appear, organizations need to respond quickly in order to take advantage (McNurlin, et al., 2009). Some rapid responses may be viewed later as failed experiments, but that may prove to be better than a lost opportunity.

As mentioned earlier in this paper, many organizations have adopted a combination of planning techniques as they undertake their planning process. Eight popular planning techniques that have emerged include the following (McNurlin, et al., 2009):

1. Stages of Growth – Include early successes, contagion, control and integration stages and is helpful in determining where an organization resides on learning and development curve.
2. Critical Success Factors – Key areas, usually less than 10 for an organization, where things must go right for the organization to flourish.
3. Competitive Forces Model – Michael Porter's model advocates that we must contend with five competitive forces in the strategic use of IS. Forces include threat of new -
4. entrants, bargaining power of buyers and suppliers, threat of substitute products or services and rivalry among competitors.
5. Three Emerging Forces – Larry Downes emphasizes the critical role of IS and suggests consideration of three factors, namely increasing growth of digitalization, globalization of commerce, and deregulation of trade.

6. Value Chain Analysis – Porter's Value Chain model suggests five primary activities that must be given attention in creating a product or service, getting it to buyers and servicing. Included are inbound logistics, operations, outbound logistics, marketing and sales and service.
7. E-Business Value Matrix – A portfolio management approach that creates four categories of projects, namely new fundamentals, operational excellence, rational experimentation and breakthrough strategy.
8. Linkage Analysis Planning – Examination of inter-organizational electronic links and identification of power relationships within suppliers, buyers and strategic partners.
9. Scenario Planning – Plan whereby there is speculation of what the future might be like and what actions must be taken as different futures begin to materialize.

In the preliminary planning preparation, those responsible for the planning process must decide which combination, if any, of the above planning techniques to employ as the process is designed. Generally as methodologies are developed, four elements for consideration emerge. They include an opinion of what needs to be solved, defined techniques on what has to be done and when to do it, advice on how to manage the quality of deliverables, and a tool kit to facilitate the process (Ishak and Alias, 2005).

Most processes also include a situation analysis in the form of Strengths, Weaknesses, Opportunities and Threats (SWOT). This analysis addresses the organization's internal and external influences, strategy formulation, and specific goals along with tactical and operational plans for achieving the goals (Semiawan and Middleton, 1999).

Key Questions and Outcomes from the Planning Process

In preparation for the strategic planning process, a wide range of topics must be taken into consideration. Many articles and books have addressed the issue of topics that should be considered. No list is all-inclusive, and the topics will vary according to organization structure and culture. A list of key questions has been adopted with minor modifications from Callon (1996) and is presented as Appendix A.

The intended result of the planning process is to arrive at an IS strategy. Galliers (1993) and Allen (1995) contend that the IS strategy has four distinct components: the Information Strategy, the Information Technology Strategy, the Information Management Strategy and the Change Management and Implementation Strategy. The Information Strategy answers the questions: what information is required and where is the information required to support the primary tasks, or key goals? The Information Technology Strategy is concerned with applications and platforms to provide the information. The Information Management Strategy is concerned with how the information services are organized for the different facets of the organization. The Change Management and Implementation Strategy will identify what organizational change will be needed for the information systems strategy to be successful, when it will be implemented and by whom.

The outcome document from this planning process should be a comprehensive report along with plans for the development of systems oriented to some future vision of the role of information systems within the organization (Allen, 1995). There is no standard format for this report.

However, in a general outline form, Appendix B presents a sample outline of the key ingredients that could be addressed in the report (Mcleod and Schell, 2007).

A Technology-Based Approach to Planning

In recent years, online electronic tools have emerged to assist with the planning process. One tool that the author has experienced and endorses is offered by the Advanced Strategy Center of Scottsdale, Arizona (www.advancedstrategycenter.com). The Center offers on-site planning sessions in their Arizona Advanced Strategy Lab (ASL) or sessions can be conducted via the Internet through the Advanced Strategy Lab Online.

The online approach is particularly attractive, as participants can connect to a host website from their own facility and enjoy the same benefits as face-to-face sessions. The keys to success with the process are the quality of the front-end preparation and the quality of the skilled facilitators. Opened-ended questions and ranking of elements on matters such as organizational mission, values, current state of the organization, external environment, overall organizational alignment and future direction must be addressed. Normally, this is done through a series of appropriately stated questions and related items that request input by rank order. Facilitators become familiar with the organization and its issues prior to conducting the sessions.

The Advanced Strategy Lab employs software developed by GroupSystems.com The software is specifically designed to support open group brainstorming and assessment sessions. A skilled facilitator, experienced in software collaboration technology and client subject issues guides the participants through a session. The sessions are designed to balance “high tech” and “high talk.” Computers and the GroupSystems software can gather rapid input on issues and strategies, and the facilitator can quickly prioritize those items deemed most important by the majority in the group. On the other hand, time to talk about the important issues and ensure there is buy-in and understanding of both positive and negative implications of implementation is also included under the direction of the facilitator (Advanced Strategy Center, 2010).

The following group of collaboration activities are made possible through the software provided by GroupSystems.com and the facilitation services provided by personnel from the Advanced Strategy Lab (Advanced Strategy Center, 2010):

- Open anonymous electronic brainstorming (all participant’s ideas are seen by all)
- Ability to rapidly categorize key ideas and themes
- Ability to electronically prioritize the key ideas and themes
- Electronic survey capability for perception surveys and concept testing
- Topic commentary to solicit open comments on a series of key issues and themes
- Project outlining capability to develop high level action plan and implementation

There are several significant advantages to be gained by this online process. All participants can immediately, but anonymously, see ideas generated by other participants. There is no longer a need for boards filled with post-it notes. As responses are received, the facilitator can immediately identify and list emerging common themes which can then be discussed. Since facilitators are very skillful, discussion can prove to be very valuable and enhancing. Finally, there is a time-saving feature to the process. A two to three hour session might be equated to a full day planning session conducted using traditional manual processes.

Conclusion

Technology and information systems play an ever-increasing role in today's organizational environment. Because of the rapidly changing nature of technology developments, it is sometimes difficult to employ standard planning processes. The primary guideline for information systems planning is that the planning process must be designed and conducted in alignment with organizational and business plans. Most organizations now agree that IS is an important strategic organizational resource that can provide strategic advantage and boost business performance (Brown, 2004). As part of their plan, many organizations have adopted a sense and respond position with regard to opportunities that may present themselves. Often, a scenario development approach that looks to possible future developments is essential to help combat the rapid rate of technology change.

There are multiple planning tools available for the strategic information systems planning process. Choosing the tools that meet the needs of the organization and lend focus to the desired areas of emphasis is critical.

Finally, organizations should consider the introduction of technology-driven approaches to planning to help with speed, efficiency, flexibility and communications.

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APPENDIX A (Callon, 1996, pp. 296-298)

Strategic Planning Questions

Strategic Plan

Vision: Do we have a clear vision of where the organization is going?
Decisions: Do we make major decisions based on our vision and strategies?
Innovations: Do the values and goals of the organization call for innovation?
Risk Taking: Does the reward system support employee and management risk taking?
Change: Do we respond quickly to changes that affect our organization?
Customer Segments: Have we identified and do we understand the needs and each type of customer and how they define products and service value?
Competitors: Are our strategies based on market intelligence and competitive information?
External Factors: Do we regularly review the economic, social and demographic trends that can affect our performance?
Management Teamwork: Are our interactions characterized by openness, candor and teamwork?
Quality: Do we emphasize and measure quality throughout the organization?

Business Processes and Organization

Culture: Does the company have a strong sense of mission and shared values?
Productivity: Is productivity measured and are ambitious but achievable goals established?
Empowering People: Are employees encouraged to get involved in multiple aspects of the business and do they readily accept accountability?
Management Support: Does management openly and enthusiastically support the ideas and efforts of our employees?
Structure: Does the current organizational structure logically and effectively support the business strategies?
Bureaucracy and Complacency: Are unnecessary overhead and bottlenecks being eliminated while being careful not to take things for granted because of past success?
Operational Systems: Are the best possible systems in place to address operational needs?
Decision Support Systems: Do existing systems effectively support multiple levels of decision making?
Communication: Do people openly communicate across the organization, or is a "chain of command" adhered to in most cases?
Experimentation: Does management encourage new ideas, provide funding for trying new things and tolerate mistakes and failures?

Information Systems Architecture and Organization

Existing Information Systems: How critical are existing information systems to our operation?
APPENDIX A (continued)

End-User Support: Does the information systems organization provide a broad range of services and support to end-users with every major function of the company?

-
Information (Data) Access: Is data available and easily accessible when users need it?
Network: Are information services delivered on a common network to those with a need to have it where and when they need it? (This includes customers, suppliers, business partners and employees). Are Internet services adequate?
Charges: Are users charged fairly for information systems support?
Relationships: Does the information systems organization see itself as an enabling resource with the users viewed as the driving force?
Information Systems Management: Is information systems run like a business within a business, benefiting the entire organization?
Information Systems Role: Is information systems focused and positioned as a competitive resource within the organization?
Strategic Planning Process: Does the strategic planning process ensure that the right things are being supported by information systems?
Distributed Systems: Have the appropriate resources been moved to where they make the most sense from a financial, management and technical standpoint?

Information Technology Opportunities

Industry Impact: Does our industry depend heavily on information technologies to achieve business success?
Competition: Do our competitors frequently use information systems to differentiate their products and services?
Education: Is our management familiar with the potential opportunities for information technology within our industry and company?
Customer Expectations: Do our customers react well to innovative approaches with information technology and will they pay for its added value?
Strategic Impact: Are our business plans directly influenced by potential new uses of information technology?
Opportunity Window: Would we be likely to lose market share if a competitor announced new systems-based services?
Vendors: Do we have a good working relationship with information technology vendors to aid in our planning for potential use of new systems?
Prototypes: Is it likely that we would authorize the building of an information systems prototype to prove operational and/or competitive feasibility?
Joint Development: Are users actively involved with information systems to reduce the risk of failure of new information technology use?
Visualization: Is anyone charged with the responsibility to make sure that time is devoted to brainstorming how the organization might look in the future considering the impact of information technology?

APPENDIX B (Mcleod, Schell, 2007, pp. 40-41)

A Sample Strategic Plan Outline for Information Systems

Executive Summary

The Strategic Plan for Information Systems (SPIS) has been developed to support the Strategic Business Plan by assembling and applying the information resources that are necessary to achieve the strategic objectives. The SPIS is organized into four sections.

- Information Technology Mission Statement
- Information Technology Goals
- Scope of Information Technology Services
- Information Technology Work Plan

Information Systems Mission Statement

The Mission of …

Information Technology Goals

The information technology mission will be accomplished by pursuing the following goals:

-
-
-

Scope of Information Technology Services

Information technology services consist of the following: (Sample list follows)

Administrative Services

- Budgeting and fiscal review
- Human resources
- Management reporting
- Stakeholder relations

Engineering Services

- Strategic planning and implementation
- Capacity planning
- Network design, maintenance, troubleshooting, and administration
- Server installations
- Contingency planning and backup

APPENDIX B (continued)

Technology Services

- Technical support in the form of help desk and call management services
- User education and training
- Database management services
- Document management services
- System development and support
- World Wide Web access
- Computer graphics
- Hardware troubleshooting, upgrading, and replacement
- Antivirus and firewall services
- Systems administration and maintenance
- Systems audits

Information Technology Work Plan

(Number) key projects have been identified to be completed during the next 3 year period and include

Project	Project Manager(s)	Estimated Person-Months

Recommendations for Technologies in Distance Learning Program at Coastal Carolina University

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At Coastal Carolina University, a Distance Learning curriculum has recently been mandated for the entire University, with the objectives of boosting enrollment figures and to provide more robust student learning opportunities. With the directive to teach entirely online, the symptom of the specific problem includes addressing technological issues that come with teaching online. Examples include course set up and delivery, emulating the natural classroom environment, and connecting with, or reaching, students online.

This project explored possible technologies which are available for use in aiding in communication, presentation, and collaboration online, with regard to content delivery. A recommended set of technologies to aid in the delivery of a Distance Learning course has since been made available to instructors who will be teaching Distance Learning courses at Coastal Carolina University.

The question for research in this investigation was: What technologies that are both proven to be useful and are preferred by Coastal Carolina's student, faculty, and staff population can be used to facilitate a completely remote, Distance Learning class.

The consulting approach used for this research is of mixed methodology through archival data research, focus group research, and opinion questioner. All three methods addressed the use of technologies in the current state of the Distance Learning program at Coastal Carolina University. The goal of this research was to provide technology recommendations for a future program model.

The models for diagnostic processing in this organizational change project include feedback loops constructed from data obtained in preliminary meetings concerning the current use of technologies used with Distance Learning at Coastal Carolina University. Feedback from participants in the past was used to create topics for specific items for the opinion survey in this research.

Participants

Research participants were faculty, staff, and students currently affiliated with Coastal Carolina University. Research participants are faculty, staff, and students currently affiliated with Coastal Carolina University. Complete project participant numbers totaled 94 respondents, including 45 faculty, 24 staff, and 24 student responses. Of the 94 participants, 56 were male and 38 were female. Twenty respondents report being eighteen to twenty-five years old (n=20), twenty report being twenty-six to thirty-seven (n=20), twenty-two respondents are thirty eight to forty five years old (n=22), twelve respondents are forty-six to fifty-five years old (n=12), and one participant reported being over sixty six years old (n=1). Seventy one project participants report either participating in or conducting an online course in the past (n=71), as the remaining twenty-three have not (n=23). When participants were asked their comfort level "using the Internet and World Wide Web", eighty-one participants responded that they are "very comfortable" (n=81), twelve respondents report being "somewhat comfortable" (n=12), one participant responded as being "not at all comfortable" (n=1).

Approach

The consulting approach used for this research was of mixed methodology survey research through archival data research, focus group research, and opinion survey questioner (Stringer, p. 177).

Measures

The research question is *What technologies would work best to facilitate a distance learning program at Coastal Carolina University?* The researcher broke this down into question sets, categorized by respondent opinion on ease of use, availability, accessibility, and preference on various technologies that are suggested for use in distance learning functions.

The qualitative measure of data used in this research methodology include archival data interpretation.

The quantitative data collection method includes a survey (see Appendix A) administered to Coastal Carolina University faculty, staff, and students regarding preferred technologies to be used in Distance Learning courses. The online opinion survey addresses the use of specific technologies to be used in the Distance Learning curriculum at Coastal Carolina University. The survey consists of 14 items for which respondents were asked to rate their level of comfort or agreement regarding the potential use of each technology to be used in a Distance Learning course at Coastal Carolina. Items were scaled by count of response for each option. Final tallies were then ranked, highest (most responses), to lowest (least responses).

The survey was constructed into three portions; the first addressing technology communication medium- the second addressing specific technologies for each medium, and the third section available for open comments from survey respondents.
Items on the first portion the survey were grouped under communication medium preferences, supplemental material, and number of resources preferred. Specific items in this portion include; "Have you ever taken or conducted a Distance Learning Course before (entirely online)?" and "What is your comfort level using the Internet and World Wide Web?"

The second portion of the online survey addresses specific technologies used to facilitate the tasks of communication, collaboration, and presentation in the online environment. Respondents were asked to select each specific item of technology (such as Twitter, Facebook, and e-mail) as it applies to the functions of communication, collaboration, or presentation, online; that they would feel comfortable using. Specific items included statements such as: "To communicate with instructor and/ or classmates I prefer, (a)Real time chat, Instant messenging programs (such as AOL Instant Messenger), (b) Social Networking sites (such as Facebook, MySpace, LinkedIn), (c) University Email (CCU Webmail), (d) Using webconferencing software with webcams (such as Skype), (e) Text messenging (via cell phones) (to contact instructor), (f) Engaging in blog or online forum discussion, ang (g) Using Tweet/ Twitter to communicate and present information; "I would feel comfortable taking a class that uses various technologies to aid online instruction: (a) Agree, or (b)Disagree.

The third portion of the survey included the prompt *Additional comments* for respondents to list open comments.

Procedures

The online opinion survey regarding the use of specific technologies to be used in the Distance Learning curriculum at Coastal was sent to faculty, students, and staff via email. The survey consists of 14 items for which respondents were asked to rate their level of comfort or agreement regarding the potential use of each technology to be used in a Distance Learning course at Coastal Carolina. Participants select the preferred option by clicking a checkbox next to the option on the screen.

Quantitative data from the online surveys which were administered were recorded by instance response to each question type and recorded on a spreadsheet by question. Total counts for each question were calculated, as well as mean, median and mode responses.

Assumptions and limitations of the study derive from the self- report method used in data collection, as participants were asked to gauge or determine their "own level of technology expertise as applied to each option", regarding the various technology products and platforms which were offered. Some participants may have not known much about the product when answering, or do not understand the scope of the product. Ninety –seven percent (97%) of the survey participants rated themselves as "Comfortable using the Internet" on the survey, yet to what degree or scope they use it or how well they understand Internet navigation was not clarified. In addition, participants for the online survey were contacted via e-mail invitation. Those individuals who do not currently use the Internet or email were automatically discarded from the participant pool, thus limiting the study only to current Internet users.

Results, Goals, and Discussion

Between the archival data mining and survey responses, one trend which is clear is that our students, faculty, and staff are not convinced the current Blackboard course management system alone is adequate to facilitate the functions needed for a great online program. Students noted that they need more popular options, while faculty look for a robust platform or means to host course artifacts and discussions. Survey results confirmed initial findings of focus group discussions concerning the need to bring in new and different technologies to host online courses.

There was a consensus among faculty and students alike that the delivery method should be interactive, as this is the only way, as one participant commented, "to emulate the discussion in the natural classroom environment." Research also is in accordance with this comment, noting that the correspondence method of course design is outdated (Moller et al., 2008). Moller et al.

(2008), the authors reiterate that technologies are a natural part of the equation when considering an interactive online model.

Participants from the online survey noted that they do generally prefer to use various or multiple mediums in addition to the current Blackboard CE learning system. Forty-eight respondents prefer to use multiple resources, as only 16 respondents noted that they prefer to use only one technology, Blackboard (n = 48 multiple, n = 16 only Bb). Participant selection of various technologies to communicate, collaborate, and present in the virtual classroom were ranked by preference selection instance. Using the Coastal Carolina University e-mail system to communicate had the most instances of preference (n = 55), followed by real time chat services such as AOL instant messenger (n = 48), blog, online forums (n = 42), social networking sites such as Facebook and MySpace (n = 32), web conferencing software such as Skype (n = 31), using cell phone text messaging for contact (n = 24), and using the online Twitter networking application (n = 14).

As far as the use of supplemental or additional materials to use for presentation, users rated the following, listed by instance of preference. Users rated *additional online resources* (additional web pages) (n = 62), followed by *Library's online resources*
(n = 51), *textbook website* (n = 50), and *epacks or online workbooks* (n = 50).

Discussion

Table 1 presents the technologies suggested for use by this research. The first column on the matrix displays a specific problem or limitation with the current Blackboard CE learning system in relation to classroom learning activities suggested by research participants. The second column on the matrix then presents a specific technology recommended by the researcher which can be used to address the problem. The third column associates the category(s) which the technology falls into (communication, collaboration, presentation), and is followed by examples of learning activities in the virtual classroom found in the fourth column.

The current course management system, Blackboard CE, has the capabilities to communicate both synchronously (real-time) and asynchronously (not real-time) one-on-one. Blackboard's internal discussion board and blog functions can complete these communication tasks respectively. However, during focus group discussion, students expressed the belief that they would benefit instructionally from being able to see their instructor and classmates at times.

Students and faculty alike agreed that being able to "see" classmates and instructor would help them "connect in the online classroom. Research by Dazakiria (2008) supports this, noting that a sense of personality can come through better when backed by visual. Using videoconferencing (Skype) technology would allow for students to see the class instructor, the instructor see the class, and students see one another. It emulates the natural classroom environment in that there are multiple learners in one location (virtually).

Table 1.
Table 1 Suggested Technologies

Limitation	Suggested technology	Functions	Specific learning activities
Students cannot see each other or instructor online	Skype web conferencing	Communication (visual, audio)	Peer-to-peer conference, student-instructor meeting
Students cannot meet a group online and do group work	Skype with doc sharing plug-in	Collaboration (group work)	Sharing documents, document markup, see one another to meet and discuss
Students cannot easily and instantly access instructor/ need for more prompt communication, must be logged on Blackboard to use Blackboard chat function	Instant Messenger	Communication	Peer-to-peer conference, group conference, and collaboration
Need for all communication to come from one source. Must be logged onto Blackboard to get Blackboard e-mail	University e-mail for private and prompt communication	Communication	Class announcements, communication
Need way to easily access and share supplemental websites. Blackboard web links list does not allow for student postings.	Blackboard Scholar, a social bookmarking site that can link from Blackboard	Presentation/ collaboration	Students can share each other's web resources or important bookmarked library pages (group work), learning community

Notes from archival data mining also indicate that students express they "need a way to connect instantly and simultaneously" with instructors.

The Blackboard CE course management system has instant messaging service which allows for synchronous, real-time chatting (typing) computer- to- computer. A concern expressed by students was that they "never were online on Blackboard, so could not find instructors easily". Students suggested that instructors created AOL Instant Messenger accounts to use. Many of Coastal Carolina's students report using the service on a regular basis, as 48 respondents reported that they would prefer to use this service for real-time communication.

The last complaint addressed is regarding the "sharing" of external learning resources (such as other websites). On the online surveys, using additional external websites to aid in instruction had the highest rating (79%). Students conveyed that having all materials available and easily accessible was also important. The researcher suggests using Blackboard as a main portal to access all resources.

Recommendations

Recommendations from this research included (a) instructors hosting their basic course materials on Blackboard, (b) using other means to provide just in time chat services, (c) and linking to other learning and reference resources online. Students in this research study indicated that they prefer having all materials accessible through one portal. In addition, just-in-time chat services (real-time, synchronous communication) can be facilitated by using either Facebook chat services, or America Online Instant messenger. Both services can be accessed through a direct Blackboard link. Students in this research indicated they prefer use of these services to communicate with instructors in real-time, as they are both mediums that are already heavily used by our student population at Coastal Carolina University. Lastly, any additional resources used in class (such as online workbooks, other websites, etc.) should be linked to from within the Blackboard course module. Instructors can post links to these additional resources from the stable and secure Blackboard Learning environment.

The template for course design, along with summary of findings from this research were presented to the Distance Learning Advisory Committee during August 2009 and adopted in December 2009. The recommendations are presented to faculty as a principle of good practice for general distance learning course design at Coastal Carolina University in distance learning instructor training sessions.

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Student Presentations via Streaming Content Capture

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Abstract

Professors at Oxford College of Emory University extend class-capture technology beyond lecture recording to the capturing of student presentations and projects. This content capture process creates instant feedback to the producing students about their content expertise and communication effectiveness as well as a self-reinforcing loop that motivates students to perfect their oral presentations.

Introduction

Prominently included in the mission statement of Oxford College is the phrase "…the curriculum and the co-curricular activities of Oxford College are designed to teach students to read perceptively, think independently, communicate clearly, and embrace responsible citizenship." In particular, the goal of students achieving the skills of clear communication is achieved through both written and oral exercises throughout the program of the college. The oral element is most prominently addressed using individual and group presentations within many varied courses.

While effective at demonstrating content expertise and exercising oral communication abilities, classroom presentations – both group and individual – also present pedagogical challenges to the professor and the course. A substantial amount of class time must be allocated not only to each individual or team presenter but also for setup and transition time between presentations. This cumulative expense of time is costly to the syllabus of the course in constraining the quantity of material that the professor is able to include across the span of a semester. Furthermore, the fleeting nature of class presentations requires hasty assessment by the professor and questionable pedagogical value to the non-presenting students.

To address these challenges while retaining the value of student oral presentations, a selection of Oxford College professors are experimenting with the student use – outside of class – of lecture capture technology. The audio and video of the captured presentations are then published via streaming video for student viewing and learning as well as professor review and assessment. Using content capture technology maintains the practice and benefits of oral presentations while liberating the previously allocated class time for other pedagogical uses.

Technology Infrastructure

Oxford College Information Technology (OCIT) researched several different content capture products prior to implementing the Camtasia Relay system created by the TechSmith Corporation. Camtasia Relay is appealing to Oxford College due to these properties:

- Software based system
- Quick and easy client installation
- Intuitive user interface
- Server based license
- Windows, Macintosh and flash drive compatibility
- Easy to use
- Automatic file formatting (multiple formats), web publishing and link address notification
- Integration with web, Blackboard and iTunesU
- Portable and offline recording options

Following a successful pilot program including faculty focus groups, instructional videos and training sessions, Camtasia Relay was fully licensed and installed.

The server computer hosting Camtasia Relay is a Hewlett-Packard DL-320 G5p with dual 2.13 GHz processors, 2 GB RAM and 149 GB hard drive. The operating system for this server is Microsoft Windows Server 2003 SP2. The Camtasia Relay server processes the captured videos into the user selected video formats and publishes the final videos to a separate media server. The media server is also a Hewlett-Packard DL-320 G5p with dual 2.13 GHz processors; 2 GB RAM but with a 292 GB hard drive. The operating system for the media server is Red Hat Linux 4.

User accounts for the Camtasia Relay server accessed via the Camtasia Relay client software are authenticated via Emory University's LDAP system. However, the user accounts must be independently activated for Camtasia Relay.

The Camtasia Relay client software is available for Apple Macintosh OS 10.4 – 10.6, Microsoft Windows XP, Vista and 7; and a portable recorder is installable on flash drives. All client software is downloaded locally from the college Camtasia Relay server. All public use workstations in student computer labs, classroom facilities, loaner laptops and the library include in the standard disk image the Camtasia Relay client. Students, faculty and staff are permitted to download and install the client on their individual workstations at their discretion.

The Camtasia Relay client computer requires a microphone to capture the presenter's voice and optionally, a webcam if the presenter's image is desired. An inserted thumbnail of video or a photograph of the presenter's face adds to the quality of the viewer's experience.

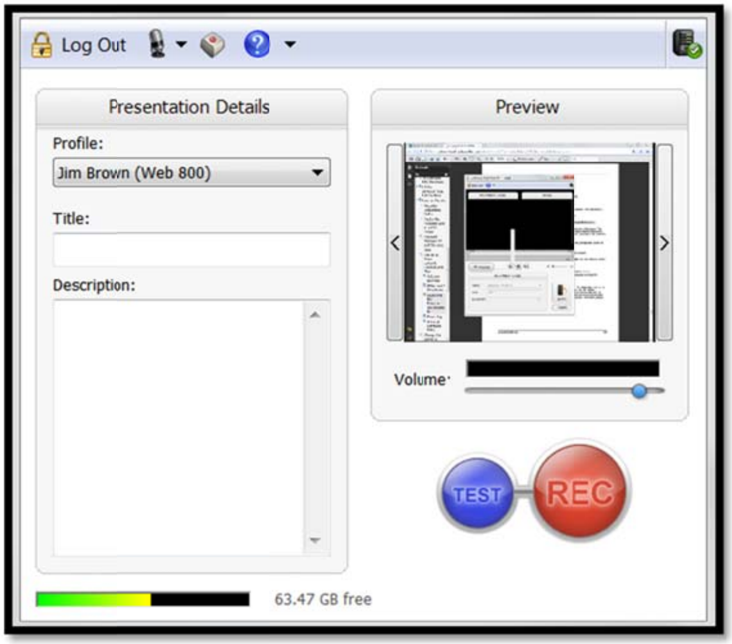
Video file formats supported by Camtasia Relay include…

- Camrec
- MP4
- XAP
- MP3
- AVI

- RMVB
- WMV

Overview of the Recording Process

When the presenter is ready to record the presentation and all the display materials to be used are perfected and displayed, Camtasia Relay is launched on the presenter's computer. Camtasia Relay requires a login that connects the user to particular profiles of preferences and settings. The user is then presented with this window:



At this step, a uniquely identifying title and description are entered, microphone volume is adjusted and the user selects from available profiles. The profile selections allow the presenter to choose among different resolution settings, video file formats and publishing destinations. The Camtasia Relay administrator defines the profiles available to each user.

When the red "REC" button is clicked, the presenter is given a 3 second countdown after which this window minimizes and recording begins. Everything that is displayed on the computer screen and heard by the microphone is captured from this point forward. The presenter proceeds with the presentation exactly as if it was being performed for as live audience. In fact, Camtasia Relay can be used to record live audience presentations equally well.

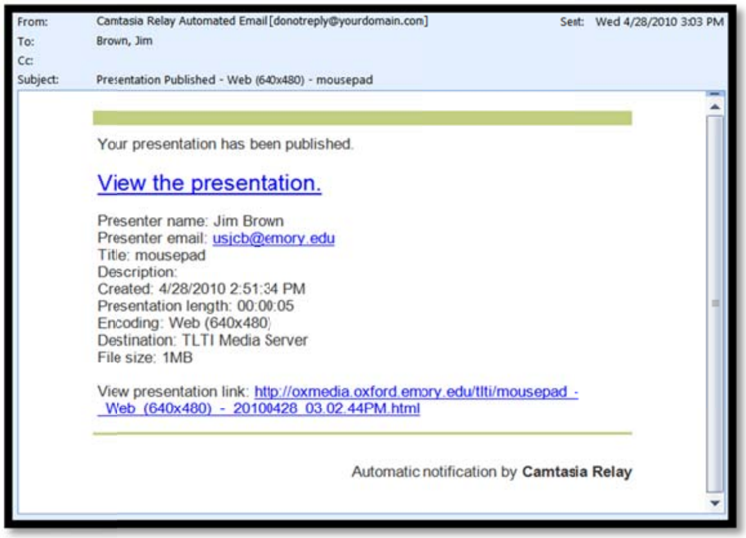
At the conclusion of the presentation, the Camtasia Relay taskbar button is clicked and the red REC is used to terminate the recording.

The following window is presented:

This window allows the presenter to quickly preview the captured audio and video prior to publishing and to trim the endpoints of the clip. Trimming is recommended to remove screen actions that are irrelevant to the actual topic of the presentation such as moving windows around, launching PowerPoint, maximizing the first slide, etc. Ideally the video begins exactly at the starting point of the presentation. With Camtasia Relay itself, trimming the end points is the only editing action available.

When the presenter is pleased with these details and the audio/video as previewed, the submit button is clicked and the Camtasia Relay client uploads the video to the Camtasia Relay server. Alternatively, the user may click the discard button to delete this recording and return to the previous window. If submitted, the Camtasia Relay server renders the video into the selected video format, moves the file to the media server, creates a web page to host the video and emails the web link to the presenter. The presenter may then utilize this web link in any manner as desired.

This automated email resembles the following:



Student Use of Camtasia Relay

To make this technology available for capturing student presentations, Oxford College Information Technology activated the login accounts for all the students in the participating professors' classes and taught 20 minute sessions to each class about the access, installation and use of Camtasia Relay.

The students formed into research, authoring and presentation teams in traditional manners and proceeded with developing their topics. Prior to deadline, the students were expected to author an academic paper on their topic and compose visuals to aid communication. The student groups were able to rehearse, and record their presentations as much as desired. The immediate review feature of Camtasia Relay allowed the students to evaluate their own performance and repeat the presentation until they were satisfied. The final presentation was submitted by the students to the Camtasia Relay server and published as a streaming video. The web address for the presentation was forwarded to the professor for review and grading.

An example of a Camtasia Relay recorded student group presentation may be found at:
http://oxmedia.oxford.emory.edu/student/Ozone_2.0_by_Michael_Asima_Ellen_and_Lea_-_Web_(800x600)_-_20091213_04.47.06PM.mp4

The web links for all the group presentations may be consolidated and archived by the professor into a class site. Longitudinally, multiple class presentation recordings may be assembled to help students learn from classes of previous semesters and years.

In these classes, the professors were able to discontinue using class time for present these student presentations, offer them online to other students and grade them at the professor's leasure.

Follow-up

With this successful pilot program complete, desired follow-up activities include:

- Interviewing the students and faculty to determine their perceptions of the effectiveness of performing online presentations compared with traditional presentations for reinforcing content expertise.
- Interviewing the students and faculty to determine their perceptions of the effectiveness of performing online presentations compared with traditional presentations for reinforcing oral communications skills.
- Beginning a library of online student presentations from various semesters and disciplines.

Educating Students in Green Computing

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Students today literally live electronically. Any walk across campus reveals students connected to others and to the Internet by all kinds of devices. Laptops are a standard part of a book bag. Constant connectivity is simply the current environment for college students. There is however an environmental cost for all these devices. Computers and the huge variety of accessories all use power. All those hand held devices need to be recharged. Do students today ever think about how much power they are using? More to the point, do colleges and universities (admittedly in the business of education) do a good job of making students aware of the environmental costs of computing? Is it easy for a student to find information about controlling the amount of power used for a computer, a monitor and various accessories on the campus web site? Will a student find out how to save printing costs? Will a student who is **not** looking for this information come across it easily and be encouraged to act on it? This paper will present some of the best ideas on how to do this as well as examples of campuses which do not seem to address the problem.

One would hope that schools with ample resources might be leaders in this area. Hence the author chose to survey the top ten liberal arts colleges in the country and the top ten national universities, as identified by the December, 2009 U.S. News and World Reports rankings. [1] Since students live on line, and one of the questions to be answered was how easy it was to find information about green computing, it seemed reasonable to survey all twenty schools by examining their web sites and following the links provided. It should be noted that the author was willing to be quite persistent. If an immediate link did not show up and a search facility was available, the author tried searching for such topics as sustainability, green computing, etc. On all sites it was relatively easy to get to a page of the campus equivalent of the Information Technology Department.

ASCUE members have had a fine example of the sorts of resources which can easily be provided in the work of Tom Marcais. His paper entitled "Green Computing – It IS Easy Being Green" was presented at the 2008 annual ASCUE meeting. His paper addressed issues such as power management, screen savers, peripherals, buying and recycling equipment, and reducing both paper and CDs/DVDs. [2] These are all important when attempting to be more responsible about our natural resources, but often students don't think about these issues or they simply are misinformed.

Let's look first at the top ten liberal arts colleges. While they vary somewhat in student enrollment (from 1170 to 2350), they are relatively small schools. Some of these colleges make an impressive effort to educate and encourage students to be responsible users of our natural resources. Others seemingly make only a small effort. Williams College tops the U.S. News and World Reports list. It is one of the few colleges with a link to Information technology available on the home page when one types in the URL for Williams. With three quick and rather obvious clicks, one arrives at a good half screen of information addressing turning off the computer, not using a screen saver and saving on paper when printing. A further link takes one to more detailed information, including information on saving power by changing light bulbs and getting rid of mini refrigerators. [3] There is also a link for a great page describing how much electricity various models and makes of computers use. This was done by interns in the summer of 2006. Admittedly, this is something that has to be kept up to date, but it is a task which can easily be handled by students.

Although virtually all colleges and universities are concerned about issues of sustainability in some way, many are looking at this with a wider focus and have not yet put information about green computing on their web sites. Amherst and Swarthmore are good examples. In just a couple of clicks, one can get to a site at Amherst with links to many issues dealing with sustainability. [4] The site describes a number of awareness and promotional campaigns, including the results of a dorm energy competition. However, the link to Green Computing leads to a page which says that information is coming soon. At Swarthmore the Sustainability Committee (charged with making recommendations to improve environmental sustainability on campus) made recommendations to Information Technology Services, asking them to educate the community. One assumes that this is a work in progress, with nothing yet on the web site.

Haverford College also falls into the category of schools which are taking a broader view of sustainability without putting focus on the natural resources consumed by computing. The Committee for Environmental Responsibility is clearly active and working on a number of projects. This committee has a page entitled Going Green @ Haverford with a report on their activities. There is a link to this under the blogs section of the main page.

Carleton College also is taking a broad view of sustainability. From the main page, one click takes one to Campus Life. On that page is a link to Sustainability. Some important programs, including the installation of a 1.65 Megawatt wind turbine and the completion of LEED GOLD certified residence halls, are described. The Pledge of Sustainable Conduct brings individual responsibility into focus. Included in the pledge are actions a signer can take to reduce power usage, including a sentence encouraging turning off a computer when it is not in use.

Middlebury's information is similar, but even easier to find than Carleton's. Sustainability is a prominent link on the home page. Middlebury hosts the oldest undergraduate environmental studies program in the country. From its Sustainability page there are links to pages describing work in many areas, including energy, food systems, sustainable design and transportation. Under Tools and Resources there is some information about powering down computers and accessories when not in use and about controlling paper waste when printing. Again, the focus is on larger projects.

Wellesley College had a page with good information on power usage , printing and recycling in the fall. In the spring this information seems to be found via a link from the sustainability page. It took perseverance to find this![5] Davidson provides a little more information and the information is easier to find. From the home page, one goes to Services and then to IT. On that page is a link to Sustainability with additional links to information on power usage, printing, etc.

A couple of colleges have done impressive work at helping their students understand responsible use of natural resources in dealing with technology. Bowdoin College (at least in February) had a direct link from one of the pictures on its home page to a page which gave a real time report of the electrical consumption in campus buildings, including residence halls. On the home page of the site for Information Technology there was a wonderful paragraph encouraging everyone to turn off computers, monitors, etc. when going on break. A couple more links takes one to the Sustainable Bowdoin website. From there more links take one to Energy Conservation and Green Computing Tips. The information is well done and relatively easy to find. Along the way one can learn something about polar bears (who don't really hibernate, but your computer can!). It is definitely worth a visit! [6]

The real prize among the top ten liberal arts colleges goes to Pomona College. Sustainability is a direct link from the college's new home page. Then there is a link to the Sustainability Action Plan. Under Tools and Resources – Publications, one finds The Little Green Book: A Guide to Sustainable Living at Pomona College. The book consists of 36 well designed pages of information, all clearly intended to gently guide students to pay attention to our natural resources. There is detailed information on recycling virtually everything as well as extensive information on power usage. Not only is there a table listing the energy usage of common computers, but the same page also lists energy usage for items such as DVD players, TVs and Wiis. The section dealing directly with computers is very detailed. For example, students are advised to use a cooling pad when using a laptop on their laps. They are also advised to avoid putting laptops on soft surfaces. Reasons are explained without overwhelming details. The Little Green Book covers all aspects of student life. The book will even tell you when your favorite fruits and vegetables are in season (remember, this is California!). However, compared to all the other top ten liberal arts colleges, the information about green computing alone is clearly the most detailed and helpful. Students were involved in putting this together, which is probably one reason why the book seems so attractive to a student population. One could argue that students attending these top ten colleges should already know how to save power, print responsibly, and recycle electronics. Given the power consumption at most colleges, this probably is not a good assumption. Pomona obviously thought it was better to be proactive and educate their students in these areas not just for life at college, but for life after college.[7]

Turning to the top ten national universities, one expects to find substantive and broad initiatives in many aspects of sustainability. These are very large schools with home pages which must meet multiple needs. An individual student looking for information on how to control the power used by a computer or how to recycle an old computer certainly would not expect to find this in one or two clicks starting with the home page. Nevertheless, large as these universities are, they still have students who can benefit from thinking about their individual carbon footprints. Harvard and Princeton tied for first in the top ten list in December, 2009. Harvard has done an impressive job at balancing the actions which the university can take to respect natural resources and the need to educate all members of the community about possible individual actions.

Harvard's Office for Sustainability was established in the fall of 2008; it was formed from an existing organization, Harvard Green Campus Initiative, which dated back to 2000. The web site for Sustainability at Harvard contains a number of very helpful links.[8] One takes you to the Office for Sustainability and its Mission Statement which addresses work in many areas. Under Places – Home & Dorm, one finds a link to the sustainability pledge. The introductory paragraph points out the Harvard tackles reducing its environmental impact from two sides – making changes as a university while encouraging all members of the community to green their own habits. The pledge, definitely meant for individuals, including all students, lists several items under the headings of energy, food, water and waste. The very first item under energy addresses setting the sleep mode on a computer and monitor. The "Green Tip of the Month" feature offered by the Office of Sustainability is available to anyone, not just Harvard community members. Overall the web site for Sustainability at Harvard offers an abundance of information about current efforts and possible actions, both large and small. No one could doubt the where sustainability ranks in the priority list at Harvard if they happened to visit the home page of the university on April 1, 2010. Banners proclaiming that "GREEN is the new Crimson" took center stage on the home page, with a direct link to the Office of Sustainability. This was no April Fool's joke, but rather a visual way to bring attention to the environmental consequences of our actions.

Princeton also has an Office of Sustainability which maintains a web site with information on projects and research as well as a report on sustainability at Princeton.[9] Unfortunately, the link to "Guide to Living Green at Princeton" on the student initiatives link did not work at the time this paper was written. There are currently 11 student environmental groups representing a range of issues, with 8 of these started since 2004. Clearly some of the students are concerned, but currently a student would be hard pressed to find information about individual actions that could reduce the carbon footprint of technology usage.

Just as with the top ten liberal arts colleges, the top ten universities vary quite a bit, from some which offer almost no information on the environmental cost of computing to others which have robust plans and resources, both for the university as a whole and for an individual student. California Institute of Technology maintains a web site on sustainability at Caltech. The site offers information about efforts in multiple areas, but is really more geared to employees. Efforts to find information which would help students reduce their carbon footprint when using technology were unsuccessful. Maybe we should assume that Caltech students already know this. Certainly these students are contributing to the cause by the basic research that is being done at Caltech.

Likewise, it was difficult to find this kind of information at the University of Chicago. The University of Chicago also maintains a website, Sustainability at the University of Chicago, which serves as a portal to a wide variety of activities, initiatives and programs. [10] There is very little focused information on green computing for students, but there is a link to a nice guide entitled "Greening Your Apartment," an appropriate guide for students at the University of Chicago.

Both the University of Pennsylvania and Duke provide some good suggestions without extensive detail. The GreenIT website maintained by the University of Pennsylvania is a fine resource for those wanting to "green up" their computer usage. There are lots of good suggestions on one page with links on the side to more information.[11] The University also encourages its community members to take a pledge to incorporate various sustainable practices into their everyday lives.[12] Second on the list of practices is setting the computer to sleep mode. In February, on Duke's Sustainability site, the second Green Devil Challenge was issued. Community members (faculty, students and staff) were encouraged to take the Duke Carbon Calculator to determine how much carbon they produce at Duke while eating, studying, traveling, etc. From the Take Action link, one gets to "Ten Quick Actions to Lower Your Impact." The third action addresses technology.[13]

The Yale Office of Sustainability maintains a website which details the expected university wide efforts at sustainability. A link takes one to the pledge, which encourages an individual commitment to sustainability – “a crucial step towards a sustainable campus.” [14] Rather than present a checklist, each person taking the pledge is asked to type in specific actions he or she will take. This, of course, requires those taking the pledge to be educated about possible steps an individual can take to reduce their own carbon footprint. There is another link from the Office of Sustainability page to the Student Taskforce for Environmental Partnership (STEP). STEP is designed to educate the Yale community about sustainability. Links from the STEP page lead one to good information on saving energy, including references to technology. Clearly Yale students are taking the lead when it comes to educating individuals in the community on reducing their carbon footprint.

Among the top ten universities, the three that stand out in terms of educating individuals about green computing, are MIT, Stanford and Columbia. MIT sponsors an annual set of events to educate, inspire and engage the MIT community in all things energy. There is a direct link on the MIT website to energy initiatives. One more click yields campus energy activities with the top of the page entitled “Help MIT Walk the Talk on Energy and the Environment.” This is followed by good information with many links to additional information. Just to the side there is a clever logo called “greeningmit.” Clicking on this reveals a wealth of practical advice, with heavy emphasis on the energy consumption of computers. It is not surprising that MIT is taking a lead in energy related activities, but it clearly also takes the prize for making the information for individuals easy to find. [15]

Stanford’s website on sustainability is well designed and easy to navigate. [16] Under the heading “What We’re Doing” are links to projects in multiple areas with the same broad focus common to many of the large universities. However, Stanford’s progress is impressive. In 2008-2009 Stanford was the only school in California to receive the highest ranking for leadership in sustainability out of 300 colleges and universities surveyed for the College Sustainability Report Card. [17] Under the heading “What You Can Do” are links for students and for faculty and staff. The student link leads to “Get in on the Action” and then to “A Students’ Guide to Sustainable Living at Stanford,” a full and complete guide similar to the guide developed at Pomona. The guide addresses all areas of student life, and gives full and complete information on the energy used by computers, peripherals and other electronic equipment. The table on page 8 listing energy consumption by all these devices when active, when in standby mode, when hibernating and when turned off is convincing and easy to read. This guide was presented in the orientation for new students in the fall of 2009. This is an easy step to imitate at other campuses; educate our students as they begin their college careers!

Columbia University is a leader in research on climate change and sets an example of long-term environmental sustainability both on its campus and in the daily lives of its community members. The Office of Environmental Stewardship initiates, coordinates and implements programs to reduce Columbia’s environmental footprint. [18] There is a direct link from its web site to the “Guide to Green Computing,” perhaps the most complete guide found on any of the 20 colleges and universities surveyed. The guide covers all areas thoroughly, including common myths, purchasing, power management, printing and upgrading and disposal of old computers. It contains an excellent discussion of how many kilowatts a typical desktop PC with a 17 inch flat panel LCD monitor uses. The discussion is convincing and written in layman’s terms. This guide is exactly the kind of document every incoming first year student should have in hand before buying a computer for college use. Columbia has made this information easy to find.

Virtually every college and university is working on issues of sustainability. The College Sustainability Report Card (mentioned above in connection with Stanford) rates colleges and universities in 9 different areas, including administration, climate change and energy, food and recycling, green building, student involvement and transportation.[19] The 2009 report card give the highest rating (an A-) to only 15 schools. From the schools considered in this paper, Middlebury, Carleton, Harvard, Stanford, the University of Pennsylvania and Columbia were included. In the 2010 ratings in which 332 schools were surveyed, 27 schools received a grade of A-. Nine of the schools considered for this paper were included. Schools were included in the survey if they had $160 million or more in endowment assets.

Exemplary work on sustainability should involve campus wide initiatives as well as actions to get individuals to make more appropriate choices. In many cases, good information is available on a campus website, but it takes work to find it. This is not an area in which we can be complacent. If we are going to change the habits of our campus citizens, the needed information has to be visible and easy to find. It should be pointed out that the topic of this paper is a moving target. All colleges and universities care about sustainability. Programs, initiatives and educational actions are taking place at a rapid rate. Hopefully green computing will soon become almost automatic!

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The Effects of Electronic Feedback on Student Performance

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Introduction

Prior research (e.g., Wilson, 2006; Wilson & Taylor, 2001) suggests that immediacy behaviors of instructors are associated with increased grades and satisfaction with both the course and the instructor. Immediacy behaviors are both verbal and nonverbal. Examples of nonverbal immediacy behaviors include looking at the class while talking, not talking in a monotone voice, moving around the classroom while teaching, and having a relaxed body posture while talking. Examples of verbal immediacy behaviors include calling students by name, asking students how they feel about things, and using collective pronouns to refer to the class (Immediacy in the Classroom: Research and Practical Implications, 2010).

The importance of immediacy behaviors in the classroom cannot be overstated. The use of immediacy behaviors in the classroom has been shown to increase student satisfaction and even student grades (Wilson, 2006; Wilson & Taylor, 2001). There is ample research (see Immediacy in the Classroom: Research and Practical Implications, 2010, for a review) showing that immediacy behaviors in the classroom are associated with improved affective and cognitive learning, perceived instructor competence, student motivation, and attendance and participation. As such, instructors should be encouraged to display these immediacy behaviors in the classroom.

Although the effectiveness of immediacy behaviors in the classroom has been well documented, it is not clear how online instructors can make use of these in-class immediacy behaviors. Behaviors such as asking students how they feel about things and referring to the class with collective pronouns can easily be translated to an online environment. But most immediacy behaviors, such as looking at the class when talking and moving around the classroom when teaching are not transferable to online settings. So, the question becomes, how can online instructors take advantage of the effectiveness of immediacy behaviors in online, asynchronous, distance learning classes.

There is a fairly substantial literature on the effectiveness of out-of-class communication. Out-of-class communication between instructor and student has been associated with student retention (Milem & Berger, 1997), academic performance (Terenzini, Pascarella, & Bliming, 1996), and positive affect for learning (Pascarella & Terenzini, 1991), for example. In an interesting study on the effectiveness of email from a professor on student motivation and attitudes, Legg and Wilson (2009) sent a welcoming email to some students and no email to other students prior to the start of class. They argued that developing rapport with students (an immediacy behavior) will affect their motivation, attitudes, and grades. The results of their study showed that an email sent prior to the start of class significantly enhanced student motivation and their attitude toward the course and the instructor. The email did not impact their performance in the course.

The purpose of the current research is to examine the effectiveness of electronic feedback on student performance in online and hybrid courses. Specifically, we sent personalized emails to students about their performance (on an exam or activity) relative to the class average. When a student performed lower than the class average, the emails expressed concern, offered assistance, or directed the student to resources that might be of help to them. When a student performed better than the class average, the emails encouraged the student to continue to exert the effort needed to perform at that level or better. Personalized feedback was sent to students following the second exam or quiz. Students did not receive electronic feedback from their instructors following the third exam or quiz. The personalized emails served as a proxy for immediacy behaviors that one might find in a traditional classroom. We anticipated that exam or quiz scores following personalized electronic feedback would be significantly greater than those not followed by electronic feedback.

Method

Participants. Participants were 49 students enrolled in either online and hybrid psychology courses or hybrid physics courses. There were 15 students in the online psychology course, 11 in the hybrid psychology course, and 23 students in two sections of a hybrid physics course.

Procedure. In the psychology courses, students received an email from the instructor following the second exam. Students who scored above the mean received positive feedback from the instructor: "I noticed that you scored above the mean (76.5%) for the exam. Whatever you are doing to prepare for the exams, keep doing it because it is working." Students who scored below the mean received encouraging feedback from the instructor: "I noticed that you scored below the mean (76.5%) for the exam. I want to remind you about the resources in our Blackboard site, particularly the "Effective Study Skills" link in the Course Information tab. If there is anything I can do to help you improve on the next exam, then please let me know." Students did not receive any other feedback on the first, third, or fourth exams.

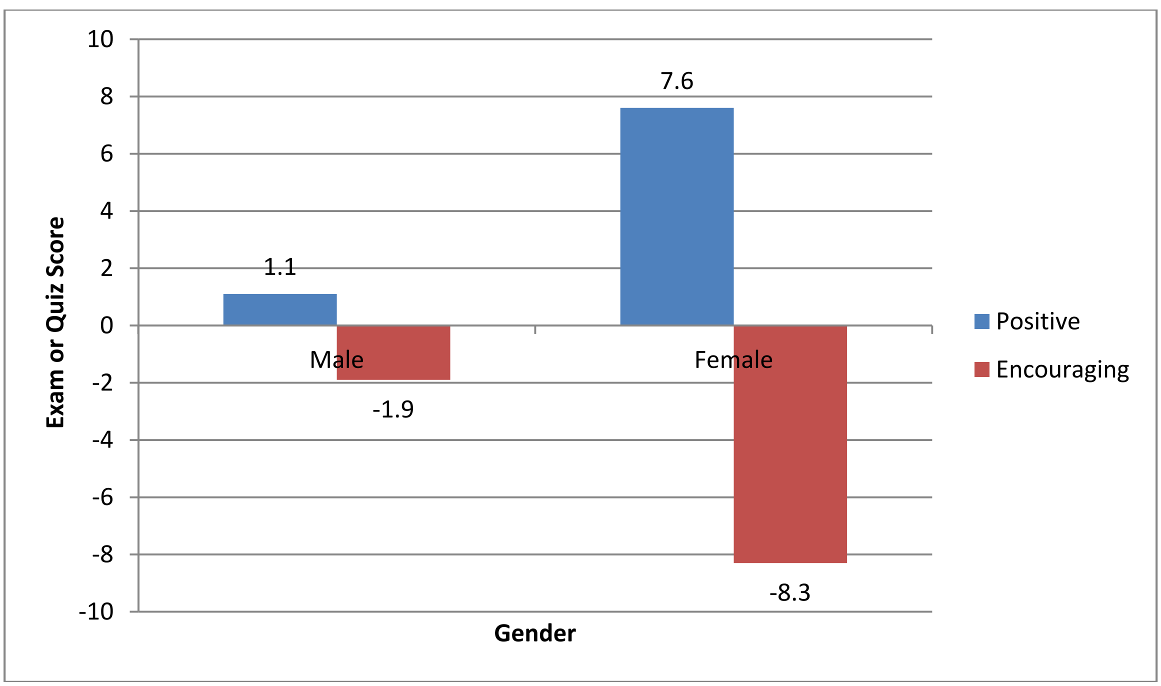
In the physics course, students received positive feedback if they scored above the mean for a quiz: "I noticed that you scored above the class average on the last quiz. That is fantastic. Keep up the hard work. Continue utilizing the successful study practices you are already using. Keep in mind that for the next test, you will have twice the questions in the same amount of time so keep studying." Students who scored below the mean received encouraging feedback: "I noticed that although you had a good score on the quiz, you scored below the class average. Some suggestions I have for the next test is to come to class regularly, do the Webassign problems several times, and choose more book problems to look over. Please come to office hours if there is anything I can help you with. Keep in mind that for the next test, you will have twice the questions in the same amount of time so keep studying. " Students received this email after the second quiz only.

We recorded the type of feedback (positive, encouraging) students received, as well as their exam or quiz grades on the second (no feedback) and third (feedback) exam or quiz. We compared the effects of feedback (positive, encouraging) on their exam or quiz scores (no feedback, feedback). We anticipated that exam and quiz scores would improve after receiving electronic feedback, regardless of the type of feedback. We also examined the effects of gender (male, female) and type of class (psychology, physics) on exam and quiz scores.

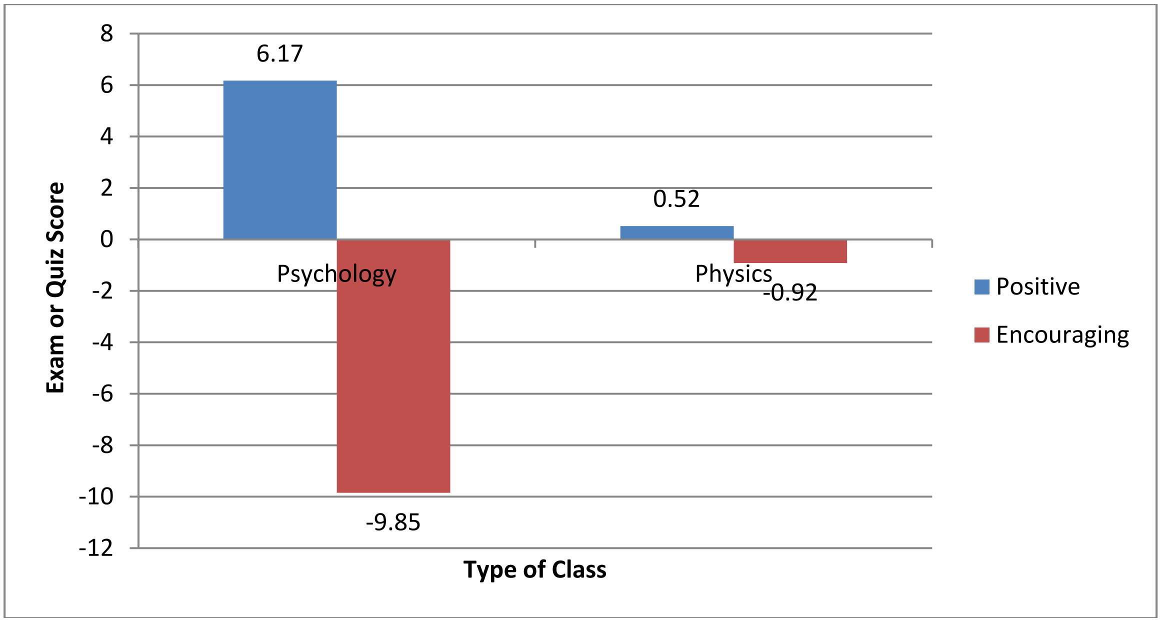
Results

Because the exams and quizzes included different numbers of questions and the means were different, all exam and quiz scores were standardized by subtracting the exam or quiz mean from the exam or quiz score. Thus, higher numbers indicate better performance.
To examine the main hypothesis that feedback will improve performance, we conducted a 2 (Type of feedback: positive, encouraging) x 2 (Timing: no feedback, feedback) mixed model analysis of variance. The results showed a main effect for type of feedback, with those receiving positive feedback ($M = 3.53$, $SD = 10.17$) performing better than those receiving encouraging feedback ($M = -5.65$, $SD = 12.4$), regardless of time of exam or quiz, $F(1,47) = 11.77$, $p < .001$). In effect, good students continued to perform well, regardless of feedback. These results disconfirm our hypothesis.

To examine whether males and females responded differently to the feedback, we conducted a 2 (Type of feedback: positive, encouraging) x 2 (Timing: no feedback, feedback) x 2 (Gender: male, female) mixed model analysis of variance. The results show a significant interaction of gender and type of feedback, $F(1, 45) = 6.12$, $p < .05$. These results are displayed in the figure below. Clearly, females were more responsive, in both directions, to the feedback than males.



Finally, to examine if the type of class affected exam and quiz performance we conducted a 2 (Type of feedback: positive, encouraging) x 2 (Timing: no feedback, feedback) x 2 (Class type: physics, psychology) mixed model analysis of variance. The results, displayed in the figure below, show a significant class type by type of feedback interaction, $F(1, 45) = 8.45$, $p < .01$. The results suggest that the feedback had a more significant effect, in both directions, on psychology students.



Discussion

A variety of research attests to the effectiveness of immediacy behaviors in improving learning for students (e.g., Immediacy in the Classroom: Research and Practical Implications, 2010). Yet, in online and sometimes hybrid environments, most immediacy behaviors do not translate well. Happily, an abundance of research attests to the effectiveness of out-of-class communication on student retention (Milem & Berger, 1997), academic performance (Terenzini, Pascarella, & Bliming, 1996), and positive affect for learning (Pascarella & Terenzini, 1991). The purpose of this research was to examine the effects of electronic feedback, serving as a proxy for verbal feedback, on student performance. It was expected that student performance following instructor electronic feedback would exceed performance on exams and quizzes not followed by electronic feedback.

The results of the study did not find the anticipated significant interaction between type of feedback and timing of the exam. Exam or quiz performance following feedback was not significantly different than performance not followed by feedback, regardless of the type of feedback. The results of the study showed a significant difference between the type of feedback, with positive feedback leading to more improved performance than encouraging feedback. This result suggests that the type of encouraging feedback might need to be altered so that it sounds more positive. For example, instead of indicating to students that their performance was lower than the class average, perhaps the feedback might simply suggest resources that students can make use of on the next exam or quiz.

The results did show a couple of interesting interactions with type of feedback. Specifically, female students seemed more responsive to feedback of any type, as indicated by their performance, than males. Prior research indicates that females are more sensitive than males to non-verbal forms of immediacy behaviors, such as eye contact and length of meetings (Rester & Ed-

wards, 2007). In the current research, positive feedback improved performance whereas encouraging feedback seemed to lead to worse performance. Again, it may be that the encouraging feedback needs to be changed in a manner more like the positive feedback.
There was also an interaction of type of class (psychology and physics) and the type of feedback. Psychology students responded more extremely, in both directions, to the feedback than physics students. Of course, these results might simply mirror the gender results as 78% of the physics students were males, compared to 38% of the psychology students.

The results of this study suggest several possibilities for future research. First, it would be interesting to change the type of electronic feedback that students receive. The results of this study showed that positive feedback did indeed improve performance, but encouraging feedback seemed to make it worse. It would be interesting to test the effects of different types of electronic feedback on performance. It would also be interesting to examine the effects of performance on a multitude of other variables, such as satisfaction with the course and the instructor, student motivation, student interest in the course material, and course retention, which is often a problem in online courses. If electronic feedback, as a proxy for in-class immediacy behaviors, has positive benefits beyond performance, then it seems worthwhile for instructors to provide such feedback.

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Using Semi-Automated Forms for Student Advising

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Abstract

At the University of South Carolina Upstate, each student must be advised every semester before registering for classes. Historically, advisement has involved the completion of a multi-part, carbon-paper form on which an advisor lists recommended courses in consultation with the student. Students use the information to later complete the registration process online. Because of budget limitations, the university recently decided to eliminate the handwritten carbon-paper forms without providing a campus-wide replacement mechanism leaving it up to individual departments to innovate and adapt. We considered using physical hard copies of the old forms, developing a fully-automated online advisement system, and Microsoft Word-based forms but all had limitations. The best solution for us was to create a standalone PDF file employing drop-down selection boxes populated with the most likely course information. We experimented with several different layouts and continue to refine the form each semester. The form is such that one can type over the drop-down box (information can often be cut and pasted from our online course information system). The form can also be printed and filled in by hand if necessary. The form can be retained electronically, emailed, and the printed form stored physically. We have found that the new partially automated form, a very inexpensive solution that can be done by anyone with no special skills, reduces advisement time and effort while retaining much of the flexibility and utility of the old handwritten form.

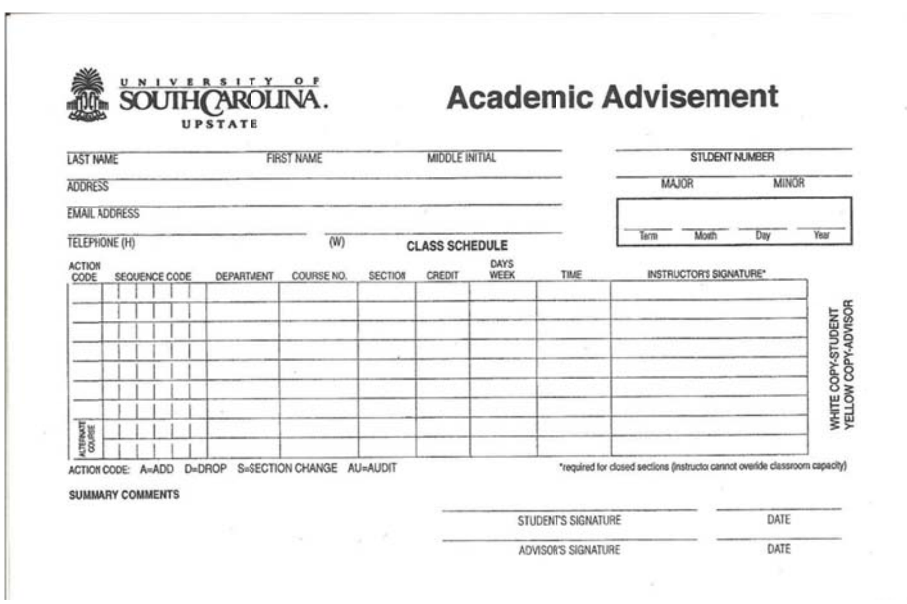
Introduction

The University of South Carolina Upstate, one of the satellite campuses in the University of South Carolina system, is a metropolitan university offering a variety of degrees predominantly at the baccalaureate level, and is home to over 5,500 students. The university has always strived to retain a small-campus feel even though it has grown dramatically over the last fifteen years. Personal interaction with each student is a continual goal. In a session called an advisement, each semester, every active student meets with a faculty advisor who reviews the student's academic progress and recommends several courses for the student to take the following semester. This allows advisors to tailor a student's academic program to individual needs and is a wonderful retention and student satisfaction mechanism.

However, advisement places a burden on the advising faculty who must conduct over 10,000 advisements each academic year. Averaging ten to fifteen minutes per advisement, this effort represents thousands of person-hours each year. Also, not surprisingly, there is a workflow associated with advisement. Students' ability to register for classes is disabled until completion of the advisement is verified by an administrative action known as clearing the advisement flag. The flag is cleared only after a signed advisement form is completed and signed. The advisement form contains the list of recommended courses and information associated with the courses and - is signed by both the advisor and the student. One copy of this form goes to the student who uses it to later register for classes. A copy of the advisement form is retained by the academic department and becomes part of the students' permanent file. Retaining documentation of the advisement process is important. Once advised, students are able to register for any course, even those not recommended by the advisor. Therefore, it is possible for students to register for courses counterproductive to progress toward a degree. In such cases, the advisement form copies in the student's file serve as proof of proper advisement.

Until last year, two-part carbon-paper forms were used for student advisement and the forms were purchased in bulk for the entire university. The forms could be filled out with a typewriter or by hand to make a suitable copy. The original was retained by the student and the carbon copy was filed in the student's file. However, last year administration made the decision to stop using the carbon-paper forms in an effort to save money. This meant that each academic department was left to adapt to the new situation and do advisement documentation in their own manner.

Figure 1 shows the carbon-paper form.


UNIVERSITY OF SOUTH CAROLINA UPSTATE

Academic Advisement

LAST NAME FIRST NAME MIDDLE INITIAL STUDENT NUMBER

ADDRESS MAJOR MINOR

EMAIL ADDRESS

TELEPHONE (H) (W) Term Month Day Year

CLASS SCHEDULE

ACTION CODE	SEQUENCE CODE	DEPARTMENT	COURSE NO.	SECTION	CREDIT	DAYS WEEK	TIME	INSTRUCTOR'S SIGNATURE*
ALTERNATE COURSE								

WHITE COPY-STUDENT
YELLOW COPY-ADVISOR

ACTION CODE: A=ADD D=DROP S=SECTION CHANGE AU=AUDIT

*required for closed sections (instructor cannot override classroom capacity)

SUMMARY COMMENTS

STUDENT'S SIGNATURE DATE

ADVISOR'S SIGNATURE DATE

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ıined the

Some New Methods For Advisement

Departments have tried a number of different ways including:

- Purchasing the carbon-paper forms themselves and continuing as before
- Making single-page copies of the carbon-paper forms
- Making 3-per-page copies of the carbon-paper forms
- Implementing an electronic "form" using an Excel spreadsheet

- “Blank paper” –totally handwritten advisements

Purchasing the carbon-paper forms is an option that is difficult to beat. When bought in bulk for the entire university, the forms cost about $.05 each. When bought by individual departments, the cost is higher since the quantity is not as large. Typically the cost per form is over $.09.

Making copies of the carbon-paper forms is an attractive option since it is the easiest. The carbon-paper forms are roughly four inches high so simply copying them on a standard copier leaves most of the paper blank. Three of the forms can be copied on a sheet of paper to fully utilize the sheet, but then must be separated with a paper cutter requiring significant effort. However, copying the forms almost triples the cost when compared with the carbon-paper forms. Plus, since two copies are required, the form must be copied again after it is completed and signed. This is significant additional cost and overhead considering the utility of the form is not improved. In fact, because of the lack of the carbon copy, most would say that utility has declined.

Many administrative assistants are versed in using Microsoft Excel to create rudimentary reports. This is attractive because of the natural fill-in-the-blank and list-oriented nature of Excel and the ability to perform calculations. Therefore, some departments implemented computer-based advisement forms in Excel. While functional, these forms look more like spreadsheets than administrative forms. It is possible to create a true form-like look in Excel but this requires moderately advanced skills beyond most casual users’ ability.

Motivation For Our Solution

From the outset, it was obvious to us that any solution we came up with was not going to cost less than the carbon-paper form. Our overall goal then was to improve the advisement process in some way with our solution. We refused to implement something new that did not make it easier to perform an advisement. The most time-consuming part of an advisement is the entry of the course information. Figure 2 shows the nine pieces of information the carbon-paper form required for each course:

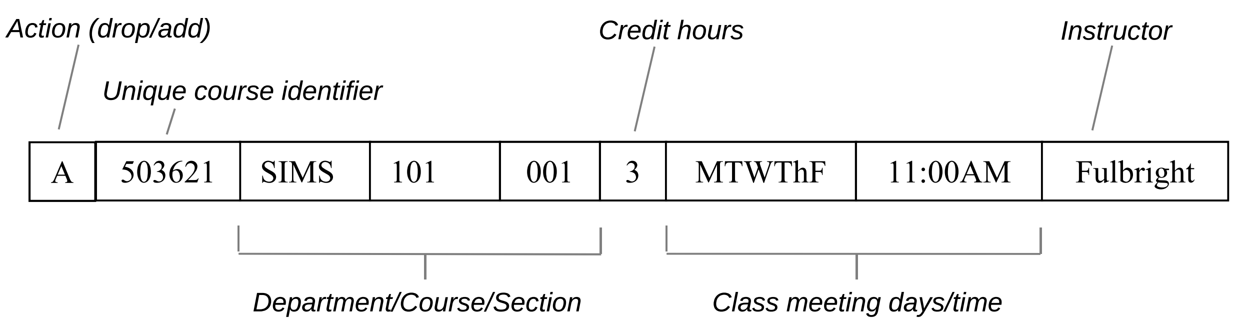

Figure 2 – The advisor must retrieve and record up to nine pieces of information for each course on the advisement form. Handwritten entry of this information is the most time consuming part of an advisement session.

This information must be retrieved by the advisor from our online master schedule of courses, or from our course database system, or from a printed schedule. The carbon-paper forms required this information be written by hand. Our primary goal was for our solution to lessen the time required for entry of form information. A secondary goal was to retain the utility and flexibility of using the carbon-paper forms. A third goal was to make the solution so that any administrative assistant on campus could implement it for their own department.

The Semi-Automated PDF Advisement Form

Drop-Down Lists

An obvious solution to the data entry challenge was to populate the form with course information in a series of *drop-down boxes*. A drop-down box is an element on a form that when interacted with a mouse pointer causes a list of selection options to display. The list appears to "drop down" out of the blank space on the form. Selecting an item in the drop-down list causes that information to be entered in the blank space.

The first problem encountered with drop-down lists was how to populate them with current information for the thousands of courses offered each semester. Drop-down lists on Web pages are ubiquitous and we certainly could have crafted a Web page with an interactive form supported by client-side and server-side programming to populate the form with data retrieved directly from the university's course schedule dataset. Developing such a page and maintaining it during advisement periods is a costly endeavor. This may well be a future campus-wide solution developed by information technology support but it was beyond the budget of our department. Another option we considered was to use a Microsoft Word-based form with add-in code to retrieve current data. An add-in is a small piece of program attached to a Microsoft Office document. However, this involved the same detriments as the Web-based form in terms of developing and maintaining the program.

These two options were driven by our initial idea of making *all* courses available through the drop-down lists on our form. However, we realized that since our advisors advise majors only in our department, they tend to advise students into a small subset of the available courses each semester. Therefore, we decided to offer via the drop-down boxes only those courses most likely to be advised by our faculty. Besides, it would have been too unwieldy to populate a simple drop-down box with *every* course. Such a list containing thousands of entries would have continued on for many "pages" and would have been difficult for the user to use.

Once we decided to limit the courses on the form, it became feasible for our administrative assistant to enter the course information prior to each advisement period. This has proven to require only about an hour's time each semester, so has proven to be an efficient solution.

Because we offer only a limited set of drop-down courses, it was necessary to insure that users be able to enter other course information via manual entry. Our first implementation attempt was with Microsoft Word. It is certainly easy enough to add drop-down boxes in Word. However, we were not able to make the blank line on the form available for both manual entry *and* drop-down entry—one precluded the other. The ideal solution was to have *all* blanks lines either drop-down or manual-entry. We discovered that this was possible using PDF files. This is why we used Adobe Acrobat to create our form.

Columns and Fields

Each line on the carbon-paper form was segmented into fields as shown in Figure 2. At first, we architected our form to have fields. However, in practice, it was difficult to get the drop-down list information to accurately fit within the pre-defined fields on the form. We spent many days battling this problem only to find some course with missing or different information that upset the spacing and thus ruin the alignment. We finally hit upon the idea that our form did not really require the fields and we were just doing it this way to make it look and feel like the carbon-paper form without any compelling reason to do so. Once we abandoned the notion of fields, the alignment problem went away. We have also observed that the freedom of having a line on the form without fields affords space for the advisor to enter whatever notes or other information he or she desires. This unintended benefit has proven quite useful.

Simplification

As shown in Figure 1, the carbon-paper form included areas for students' address, phone number, email address, and major/minor. These pieces of information may have been required at some point in the past but we do not require this now as part of advisement because we have all of this information on file already. Therefore, we did not put requests for this information on our form. This greatly increased available space and simplified the creation of the form. Figure 3 shows the resulting semi-automated advisement form.

Lessons Learned

We have used our semi-automated advisement form for two semesters and note the following observations and lessons learned:

- The drop-down lists reduce advisement time dramatically. Most advisements can be satisfied by selecting courses from the drop-down lists. Filling out the carbon-paper form by hand usually required 5-7 minutes (1/2 of the advisement meeting). However, if all courses come from the drop-down lists, the form can be completed in about one minute.

- If course information is needed beyond that available on the drop-down lists, the advisor can either type the information in or copy/paste it from our master schedule and our schedule database. This process is three times faster than hand-writing the information and twice as fast as type-writing the information.

- The PDF form allows the user to select something from the drop-down list and then also type on the same line. This has proven to be very useful in annotating the entries. There was no room on the carbon-paper forms for this which was often inconvenient.

- We have placed the form on a shared folder so all advisors can open it and use it. This allows our administrative assistant to make edits to the file without having to "distribute" the current version.

- Having the form in an electronic file has often proved useful because it can be easily emailed. Several advisements are done "remotely" because the student is unable to physically be present for the advisement. With the carbon-paper forms, one had to scan the form and then attach it to an email which was so cumbersome that we advisors usually just typed in the email body itself, thereby fouling the record trail in the students' folder.

- The version of the form presented here has evolved through several edits since its first use. The form as it is now is not very much more than name, identification, semester, and some blank drop-down list lines. In retrospect, we should have done it this way from the very beginning. However, at the beginning of the process we tried to stay true to the carbon-paper form. Simplification became obvious only after actual use.

- Because we need the student's signature, it is necessary to print two copies of the PDF form once it is completed. Some advisors have personal printers in their office, so this is an easy matter. Others have to launch the print, then go and retrieve the print outs for signature. This is not ideal, but savings in data entry time more than compensates.

- In general, the semi-automated form has reduced advisement time by more than 50%. The solution does cost more because we require two prints of each form. However, because we are printing on personal printers, the per-page cost is minimal. We estimate the total cost per advisement to be about $.12. The additional cost is compensated by the reduction in effort.

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Learning Proactive Leadership: The Power of Standards Definition

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Abstract:

Upheaval in the economy has meant every institution's strategic plan is in a state of flux. Within this maelstron, the rate of technology change has created a state of "permanent volatility." Like every ship sailing a storm there is time to ride out the worst, but you must have a way to correct course and put your technology strategy on track. Leader's control chaos by creating meaningful standards. Standards provide the framework for success, lowered cost and a sense of mission. Learn the power of the process in this session.

Editor's Note: The author had not submitted his paper at the time the proceedings went to press. He will bring copies to his presentation or make the paper available on the web.

Virtual and Traditional Lab Experiments in General Physics Courses

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In our Department of Engineering and Physics, we offer 5 different introductory physics courses that require accompanying laboratories. For our majors in Engineering Physics, and some of the students from Chemistry and Mathematics departments, we have two calculus-based physics courses. The first class, PHYSCIS 235 is basically the Newtonian mechanics plus a very brief introduction to heat and thermodynamics. This is the first freshman level physics class for science and engineering majors. This class has its lab as co-requisite which we call PHYICS 236.

The second calculus based introductory physics class that we offer; PHYSICS 255 covers the electricity and magnetism which also include a cursory introduction to optics. The lab that accompanies this course is referred to as PHYSICS 256. Our algebra-based introduction to physics courses, PHYSICS 130 and PHYSICS 132 classes are basically mirrored the PHYSICS 235 & PHYSICS 255 courses in content but differ in mathematical treatment and depth. The complexity of problems treated in these two courses differs from the calculus based classes. The labs that go along with PHYSCIS 130 and PHYSICS 132 are PHYSICS 131 And PHYSICS 133 respectively.

In addition we offer one condensed introductory class, PHYSICS 125 which is a shorter version of PHYSICS 130 and 132 combined. These entire five courses require laboratories that support the lectures. In a typical semester we have over 200 students in these classes. Providing laboratory space and equipments and managing all these individual labs are quite challenging. Since we don't have a graduate program in our Department, we cannot easily find enough undergraduate students as teaching assistants who are able and willing to help in these laboratories. Scheduling labs with skilled manpower traditionally has been a problem for us. Now that the State has been cutting our budgets and the fact that we have not had any increase in our operating expenses for years, only has exacerbated our situation.

We have tried to redesign our labs and lab projects by adding virtual experiments to the list of lab experiments that students do in a semester. It is still a unanimous opinion in our department that student must get some form of hand-on experience in physics laboratories. And all online lab or entirely virtual lab experiments is not an option. Recently we have experimented with a hybrid plan that divides the lab projects to 50 percent virtual lab experiments and the other half as tradition lab projects. We have implemented this plan only in our algebra based physics classes.

The list of lab projects for PHYSICS 131 consists of:

Introduction to Physics Lab

Measurement, Modeling, Graphing, and Use of Data Studio Software

Lab Experiment One
One-Dimensional Motion with Constant Acceleration

Lab Experiment Two
Projectile Motion

Lab Experiment Three
Newton's Second Law and the Definition of Mass

Lab Experiment Four
Work and Energy

Lab Experiment Five
Conservation of Momentum

Lab Experiment Six
Rotational Motion and Moment of Inertia

Virtual Experiment One
Position, Velocity, Acceleration and Free Fall

Virtual Experiment Two
Projectile Motion

Virtual Experiment Three
Masses on Inclines

Virtual Experiment Four
One- and Two-Dimensional Collisions

Virtual Experiment Five
Basic Torque

The above list was implemented in Fall of 2009. However the order in which these project were carried out was different for lab sections. We have implemented a similar idea in PHYSICS 133 which its list follows:

Lab Experiment One
Electrostatics

Lab Experiment Two
Capacitors and Ohm's Law

LE3. Lab Experiment Three
Series Circuits and Power
Lab Experiment Four

Electrical Circuits

Lab Experiment Five
Induced Effects and Electromagnetic Forces

Lab Experiment Six
Reflection and Refraction and Simple Lenses

Virtual Experiment One
Coulomb Forces and Electric Fields

Virtual Experiment Two
Cathode Ray Tube and Parallel Plate Capacitors

Virtual Experiment Three
Resistive Circuits

Virtual Experiment Four
Trajectory in E & B Fields, Magnetic field of a Bar Magnet

Virtual Experiment Five
Snell's Law and Simple Lenses

We have only recently implemented this plan and one single semester may not be sufficient to draw a solid conclusions. Nevertheless, the result that we have gotten so far has not been very satisfactory. To begin with, students have had the usual software complains such as the compatibility of the virtual lab and the operating systems. The windows are constantly been updated and Microsoft has a new version of its operating system. As a result, we have computers with three different operating systems, i.e. Windows XP, Windows Vista, and Windows 7. More importantly, students were complaining about the lack of continuity in labs and the gap between virtual labs verses the hands-on experiments. They liked the idea of not showing up at a regular time and being able to finish the virtual lab experiments at their convenient time. But it seems far from being clear that they are getting the experiences that were intended for these laboratories. There are many reasons for having introductory physics laboratories. However, the main goal for experimental projects has been the idea of letting students to understand and comprehend the physical concepts reviewed in the lectures. By participating in different experimental projects in the laboratories, students are supposed to prove those concepts and see how theories are applied in real life experiments.

Currently we are debating how to proceed in implementing introductory physics laboratories in our Department. Due to the lack of resources and at the same time trying to uphold the integrity of these labs and their intended objectives, have left us with very limited choices. These options include that whether we should continue with the current plan in its limited form or to expand this hybrid combination of the traditional and virtual lab projects to our other introductory calculus-based physics courses, i.e. PHYCIS 236 and PHYSICS 256. A few of us in the Department are also thinking about all online laboratories. Time is short and we need to implement something in our introductory laboratories before the Fall semester.

Introducing Fifth Grade Students to Programming through the Use of Robots

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Abstract

Students use computers all the time. But how do we get these students interested in computers as a career? I attended a conference and observed one method, the use of Lego Mindstorms NXT robots. This paper will explore the use of robots in teaching fifth graders how to program. I will discuss how the students built their robots, the progression through elementary programming features to advanced features and their final projects. I will also discuss how Avila University computer science students helped in this activity and what they learned from the experience.

Introduction

I attended The Consortium for Computing Sciences in Colleges (CCSC) conference in April, 2008. During one of the sessions (1), I learned how robots were used to introduce fifth grade elementary students to programming through the use of Lego robots. I started thinking how this could be implemented and I began working on a program to accomplish this. In April, 2009, I attended another session at The CCSC conference. This session (2), discussed how the program had been expanded to include sixth grade middle school students. That's when I decided to start a program at Avila.

Objectives

There are two objectives for this project. The first is to expose fifth graders to programming and problem solving using a fun and exciting activity, robotics. By working in teams, the students will also be exposed to group process.

The second objective is to give our college students experience in working with elementary age students. Our students will develop team leader skills while working with the fifth graders.

Backgrounds

Fall Semester

The first step was to pick an elementary school. St. Thomas More is a Catholic elementary school located about three blocks from Avila. After contacting the principal, John O'Conner, it was decided that we would start a "Robotics Club" with ten fifth grade students. Since we had five Lego Mindstorms Robotic Kits, this would allow us to set up teams of two.

Mr. O'Connor explained the club to the fifth grade class and asked them to sign-up if they were interested. We had 36 students sign up. Mr. O'Connor made the selection of ten students. We had six boys and four girls.

I asked Avila's Computer Science students if any would be interested in volunteering as team leaders for the Robotics Club. I had four Computer Science students and one Elementary Education student interested.

Spring Semester

St. Thomas More purchased two more robotics kits so we could expand to fourteen fifth graders. That also meant we would need an additional two Avila students. This turned out to be a bigger challenge than I anticipated.

Equipment

We started with five model number 9797 Mindstorms Lego Robotic Kits. During the fall semester four of the five teams used the Mindstorms expansion kits to build more sophisticated robots. During the spring semester, seven 9797 kits were used.

Each 9797 kit consisted of the NXT Intelligent brick, three interactive servo motors, hundreds of Lego pieces and several sensors. The intelligent brick is the brain of the robot. Programs are downloaded onto the brick and are then executed. The servo motors are used for movement – legs, wheels, arms, etc.

The sensors consisted of the following

- Touch sensor – used to detect contact with objects such as running into walls or an appendage making contact
- Sound sensor – detects loud sounds
- Light sensor – detects changes in light intensity
- Ultrasonic sensor – detects when the robot is within a specific distance of an object

The programming software used was Lego Mindstorms NXT 2.0 (3). This software is an intuitive graphical interface. By selecting "blocks" and dropping them on the main screen, the programmer can construct simple to sophisticated programs. Laptops were provided by Avila University for the programming purposes part of the sessions. Laptops were shared by the students to implement the spirit of sharing and cooperation in such projects.

The Project

Fall Semester

The project consisted of ten one-hour sessions, meeting Wednesday afternoons after school. The group consisted of ten fifth graders – six boys and four girls. These students were divided into five groups of two students each. Each team was assigned a college student as team leader.

The students were selected by the grade school principal, Mr. John O'Connor. These students were selected from a list of thirty-six students who signed up for the project. The college team leaders were volunteers from the computer science program and one from the elementary education program.

The students progressed through an agreed upon schedule between the Professor and the student assistants to have each session planned and managed with extra activities for students who are more advanced. Because most of the teams in the class were advancing very quickly throughout the activities, the professor and the student assistants had to come up with more creative and exciting projects for the students. This led to a great presentation for the parents.

The first two sessions were spent building the robots. Each team was given a Lego Mindstorms robot kit. The kit contained all the Lego pieces needed as well as a manual showing how to construct the robot. Figure 1 shows the completed robot. The boys' teams seemed to enjoy the construction more than the girls.

Figure 1

At the beginning of each of the next four weeks, I would demonstrate a feature of the software. The first demonstration was on moving the robot: move forward, move backward and combining these moves. The second demonstration was on turning and combining the turns with moving forward and backward. The third demonstration was on the sound and ultrasonic sensors. The fourth demonstration covered loops and combining all the features shown in the demonstrations.

After each demonstration, the students were asked to program the robots, first with the program demonstrated and then with expanding on what they learned. For example, when turns were demonstrated, the program showed how to have the robot move in a square. The students were asked to repeat this and then write a program to make the robot move in a triangle, pentagon and circle.

At this time, the boys were way ahead of the girls. In order to keep the boys engaged, we changed strategies. I brought in three expansion kits with plans for larger robots. Two of the boys' teams decided to build scorpions and the other boy's team built a preying mantis. The girls decided to stay with their original design and spend more time on programming.

The last two weeks were used by each team to develop a presentation. One of the girls' teams designed a dance using the sound sensor to signal each move. The other girl's team programmed the robot to move through a maze. They built the maze and then programmed the robot using the ultrasonic sensor. The boys created a scene from Star Wars and the scorpions and praying mantis were invading monsters.

The parents were invited to the last meeting where the students demonstrated their projects. With a few technical difficulties, the presentations were very good.

Spring Semester

The second semester was slightly different from the first one. There were observations made about the structure of the program. Adjustments were made to accommodate and maintain a timeline that would ensure that students would develop programming skills and have fun at the same time. Also, to keep some order during program development, journals were supplied that asked simple questions about what they were doing. The students were encouraged to write down their observations as they worked. Figure 2 shows an example of the journal. Day one included an introduction section that allowed the students to get acquainted with their team leader and questions pertaining to their construction experience.

Day 2

Are you done building? What needs to be done to finish up?

How can we get this robot to move forward?

Number of rotations or degrees for 1 foot? ___________________

How much for 5 feet? _________________________

What works better, timing or rotations?

Write a program that will move your robot forward 5 feet. Use the Seconds option only. Record your results as well as your experience.

Write a program that will move your robot forward 5 feet. Use the rotations or degrees option only. Record your results as well as your experience.

What about reverse?

Figure 2

Days two through seven asked the students to work on programming problems dealing with moving forward and backward, turning, sensors and looping. Each day was designed to build on the previous day's questions. Days seven and eight were for the students to decide on a project and write the programs for that project. Day nine was parents' day. The parents came to see what the students learned. The students demonstrated their projects.

While writing their programs, the students were encouraged to use trial and error along with their journal entries. The students soon learned that previous programs contained information that could help in writing their next program. For example, the students were asked to write a program that would allow the robot to move forward five feet. Later they were asked to write a program that would allow the robot to move in a square. The students could use the move forward five feet program and incorporate the new commands for turning and repeating.

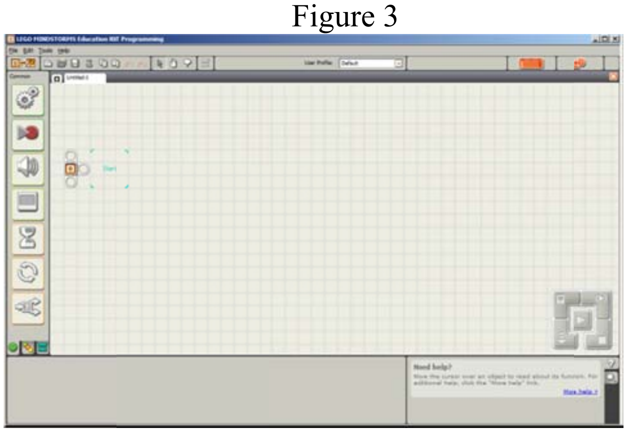
As the sessions continued, the students were challenged with more sophisticated programming. The teams progressed through simple movements forward and backward to making turns to combining moves in order to form shapes. Once all the movements were accomplished, sensors were introduced. The students started with the sound sensor and then worked with the ultrasonic sensor.

Once the students were comfortable with movement and sensors, they started working on their projects. With the problems we had during this session, most of the teams decided to demonstrate programs they designed while learning how to manipulate the robots. One team was more advanced than the others and they built a maze and programmed their robot with three touch sensors. These sensors were used as directional controls. Pressing the right sensor made the robot turn right. Pressing the left sensor made the robot turn left. The center sensor was for moving forward.

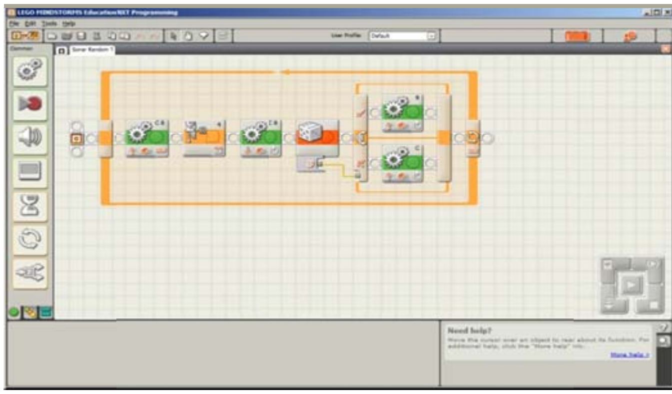
The Programming Software

The Lego NXT v2.0 software was used for this project. This software contains a very insightful graphical user interface. See Figure 3 below. Students can add components just by dragging and dropping. Each individual component has a toolbox which allows students to configure the component. For example, the move component can be configured to move forward or backward, have the speed and distance set as well as which servos are to be activated.

Figure 3



The students can experiment with the components, stringing them together in order to make more complicated programs. See Figure 4 below. Loops are available as well as selection components. The students also discovered that threads can be added so the robots can perform more than one task at a time. For example, the robot could have one thread that is using the ultrasonic sensor to determine if an object is in front of it while using the sound sensor to determine if a sound is loud enough for it to turn.



Once the students have their programs built, the program can be downloaded onto the robot using a USB cable. The robot can store several programs. If modifications need to be made, the students can make the changes, download the program again and then retest.

Figure 4

Project Evaluation

The fall session was the better one, based on how smooth the sessions went and the progress the students made with their projects. These students completed the construction of the robots in one session. The boys then went on to build more sophisticated models. The girls used the extra time on creating more sophisticated programs. Without having a journal though, the boys struggled more with the programming.

The spring session had several problems. The volunteer students were not as committed. While we needed seven volunteers each session, we never had more than six and several times had as few as four. We also had problems with the laptop computers. We had seven computers starting in the fall. This allowed us to have two backup computers. When we expanded to fourteen students in the spring, we were using all seven computers. Two computers crashed so teams had to share when programming. This led to times when a group would be waiting for a free computer.

Conclusion

The first objective, introducing fifth graders to programming and problem solving, was successful. The students enjoyed the experience and worked hard to design and implement some complex programs.

The second objective, to give our college students experience in working with elementary age students, was somewhat successful. During the fall session, all the college students were engaged with the elementary students. The team leaders encouraged the fifth graders and were involved in the development of the projects. During the spring session, only two of the college students were involved with their teams in a productive manner. Many times these team leaders would be talking together rather than working with their team. On several occasions, one or more of the college students would not show up.

Adjustments for Next Year

Based on the two sessions, the following adjustments will be made:

- Establish a training period for the volunteers. This would be two or three meetings about one hour long. These sessions would help the volunteers with building the robots and learning the software. For the past two sessions, the volunteers were given the robot kits and software two weeks prior to the session. They were supposed to build the robots and then learn the software in order to be prepared for the sessions. The fall team did a good job on preparation. The spring team did not.

- Use the journals. The fifth graders need more than just verbal guidance when trying to write the programs. They also need a way to keep track of their accomplishments so new programs can be designed based on previous programs.

- Limit the number of students to ten. When the group was increased to fourteen, it put a strain on resources as well as keeping control of the entire group when one or more volunteers didn't show up.

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[3] NXT Software Version 2.0: http://www.lego.com/education, retrieved May 4, 2009

[4] http://www.philohome.com/mindstorms.htm, retrieved June 7, 2009

Online Collaboration

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Abstract

Even though the Internet technology has become ubiquitous, many people are still afraid of using the technology to collaborate on projects online. A few people think it is too late for them to learn how to use online technology, while others think it is not as effective as face-to-face collaboration. There are definitely distinct advantages in working in a face-to-face environment; however, there may be several hindrances in making the collaboration successful, such as two individuals working on a project from two different parts of the world. Online collaboration can cut travel costs, time, and the office space required to meet in person. Because distance is no longer a factor in online collaboration, organizations can save virtually thousands of dollars just on travel expenses. The current Internet technologies allow us to collaborate in a variety of ways. This paper addresses the use of email attachments (e.g. with Microsoft Word review features), discussion forums, and other online collaboration technologies, such as AdobeConnect, Blackboard, ProjectSpace, MegaMeetings, and WebEx.

Online collaboration tools can greatly enhance the success of a student project. Even though these technologies can be used in a variety of ways, the author primarily focuses on using email attachments (e.g., Microsoft Word documents), Blackboard, AdobeConnect, and Google docs. The reasons for selecting these popular technologies, which are among many other online collaboration technologies, such as Cisco's TelePresence and WebEx; GoToMeeting; and Microsoft's Groove, NetMeeting, LiveMeeting, and SharePoint to name a few, is the cost and products of choice for Purdue University College of Technology at Columbus. In addition, all of our students are entitled to use these products for free. Google Docs is free for everyone. It can be accessed from http://docs.google.com. Using the Google Docs technology, one can create/edit/delete Word and Excel documents just by using any Internet browser, e.g. Internet Explorer, FireFox, and Opera. All of the changes made to the documents are automatically saved and available immediately for distribution and/or collaboration.

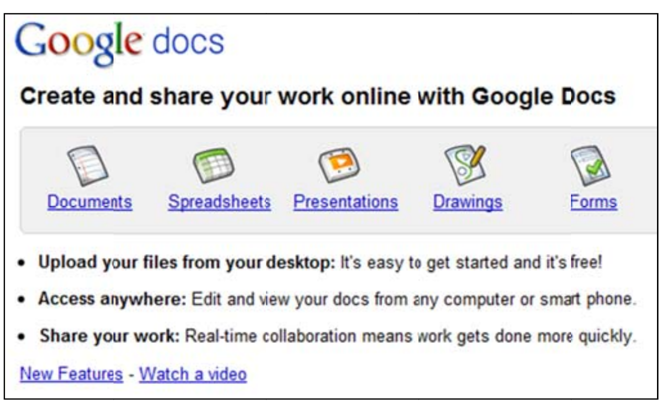

Figure 1: Google docs

"Telepresence technology can slash travel costs—if you can afford it, and if it's really used." (Shein, 2010). This is particularly true in a corporate environment. But in an educational environment, "Review", with the "Track Changes" features of MS Word is particularly useful. This way several students can work on one document, yet keep track of who made - what kind of changes to the documents. Suppose students are working on a group project and not all of them are able to meet face-to-face. In this situation, students can simply email their project as an attachment, such as an MS Word document to all the group members. Once the document has been received, each student can open the document in MS Word and turn on the "Review" feature. Even though this technology has been available for many years, its usage has not become widespread yet. Figure 2 depicts an example of using the digital ink.

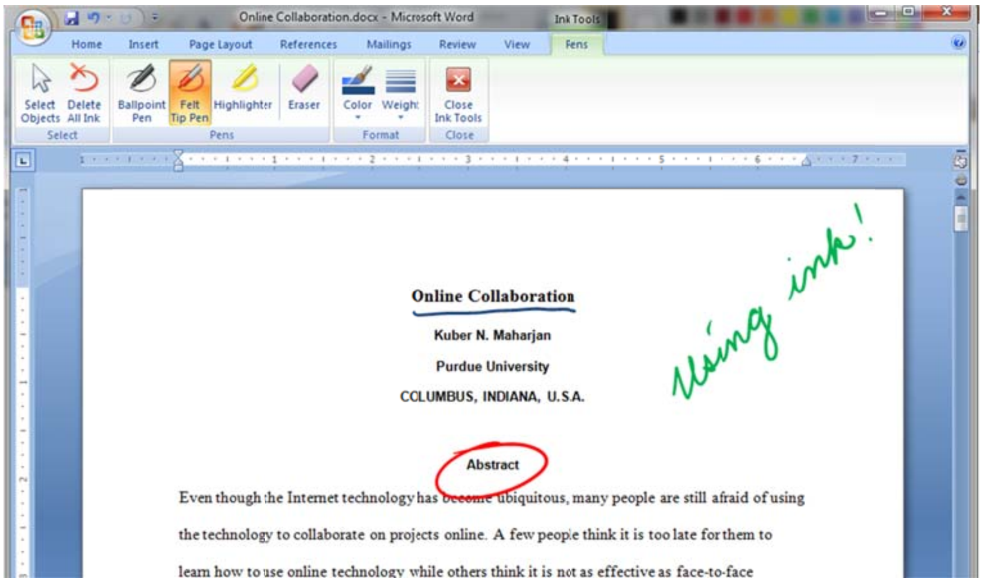

Figure 2: Digital Inking

For a number of semesters, the author has eliminated the paper submission of homework assignments. Instead, students get their assignments online, complete their assignments at home, or at the library, or any place with a computer, then submit the assignment online. The author uses his personal tablet PC to grade the submitted assignments. The use of the "Start Inking" task feature of "Review" in MS Word allows the instructors to grade electronically submitted papers in lieu of traditional hard copies. First, the document is downloaded and saved with a different name. Then the document is opened for grading. Then turn on the "Review" feature and "Start Inking". Once complete, the document needs to be saved and returned to the student. It certainly involves a lot of extra work for the instructor, but the students enjoy the feedback with a personal touch. Figure 2 depicts online homework assignment using the Blackboard technology.

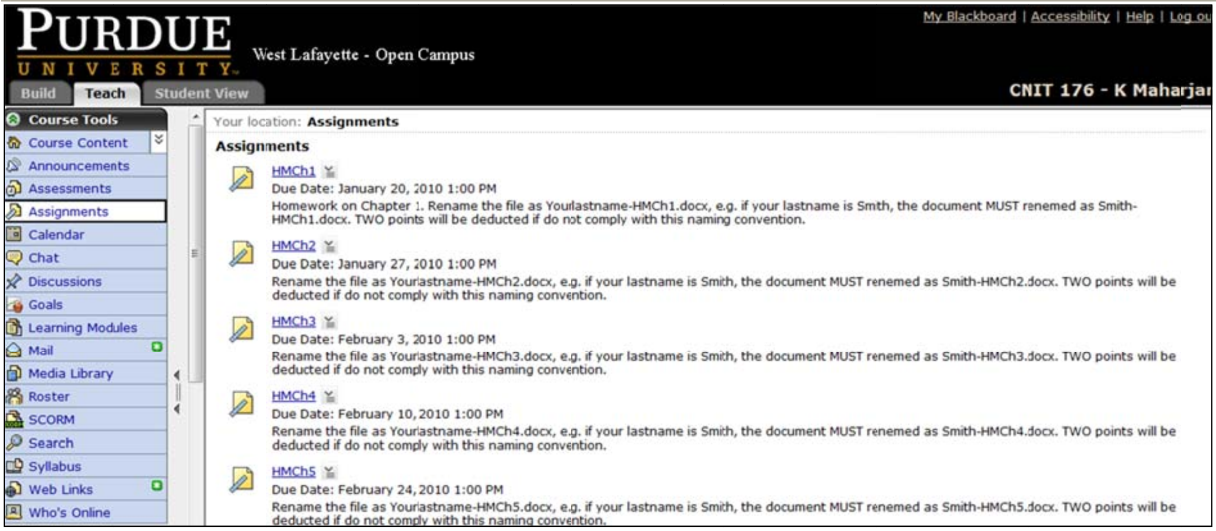

Figure 3: Online Homework Assignments

The author uses Blackboard technology throughout the semester and in numerous occasions the author has implemented AdobeConnect in traditional classrooms. There are several reasons for using this technology in a traditional classroom. First, it introduces students to the latest online collaboration technologies. Second, the students gradually become used to these technologies and become proficient in using these technologies to communicate, submit assignments, and meet virtually. Third, in case of emergency, students can attend the classroom virtually. Most of the students, at Purdue University College of Technology at Columbus, are non-traditional, such as single parents and/or full-time/part-time workers. Several students drive to campus in excess of 25 miles. This semester (spring 2010), the school was not closed, even during snow storms, however some of the students were not able drive to the school because of the inclement weather. But because the author implemented AdobeConnect, those students were able to attend the classroom virtually from home. Other reasons for students using this technology to attend the classes are due to the inability to find babysitters; they're out of town on official business, and for medical reasons.

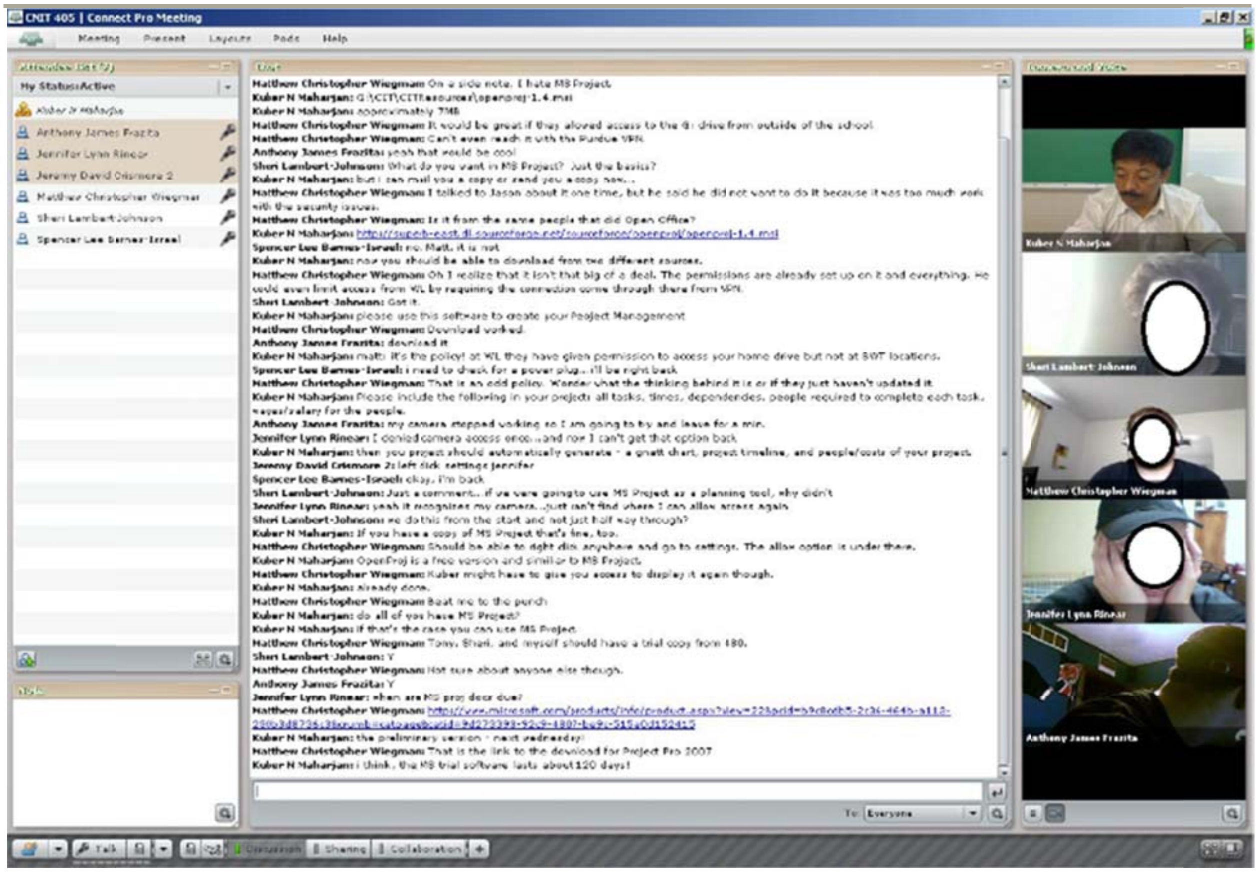

Figure 4: An AdobeConnect Session

The above figure depicts an AdobeConnect session in progress. During the session, texting, audio, and video were enabled. All of the students, seen in the pictures, participated from their homes using their personal PCs, webcams, speakers, and microphones. Students preferred text messaging to complement the video instead of using microphones, because they can see what was said on the screen.

The author has been implementing a course-specific email system for many years. Still, many students are not accustomed to using this type of email for online collaboration. Once groups are created in Blackboard, students are able to communicate with their groups very easily. Because of the use of a course-specific email system, student mailboxes are no longer swamped with junk mail and any other non-course specific mail.

This semester (spring 2010), the author extensively used “docs.google.com” to distribute course schedules and arrange online scheduling. Because documents can be edited online without any specific software other than the browser, it is a tremendous asset for quick editing and distributing. These documents can be shared as read-only or read/write. As an example, the author used this technology to collaborate on filling out a lab check-off spreadsheet document. Initially, the document was shared with read/write permission to all students. Once all students have selected their check-off days and times, the document is locked. Now students can view the document (every one’s schedule) but not modify.

In conclusion, there are many ways to implement online collaboration technologies in the classrooms. Possibilities are endless and it could certainly overwhelm anyone. Therefore, start with a small and a simple project first, e.g. class-specific email. It is better to introduce course-specific technologies gradually until all students embrace the technology. It is very important to test and retest before each class period to make sure that everything goes smoothly. When technology works it is great. But when it fails it can be miserable.

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Managing a Multi-tiered Emergency Notification System

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In response to campus incidents over the past few years, many colleges and universities have acquired hardware and software to provide emergency notification to their communities in time of crisis. As these schools investigated their options, businesses that focused upon emergency notification also came into focus. Academic leadership was concerned about the safety of their students, employees, and guests and purchased and installed various methods to enable emergency notification, but failed to consider the "system"; rather, addressing only the parts.

Adding equipment is only one part that must be considered when designing, building, and utilizing an emergency notification system. One cannot neglect the other two equally important aspects of the system: the people and the process. Like a triangle, institutions must consider a plan for all three legs. Focusing on only one or two of the three parts will result in an incomplete system. Another important aspect of an emergency notification system is alternate methods to ensure that all members of the campus community can be reached in a timely manner. Since universities and colleges are so diverse; often spread out, some with various campuses; built with a myriad of construction materials; and constituents on different time schedules, relying on a single technique will fail to reach everyone in the targeted audience. The solution must be robust, flexible, easy-to-use, and hopefully inexpensive.

Moravian College and Moravian Theological Seminary, which will be referred to as Moravian, developed a multi-tiered Emergency Notification System (ENS), since no single technique will reach the entire community, to provide quick, mass emergency notification of the campus community using sirens, public address, text messaging, e-mail, web portal, desktop telephone messaging, etc. To assist with planning and operations of the system, Moravian developed an Emergency Notification System Execution Matrix that delineates departmental and individual responsibilities for tier execution and testing. As Moravian continued to expand options to notify the community of emergencies using digital signage, Face Book, Twitter, alert beacons, computer monitor pop-ups, fire alarms text to speech, etc., this matrix helped to integrate new technologies and clearly define responsibilities. To avoid overwhelming a single person who would have to activate multiple tiers, Moravian linked many of these techniques to a single service for activation.

At each tier Moravian leaders can provide additional information as it becomes available: **siren and public address broadcasts** through speakers on Main and South Campuses (on top of Reeves Library and Main Hall respectively) for immediate, mass notification; **cell phone text message warnings** which send messages to cellular phones via a service called e2Campus; **e-mail messages** sent to your provider of choice through e2Campus and also via the College's email system; **postings** on AMOS' our web portal, public webpage, Twitter, and Face Book; displays on large digital screens; and computer monitors.

Moravian's guiding principle of the design and build of the emergency notification system was to keep it simple, with as much as possible, if not all activated by a single controlling program. Campus police/safety dispatchers will be very busy coordinating the efforts of their department when an incident occurs and will not have the time to pull books or manuals off the shelf to refer to in order to activate an emergency notification system or any of its components. Moravian has been able to successfully integrate all but one tier into e2Campus as the controlling program.

Members of the Moravian community may sign-up using e2Campus' cell phone emergency notification link on the school's portal, AMOS. It is a quick process where users can register up to two cell phones and two e-mail addresses, in addition to their Moravian e-mail address, which does not need to be registered. This information saves as the key portion of ENS and be used only for tests and real emergencies. During these tests, the community is encouraged to provide feedback directly to the Campus Safety, Center for Information Technology and select vice-presidents through a designated ENS e-mail group.

If the Moravian community hears the siren, a high-low siren like those used by European emergency vehicles to distinguish it from U.S. sirens, followed by a voice message indicating if it is a test or actual emergency, they know to check for a text message with additional information and required actions. If they do not own a cell phone or have one in their possession, they should ask a colleague or student to check and assist to spread the word to others. They will also receive a notification via computer monitor pop-up on public computers and personal computers if they registered for the service. The company Alertus provides the software to enable this functionality. Large digital displays located throughout campus will also display the warning. If students and employees registered for e-mail notification through e2Campus when the signed up for cellular notification, they will receive an e-mail message. This e-mail message will also be display on Moravian's portal AMOS, public website and Twitter and Face Book pages with the subject lines MOCO TEST for a test of the system or MOCO ALERT for an actual emergency. (Side note: MOCO is Moravian's nickname.)

To facilitate control, testing, responsibility designation, activation decision points, and future expansion of emergency notification, Moravian created an ENS Execution Matrix. This matrix, included at the end of this document, is an active matrix and has changed as Moravian learns from our testing experiences and new technique evaluations. Goal of all tiers built into the system is integration with e2Campus so that Campus Police/Safety dispatch has only one system to activate to send out the warning reaching as many of the community as quickly as possible.

Although highly encouraged, employees are not required to sign up for e2Campus, but incoming students must either sign up or opt-out in writing by signing the Opt-out form below.

MORAVIAN COLLEGE

TO: All New Students
FROM: Vice President for Student Affairs
SUBJECT: e2Campus Information and Opt-Out Form

It is important that Moravian have a mechanism to alert members of the college community in the event of an emergency and, subsequently, to provide information and instructions through various mediums: siren, cell phones, e-mails, and the College website. While there can never be a guarantee of safety, we believe that moving in this direction places the College in a better position from which to deal with the unexpected threats of today's world.
In the event of an emergency, a system called e2Campus allows us to send text messages to the cell phones of registered members of the campus community with information about what is happening and/or what precautions should be taken. Students may register two cell phone numbers and two e-mail addresses. Additional information about the company and the service may be found at this internet address: http://www.e2campus.com/.

We very feel strongly about the need to have cell phone information on file. **As a result, we are requiring all new students to either register with e2Campus *or* to sign a form indicating that they do not have a cell phone or that they are purposely choosing not to enroll in e2Campus.**

You must do one or the other prior to the end of the first week of classes on August 29, 2008 or your student ID/access card will be deactivated.

*In order to enroll in e2Campus, use the personalized information included in this packet to log on to AMOS (**A**ccess **M**oravian **O**nline **S**ervice) at http://amos.moravian.edu and click on the e2Campus registration link on the left-hand side. A computer will be available be close proximity to May Registration activities if you would prefer to take care of this while on campus.*
In order to opt-out, either because you do not have a cell phone or you are purposely choosing not to enroll in e2Campus, please complete the form below, sign it, and return it to Campus Safety (address below).

Any questions you have about e2Campus or how to register a cell phone number may be directed to Director of Campus Safety and Chief of Police, at 610-861-1421 or @moravian.edu.

Moravian College
e2Campus Opt-Out From

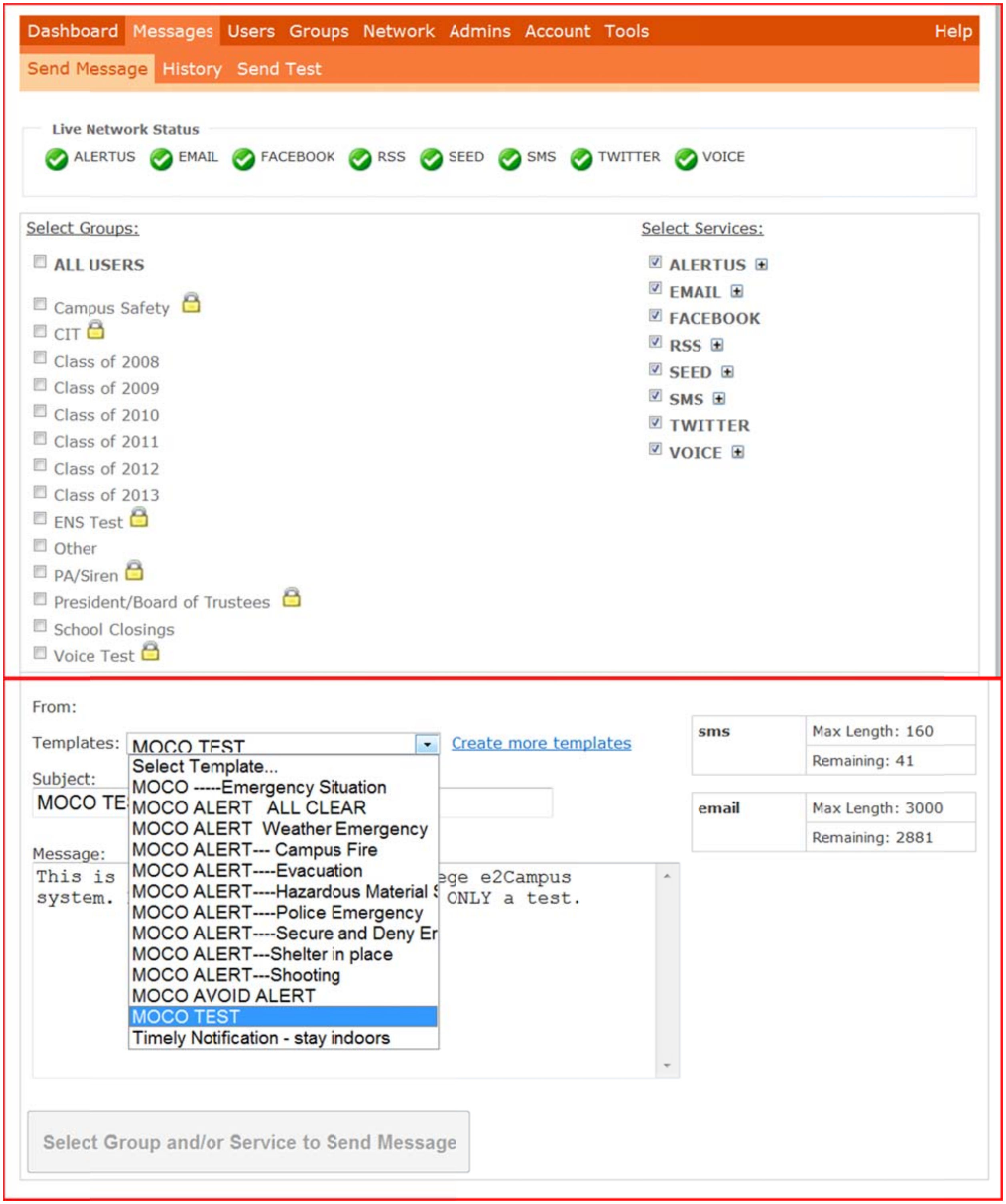
I, ____, hereby opt-out of the requirement to enroll in e2Campus… Printed Name

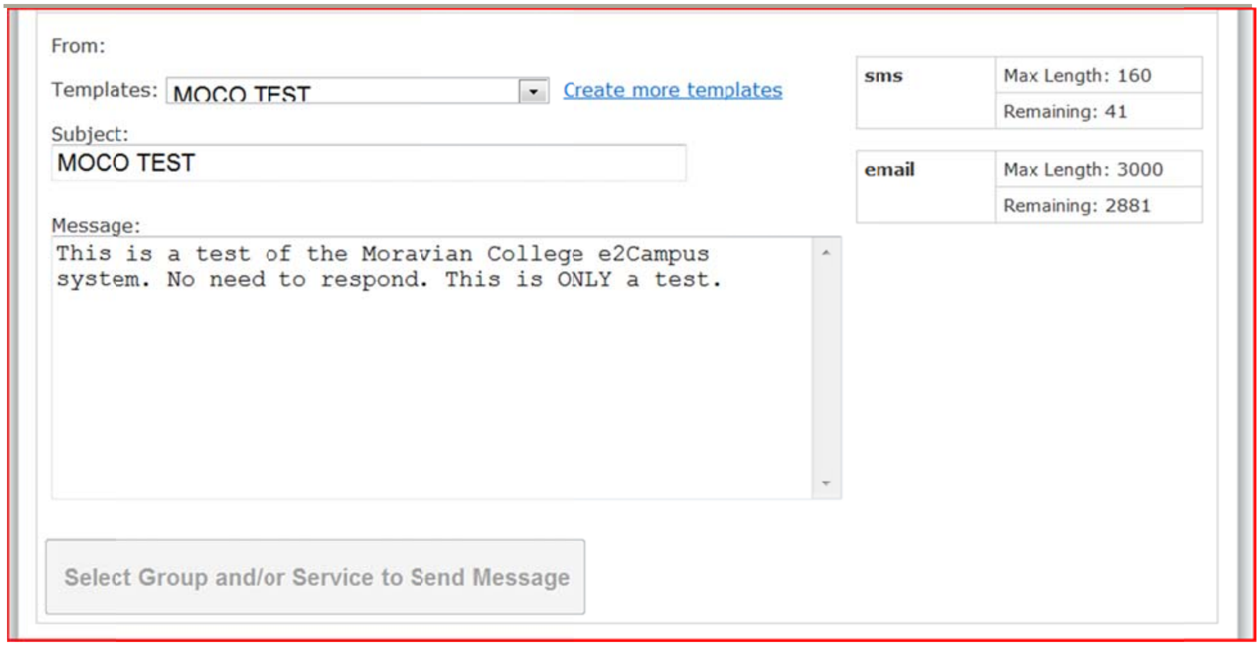
_____ …because I do not own a cell phone.
_____ …because I am purposely choosing not to enroll.

I understand that, as a result of this action, I will not receive e2Campus text messages.

____________________________________ ______________ ______________
Signature Class Year Date

Please return this form to Campus Safety, Moravian College, To provide flexibility to the system, Campus Police/Safety dispatchers have the ability to activate all ENS tiers or select specific tiers as the situation dictates using Send Message. page.





Even with multiple tiers in the ENS, there are still gaps within the community because of building design and location and Moravian continues to evaluate alternatives. Two promising alternatives that integrate with e2Campus are alert beacons that can be placed in specific locations to target the dead space and voice notifications through the fire alarm system. Unfortunately both require additional funding. Fire system notification requires speakers that can support voice messaging and may be expensive to retrofit an existing building, but should be considered during new building construction or existing building renovations.

Testing is conducted in accordance with ENS Execution Matrix below.

Example of an Emergency Notification System Execution Matrix

Immediate Notification

Sept & Jan tests - 1st Thursday of classes

Internal Notification:

Tier	Action	Responsible Office	Primary	Alternate	Decision /Trigger Point	Athorized By	Used	Tested		Notes
1	Siren/PA	CS	Dispatcher	CS Officer in Charge (OIC)	Actual Event	CS OIC	Event Dictate:	Weekly	Connectivity & recording only. No actual sounding.	
								Sept & Jan	Full system test	
2	e2Campus - MOCO Alert*****	CS	Dispatcher	CS OIC	Actual Event	CS OIC	Always when Tier 1 activated	Weekly	To test groups only. Will also send e-mail message if users	Need to periodically test the CS laptop with cellular air
								Sept & Jan	Full system test	Tier 2 sends messages to AMOS, digital displays, computer monitors, public webpage, Face Book, Twitter, & e-
3	e-mail message - internal	CS	Dispatcher	CS OIC	Actual Event	CS OIC	Always when Tier 2 activated	Sept & Jan	Full system test	
4	Phone broadcast message - internal	BO	Operator	Asst Dir, Bus Affairs	Tier 2 or 3	CS OIC	Operating hrs	Sept & Jan	Full system test	uses e2Campus wording
5	Dpt'l/Bldg Wardens	Warden list & process TBD			Tier 2 or 3	CS OIC	Operating hrs	Sept & Jan	Full system test Dpts & Bldgs need to designate primary & alternate wardens	pending

External Notification:

Tier	Action	Responsible Office	Primary	Alternate	Decision /Trigger Point	Athorized By	Used	Tested		Notes
1	public release e-mail message	PR	Director	Web Manager	VP notificatic	President	Event dictates	N/A		
2	Internet posting	PR	Web Manager	Director	VP notificatic	President	Event dictates	N/A		
3	Phone recording (1300)	BO	Operator	Asst Dir, Bus Affairs	PR notificatic	President	Event dictates	N/A		Uses PR wording

All Tiers, as well as the following, may be activated individually, manually,

	Action	Responsible Office	Primary	Alternate	Decision /Trigger Point	Athorized By	Used	Tested
	Digital signage	PR	Director	Web Manager	Tier 2 or 3	CS OIC	with Tier 1	Sept & Jan
	AMOS	CIT	AST TL	AST Analyst	Tier 2 or 3	CS OIC	with Tier 1	Sept & Jan
	Monitor Pop-ups	CIT	AST Analyst	AST TL	Tier 2 or 3	CS OIC	with Tier 1	Sept & Jan
	Face Book	PR	Director	Web Manager	Tier 2 or 3	CS OIC	with Tier 1	Sept & Jan
	Twitter	PR	Director	Web Manager	Tier 2 or 3	CS OIC	with Tier 1	Sept & Jan
	Public website	PR	Director	Web Manager	Tier 2 or 3	CS OIC	event dictates	Sept & Jan

A Training Regimen for Incoming USAF Employees

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Table of Contents

The Importance of Training

Effective training benefits both the employee and the organization. On the employee side, most, if not all, employees want to be valuable and remain competitive in the labor market. A major method of achieving this is effective employee training and development. Not only one-time training but recurring training that will result in a continued well-trained and effective workforce while at the same time meeting legal and regulatory requirements On the employer side, especially in the current tight labor market, employees want to develop career-enhancing skills, which will, in turn, lead to employee motivation and retention, both "pluses" for any organization public or private. There is no doubt that a well trained and developed staff will be a valuable asset to the company and thereby increasing the chances of his efficiency in discharging his or her duties. Specifically, why? The right employee training, development and education can result in significant payoffs for the employer in increased tangibles such as productivity, and intangibles such as loyalty, knowledge, and contribution to the organization.1

Training and Education

First, let us briefly examine the differences between training and education. Formal education is typically envisioned as the process of studying a series of subjects in schools, whether they be primary schools or major universities. According to Census 20002, more than one-fourth of the U.S. population aged 3 and older attended school in the spring of 2000. The 76.6 million students included 5.0 million enrolled in nursery school, 4.2 million in kindergarten, 33.7 million in elementary school, 16.4 million in high school, 14.4 million in college (undergraduate), and 3.1 million in graduate school. Most if this is formal education. Of course, this leads us to the conclusion that age is not necessarily a relevant factor here, namely that the age of a student undergoing formal education can range from age 4 through adulthood. The students range from the very youngest through college to those in adult education. For example, Nola Ochs is a **continuing education** student at the Fort Hays State College in Kansas. Nola has her own apartment on campus where she attends classes, and when she's able to get home for the weekend, she drives 100 miles home her family farm. She is scheduled to graduate with a bachelors degree this spring. Nola turned 95 in November.3

The objective of classes, of course, is typically to gain knowledge about facts, events, principles, concepts, etc. How is this skill demonstrated? Many times the learner is required to demonstrate the memorization of facts and the association between concepts. In other cases, they must apply rules to solve problems. Also, there is the issue of assessments, commonly known as testing.

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1 "Importance Of Training And Development In A Firm", by Ndunuju Adiele , http://ezinearticles.com/?Importance-Of-Training-And-Development-In-A-Firm&id=1885451.

2 School Enrollment 2000, http://www.census.gov/prod/2003pubs/c2kbr-26.pdf

3 "Oldest College Graduate In The US", by Pam Sissons, March 21, 2007, http://www.suite101.com/blog/adirondack/oldest_college_graduate_in_the_us

Testing addresses the skills of memorization and understanding, plus perhaps analytic and problem solving skills.4

Fundamentally, training is usually centered around the concept of obtaining a skill. Training is typically conducted in trade schools, technical institutes, seminars, and business training classes. Apprenticeships also are evident here in order to provide on the job training, a crucial aspect of the training process. The age range in this mode ranges from the very young to the very old, similarly to formal education. Apprenticeship programs vary throughout the U.S. For example, the U.S. Department of Labor offers a Registered Apprenticeship program to assist prospective apprentices and employers in this arena and offers access to 1,000 career areas, including the following top occupations:5

- Able seaman
- Carpenter
- Chef
- Child care development specialist
- Construction craft laborer
- Dental assistant
- Electrician
- Elevator constructor
- Fire medic
- Law enforcement agent
- Over-the-road truck driver
- Pipefitter

In short, education concerns remembering facts and understanding concepts. It is usually taught in school. Training concerns gaining skills and taught either in trade schools or business training sessions.6

This being said, these do have a common trait, namely that training and education are both different facets of learning. At first, it may be difficult to tell the difference between them, especially in today's school system, but there are major differences in training and education. Their purpose, history, and methodology are all vastly different.7

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4 "Difference Between Education and Training", by Ron Kurtus, October 12, 1999, http://www.school-for-champions.com/training/difference.htm

5 U.S. Department of Labor, U.S. Employment and Training Administration, http://www.doleta.gov/oa/apprentices.cfm

6 "Difference Between Education and Training", by Ron Kurtus, October 12, 1999, http://www.school-for-champions.com/training/difference.htm

7 'Difference Between Education and Training" , http://www.differencebetween.net/miscellaneous/difference-between-education-and-training/#ixzz0lfPsvvwS

Purpose

Training – is undertaken in the hopes of gaining a specific skill. Generally this skill will make you more employable. These skills can be manual such as the ones listed above by the U.S. Department of Labor.

Education – is undertaken in the hopes of furthering your individual knowledge and developing your intellect. While a highly educated person is often more employable, education is not about getting a job.

History

Training – was originally practiced through guilds. Youngsters would be apprenticed to a master baker, builder or blacksmith and then work under him, sometimes for decades, in order to learn his trade. This was considered the appropriate and most effective method of learning for the lower and middle classes, if one was lucky. In most cases, young men were not selected into these programs and so died at an early age.

Conversely, education has its origins in the medieval university system. Young men from wealthy families would complete a course in theology or philosophy before studying his chosen profession (women didn't generally enter this picture until much later). In fact, the educational progress of women did not occur until many centuries later. For example, "the education of Noble women in the Middle Ages concentrated on the practical as opposed to academic. Young noble women as young as seven girls would be sent away from their home to live with another noble family. There she would be taught a range of subjects and skills. Manners and etiquette were of prime importance, including how to curtsey and how to mix with the greatest nobles in the land. Time would be spent learning how to dance and ride. Archery were also taught to young noble women. These young girls were expected to act as servants to the older ladies of the castle. The duties of the young noble women would be to look after clothes and the assist ladies with their dressing and coiffure. Some housewifely duties such as preserving fruits and household management would be taught, to prepare them for their duties as a married woman. High ranking young women would take on the role of ladies-in-waiting and were taught French. Young noble women would also be taught the principles of the Medieval Code of Chivalry and Courtly Love and would join the spectators at jousting tournaments."8 "Their role greatly expanded during the Renaissance. During that age, women had a significant impact on the economy, social structures, and the culture of the Renaissance, despite the constraints on their exercise of power, lack of opportunities, enforced dependence, and exclusion from politics, government, science, law, banking, and more."9 Even though women's roles in these arenas expanded during this period, it is still true that the power of men was almost absolute and remained that way. Argualbe, this trend is still evident today, but major strides are being made. For example,

8 "Noble women in Middle Ages", http://www.middle-ages.org.uk/noble-women-in-the-middle-ages.htm

9 Brown, M., McBride, Kari. 1995. **Women's Roles in the Renaissance. Santa Barbara: Greenwood Press.**

Nearly six out of ten adults holding advanced degrees between the ages of 25 and 29 are women.10

In today's myriad educational system, the line between education and training can be very fine indeed. Especially at the collegiate level, many areas of mental training are being passed off as education. Programming, for instance, requires a difficult and specialized skill set and needs years of training. Even fields previously thought of as "training" such as heating and air conditioning, now, due to the pervasiveness of complex technology inherent in the devices utilized in this field, require a great deal of what is known as formal education.

The USAF: Education and Training: Some Differences11

A CONTINUING debate exists as to the distinction between *education* and *training*. In everyday conversation, people frequently use the terms interchangeably. Indeed, there are some, I suspect, who believe that the best approach to the problem of differentiating between education and training is to ignore the distinction. I do not share this view.

For many years the U.S. Air Force drew a clear distinction between education and training. Education was organized under Air University; training, under Air Training Command. Then, in 1978, the Air Force consolidated education and training under the same major air command structure. In 1983, USAF leaders decided again to draw a clear distinction between education and training, reintroducing a major air command structure to administer each. The decision was a good one, for although there are similarities between education and training, there are some basic differences—differences which Air Force curriculum developers and instructors should keep in mind.

Following the traditional three-part distinction among the domains of learning (psychomotor or doing, cognitive or thinking, affective or feeling), training emphasizes the psychomotor domain of learning. Training that is done in the cognitive domain is generally at the knowledge level and lower part of the comprehension level. Education, on the other hand, teaches a minimum of psychomotor skills. It concentrates instead on the cognitive domain, especially the higher cognitive levels, i.e., high comprehension and above. Affective learning, by the way, may be a product of both education and training.

Criterion objectives are most appropriate for training. That is, under a given set of conditions, a student will exhibit a specific behavior to a certain predetermined level or standard (e.g., "without the use of references, list the steps of the USAF Instructional System Development Model according to AFM 50-2, in order and without error"). Cognitive objectives written at the appropriate level of learning (knowledge, comprehension, application, analysis, synthesis, or evaluation) are more useful for education. When behavioral or criterion objectives are used in education, they are generally broader than when used in training and relate to the learners' ability to

10 "More women than men get advanced degrees", by Stephanie Chen, April 20, 2010, http://www.cnn.com/2010/LIVING/04/20/census.women.advanced.degrees/index.html?hpt=Sbin.

11 Education and Training: Some Differences, John Kline, verbatim, http://www.airpower.maxwell.af.mil/airchronicles/aureview/1985/jan-feb/kline.html

generalize, see relationships, and function effectively in new situations—situations which cannot be completely visualized or defined.

Training is essentially a closed system. The trained individual is easily recognized as knowing the "right answers," doing things the "approved way," or arriving at the "school solution." Under these conditions, the products of each trainee in every situation can be expected to look the same. Education, in contrast, is an open system. Learning is continuous with no cap or ceiling on how well the graduate may be prepared to handle new responsibilities. Right answers and ways of doing things often do not exist in education—only better or worse ones.

Objectives, job requirements, and skill levels are constraints with training. Yet time required for training can vary because of the aptitude, experience, and previous skill level of the student. With education, however, time is often a constant (four years, ninety semester hours, ten months, forty hours in class) and therefore is specified. This is not to say that one's education is ever complete. It is not. However, to fit time constraints, objectives in education must be selected from a much wider range of possible objectives than can ever be included in the time available, due to the nearly infinite combination of position responsibilities of the graduates. Objectives, job requirements, and skill levels are not constraints with education, since persons are encouraged to develop to their potential.

With training, a task analysis can be done so that the curriculum will include a complete listing of skills and knowledge required for the graduate to demonstrate competence. With education, curriculum planners and instructors must select a sample to teach from a universe of ideas. Furthermore, they must often rely on opinion from acknowledged, credible experts to determine what needs to be taught. Creative, visionary experts are needed to predict future needs rather than merely reflect current ones. This absence of exactness often results in a lack of consensus on what should be taught. Analyze courses taken by majors in a given field or discipline at different universities, and you will find differences. For that matter, you will find differences among curricula of the various senior and intermediate service schools. Differences in curricula and emphasis on individual study are good in education but usually not in training.

These differences between education and training do not suggest that one facet of learning is more important than the other, only that they are different. Obviously, genuine accomplishment (competence, proficiency, good judgment, effectiveness) incorporates both. A person cannot, for example, effectively give a speech, fly an airplane, edit a scholarly journal, or command an Air Force organization without a wide range of knowledge and skills. Still, these differences have strong implications for those who provide education or training. Failure to acknowledge them will hinder learning and, ultimately, performance. Recognizing their relevance in curriculum planning and teaching will improve both education and training in the United States Air Force.

The Environment and Role of the United States Air Force in Training for a Cyberspace Role

Foreword

Cyberspace is a critical global domain, in which the USAF will conduct integrated operations in support of Joint Force Commanders' needs. The United States is not alone in recognizing the asymmetrical advantages of this domain. Potential adversaries worldwide are rapidly improving or pursuing their own cyber capabilities. Attempts to disrupt or penetrateour networks are relentless. To address these issues, the USAF has developed The United States Air Force Blueprint for Cyberspace, dated November 2, 2009. This document provides a framework to meet these challenges by evolving the Air Force culture and improving it's capabilities. Air Force Space Command as the lead USAF Major Command (MAJCOM) for cyberspace is charged with executing this blueprint as a unified effort--working closely within the Air Force, and with sister services, combatant commands, Joint Staff and other partners in order to fully provide the necessary capabilities for the future.

Tenets of the USAF Blueprint for Cyberspace

Current Situation

Cyberspace touches practically everything and everyone every day. The security and prosperity of our nation is dependent on freedom of access to and freedom of action in cyberspace. While there are many benefits that come with this access, there are numerous inherent vulnerabilities. Threats via cyberspace pose one of the most serious national security challenges of the 21st Century. The threat is asymmetrical with a minimal cost of entry; events of the last several years show that one person, with one computer, can affect an entire nation. Growing arrays of adversaries are targeting the US military and our critical national infrastructure, commerce and citizens. The combined and coordinated efforts of government, industry and academia will be required to effectively counter many of these attacks and assure mission success in the future.

Presidential Guidance

In May 2009, the White House released the "Cyberspace Policy Review - Assuring a Trusted and Resilient Information and Communications Infrastructure". While the White House review sought primarily

"to assess US policies and structures for cyber security," it examined "the full range of threat reduction, vulnerability reduction, deterrence, international engagement, incident response, resiliency, and recovery policies and activities, including computer network operations, information assurance, law enforcement, diplomacy, military and intelligence missions as they relate to the security and stability of the global information and communications infrastructure." 12

12 "Cyberspace Policy Review - Assuring a Trusted and Resilient Information and Communications Infrastructure", May 2009, The White House, Policy Review - Assuring a Trusted and Resilient Information and Communications Infrastructure.

The review acknowledged “America’s failure to protect cyberspace [as] one of the most urgent national security problems facing the new administration” and that “protecting cyberspace will require changes in policies, technologies, education and perhaps laws.”

On the technology front, the review concluded “existing solutions can only do so much given the underlying design of the Internet architecture,” and cited an advisory group for the Defense Advanced Research Projects Agency (DARPA) as saying, “the defense of current Internet Protocol-based networks as a losing proposition and called for an independent examination of alternate architectures.” The President called for the federal government to work with industry on the development of “next-generation secure computers and networking for national security applications.”

Specifically, the globally-interconnected digital information and communications infrastructure known as “cyberspace” underpins almost every facet of modern society and provides critical support for the U.S. economy, civil infrastructure, public safety, and national security.13 It is certainly true that information technology has transformed the global economy and connected people and markets in ways never imagined. In order to realize the full benefits of this digital revolution 14, users must have confidence that sensitive information is secure, commerce is not compromised, and the infrastructure is not infiltrated. Since this digital revolution is so profound, this is indeed a major challenge.15

Nations also need confidence that the networks that sustain their national security and economic prosperity are safe and durable. It is clear that achieving a trusted communications and information infrastructure will guarantee that the United States achieves the full potential of the information technology revolution. The December 2008 report by the Commission on Cybersecurity for the 44th Presidency states the challenge plainly: “America’s failure to protect cyberspace is one of the most urgent national security problems facing the new administration.”16

Protecting cyberspace requires strong vision and leadership and will require changes in policies, technologies, education, and regulatory, criminal and civil law. Only via demonstrating commitment to cybersecurity-related issues at the highest levels of government, industry, and civil society will allow the United States to continue to lead innovation and adoption of cutting-edge technology, while at the same time improving national security and its global standing and economy.

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13 Office of the Presidency, U.S. Government, “*Cyberspace Policy Review: Assuring a Trusted and Resilient Information and Communications Infrastructure*”, May 9, 2009.

14 The New Geography: How the Digital Revolution Is Reshaping the American Landscape, Joel Kotkin, 1991, New York: Random House.

15 http://library.thinkquest.org/25744/index.htm.

16 CSIS Commission on Cybersecurity for the 44th Presidency, *Securing Cyberspace for the 44th Presidency*, December 2008, at 11.

Case for Action

Threats to cyberspace pose one of the most serious economic and national security challenges of the 21st Century for the United States and our allies. A growing array of state and non-state actors such as terrorists and international criminal groups are targeting U.S. citizens, commerce, critical infrastructure, and government. For example, on March 25, 2010, one of the world's most notorious computer hackers, Albert Gonzalez, was sentenced to 20 years in prison after he pleaded guilty to helping run a global ring that stole tens of millions of payment card numbers. It was the harshest sentence ever handed down for a computer crime in an American court. Gonzalez and conspirators scattered across the globe caused some $200 million in damages to those businesses.17

These actors have the ability to compromise, steal, change, or completely destroy information.18The continued exploitation of information networks and the compromise of sensitive data, especially by nations, leave the United States vulnerable to the loss of economic competitiveness and the loss of the military's technological advantages. As the Director of National Intelligence (DNI) recently testified before Congress, "the growing connectivity between information systems, the Internet, and other infrastructures creates opportunities for attackers to disrupt telecommunications, electrical power, energy pipelines, refineries, financial networks, and other critical infrastructures."

The Intelligence Community assesses that a number of nations already have the technical capability to conduct such attacks.19 Several nations are known or suspected to have this capability to include China, North and South Korea. Attacks originated in China lately have been pervasive in the news. Researchers from the University of Toronto have uncovered a network of hackers, centered in China, which has used popular online services to obtain top secret information from the Indian government, many centered around Tibetan dissident groups and the Dalai Lama. The researchers stated that they were able to observe the cyber attacks and traced them to servers located in China, and specifically to individuals located in the city of Chengdu--the home of the communist country's military intelligence collection/technical reconnaissance bureaus. These attacks uncovered "complex ecosystem of cyber espionage that systematically compromised government, business, academic and other computer networks in India, the Offices of the Dalai Lama, the United Nations, and several other countries."20 And India is not alone. Australia has also felt this effect. Firms in that country have recently been hit by hackers originating in China,

17 Albert Gonzalez, '$200 million damage' hacker, sentenced, Reuters, *http://www.independent.co.uk/life-style/gadgets-and-tech/news/albert-gonzalez-200-million-damage-hacker-sentenced-1928313.html*

18 Director of National Intelligence, *Annual Threat Assessment of the Intelligence Community for the Senate Armed Services Committee, Statement for the Record*, March 10, 2009, at 39.

19 Director of National Intelligence, Annual Threat Assessment of the Intelligence Community for the Senate Armed Services Committee, Statement for the Record, March 10, 2009, at 39.

20 *Shadows in the Cloud, Investigating Cyber Espionage*, April 6, 2010, Shadowserver Foundation, University of Toronto.

one time even dramatically slowing that nations' second largest broadband network.21 And the recent censorship debate between Google and the Chinese government has resulted in series of hacker attacks on both Google and Chinese dissent groups living abroad.22 China is not the only culprit. Hackers originating in Russia also are active. For example, denial-of-service (DOS) attacks against Web sites in Estonia have been increasing lately. The attacks crippled Web sites for Estonia's prime minister, banks, and less-trafficked sites run by small schools, said Hillar Aarelaid, chief security officer for Estonia's Computer Emergency Response Team (CERT). Hackers sponsored by the Russian government are suspected. Press reports also speculated that tension between the two countries may have resulted in a coordinated campaign by Russia against Estonia. Last month, Estonia irked Russia by moving a Soviet-era World War II memorial of a bronze soldier, sparking protests.23 North Korea has also been active in this regard. A series of attacks on computer networks in South Korea and the US was apparently the work of North Korean hackers. The attacks, which targeted the White House, the Pentagon, and the Washington Post, among other high-level institutions, are raising concerns that the long-simmering conflict with North Korea is expanding into a dangerous new theater.

The Associated Press obtained a list of the targets in the attack. Included on the list are the National Security Agency, the Department of Homeland Security, the State Department, and the Nasdaq stock exchange. In South Korea, the sites of the presidential office, the defense ministry, and the National Assembly were targeted. Many analysts see the attacks as a test of the US government's ability to deal with a coordinated cyber-attack.2425

The growing sophistication and breadth of criminal activity, along with the harm already caused by cyber incidents, highlight the potential for malicious activity in cyberspace to affect U.S. competitiveness, degrade privacy and civil liberties protections, undermine national security, or cause a general erosion of trust, or even cripple society. For example:

• Failure of critical infrastructures**.** CIA reports malicious activities against information technology systems have caused the disruption of electric power capabilities in multiple regions overseas, including a case that resulted in a multi-city power outage.26

• Exploiting global financial services. In November 2008, the compromised payment processors of an international bank permitted fraudulent transactions at more than 130 automated

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21 "Chinese cyberattack targets Australia", by Rohan Sullivan, April 15, 2010, http://www.physorg.com/news190524906.html

22 "Chinese Human Rights Sites Hit", by Owen Fletcher, http://www.pcworld.com/businesscenter/article/187597/chinese_human_rights_sites_hit_by_ddos_attack.html

23 "Estonia recovers from massive denial-of-service attack", by Jeremy Kirk, http://www.infoworld.com/d/security-central/estonia-recovers-massive-denial-service-attack-188

24 "North Korean hackers blamed for sweeping cyber attack on US networks" , by Matthew Shaer, July 8, 2009, http://www.csmonitor.com/Innovation/Horizons/2009/0708/north-korean-hackers-blamed-for-sweeping-cyber-attack-on-us-networks

25 "South Korea again hit by cyber-attacks, as search for hackers intensifies", by Matthew Shaer, July 9, 2009, http://www.csmonitor.com/Innovation/Horizons/2009/0709/south-korea-again-hit-by-cyber-attacks-as-search-for-hackers-intensifies

26 www.sans.org/newsletters/newsbites/newsbites.php?vol=10&issue=5, CIA presentation, SANS SCADA Security Summit, January 16, 2008.

teller machines in 49 cities within a 30-minute period, according to press reports.14 In another case reported by the media, a U.S. retailer in 2007 experienced data breaches and loss of personally identifiable information that compromised 45 million credit and debit cards.27

• Systemic loss of U.S. economic value. Industry estimates of losses from intellectual property to data theft in 2008 range as high as $1 trillion.28 • losses due to criminal gangs. criminal gangs are increasingly committed to cyber crime, even recruiting promising young people as young as 14.29 Why? The possibilities of potential earnings over the internet are roughly unlimited and the reasonable securities which the Internet sources provide are not sufficient to catch these criminals. In fact, it is reported that cyber crime has been one of the main income earnings for many criminal gangs.30

DoD Guidance on Cyberspace

The Department of Defense (DOD) defines cyberspace as "a global domain within the information environment…" Cyber operations are defined as "the employment of cyber capabilities where the primary purpose is to achieve objectives in or through cyberspace; such operations include computer network operations and activities to operate and defend the GIG."

The President's Unified Command Plan assigns United States Strategic Command (USSTRATCOM) the mission to conduct cyberspace operations. To fulfill the President's vision, the Secretary of Defense (SECDEF) tasked USSTRATCOM to establish the sub-unified US Cyber Command (USCYBERCOM). Subsequently, the USSTRATCOM Commander directed the development of an overarching vision and unified framework to synchronize and integrate global cyberspace operations. This direction compliments the Joint Chiefs' of Staff GIG 2.0 concept calling for the integration of service specific cyber infrastructures into a common enterprise; organized, trained and equipped to support the Joint Force Commanders. Thus, the intent for USCYBERCOM is to direct operations and defense of specified DOD information networks and conduct full spectrum military cyberspace operations in order to enable actions in all domains. In response, each of the military services is aligning its organizations and capabilities to support the SECDEF's direction.

USAF Intent

The significance of USAF operations in cyberspace is readily apparent. Not only is cyberspace vital to today's fight, it is key to the continued US military advantage over our enemies, now and in the future. Consequently, the USAF is steadfastly intent on providing a full range of cyber

27 www.infoworld.com/d/security-central/retailer-tjx/reports-massive-data-breach-952, January 17, 2007.

28 www.mcafee.com/us/about/press/corporate/2009/20090129_063500_j.html. See also http://resources.mcafee.com/content/NAUnsecuredEconomiesReport, McAfee, "Unsecured Economies: Protecting Vital Information", January 2009. Projection based on survey by Purdue's Center for Education and Research in Information Assurance and Security.

29 Criminals target tech students, December 8, 2006, http://news.bbc.co.uk/2/hi/6220416.stm

30 A Short Summary of Cyber Crime, August 28, 2008, by AnindyaSundar Mandal, http://www.ecademy.com/node.php?id=110978

capabilities to Joint Force Commanders, whenever and wherever needed. Today, USAF cyber capabilities range from the virtual to the very real, including critical combat communications provided to the warfighter within hours upon the arrival of the USAF. The USAF will move forward aggressively to:

• Consolidate and protect the USAF portion of the DOD network
• Build capacity by increasing the skill of our people, generating innovative operational capabilities, leveraging new partners and integrating those capabilities with those in the air and space.3
• Expedite requirements and acquisition processes to deliver proactive and responsive cyber capabilities
• Develop doctrine, policies, security and guidance to effectively employ and innovate in cyberspace
• Prioritize and advocate for needed resources for cyberspace
• Significantly increase intelligence and analytical capabilities
• Shift paradigms from network-focus to mission-focus
• Develop cyber expertise to meet mission needs
• Improve commanders' decision making abilities by increasing situational awareness
• Affect changes in behavior, practices and culture by improving training, standards, communication and accountability
• Modernize and sustain the technology and equipment used for combat communications
• Eliminate seams in command and control (C2), security and doctrine to improve cross-domain effectiveness
• Combine and converge traditional operations with cyberspace operations to deter attacks and affect outcomes
• Partner with the DOD and other services to integrate, synchronize and consolidate the network infrastructures used by the joint forces

Commander's Guidance

The USAF will contribute to the joint fight by organizing, training and equipping expeditionary-capable cyber forces which will be presented to USSTRATCOM, USCYBERCOM, and other Combatant Commanders (COCOMS) as needed to conduct full spectrum operations. Consistent with joint terminology, operating concepts and views on the joint operating environment, the USAF views cyberspace as a contested operational domain that pervades and enables capabilities and effects in all other operational domains.

Cyberspace is persistent, real-time and inherently global. USAF operations in the air, space and cyberspace domains are interdependent and focused on the needs of the Joint Force Commanders. The USAF will protect cyber capabilities and integrate them with other domains to enable joint warfighting effects greater than the sum of their parts. The protection of the USAF portion of the DOD network architecture will focus on mission assurance. Until now, US adversaries have faced little to no risk or consequence in attacking or exploiting our systems, and the response has been to build stronger "walls." The time has come to think of cyberspace in a new light; not only must we defend against any attack, we must be able to "fight through" any attack, accomplish our missions and retain the ability to respond–thus giving us mission assurance in the face of future attacks or other disruptions.

Under the direction of the Commander, US-CYBERCOM, the Air Force will prepare and conduct a dynamic defense with a range of responsive capabilities enabling flexible strategic and operational response options for the combatant commanders. The USAF will assess network vulnerabilities and threats by mapping mission dependence on cyberspace, mission essential functions and supporting infrastructure. Additionally, the USAF will leverage its space and air assets to create redundancies for mission assurance and critical infrastructure needs while ensuring cross-domain tactics, techniques and procedures (TTPs) are effective and consistent. Training and standardization and evaluation programs will reflect the operational mission focus and the combat mission readiness status of USAF cyber forces.4

The USAF will continue to improve security of existing cyber infrastructure while pursuing a next generation network architecture that is integrated, mobile, visual, virtual, secure, responsive and intuitive. Currently, the joint community and COCOMS are supported by a multitude of decentralized network infrastructures operated by the services, contractors and industry, most running different configurations of the same programs, which is costly, complex and difficult to defend. It is both necessary and inevitable to integrate and synchronize these networks while transitioning to a single seamless network. The USAF will seek a single, integrated network encompassing air, terrestrial, and space layers that is managed and commanded/controlled as a single entity and that is fully compatible with a seamless DOD network. Cyber operators must be able to employ this common architecture and associated technologies for the full range of cyberspace operations, and to do so seamlessly with those of our mission partners. This next-generation architecture will enable exponential increases in capabilities for every mission and increase synchronization and real-time global situational awareness. It is estimated that in the next decade an Airman will carry in his hand 10 times the computing power of his current desktop, laptop and phone combined. It is the goal of the USAF to ensure each Airman has access to leading-edge technology and connectivity through an assured next-generation network.

The USAF Concept of Operations

In October 2008, the Secretary of the Air Force designated Air Force Space Command (AFSPC) as the USAF lead MAJCOM for organizing, training and equipping cyber capabilities. This alignment allows the USAF to focus its efforts and capitalize on inherent synergies found in space and cyberspace architectures and processes. Additionally, the USAF established a new cyberspace operational Component Numbered Air Force (C-NAF) under AFSPC. In August 2009, the USAF activated the 24 AF as its operational cyberspace entity with the responsibilities to integrate, employ and consolidate cyber capabilities in support of Joint Force Commanders and USAF component commander needs.24 AF is the USAF's cyber warfighting organization and has the requisite capabilities and authority to establish, operate, maintain and defend USAF networks, conduct other operations as required and present cyber forces and capabilities to USCYBERCOM and the other combatant commanders as required. The 24 AF Commander serves as the USAF component commander to USCYBERCOM and provides the operational focus, flexible command and control (C2) capability and single streamlined force to support Joint Force Commanders. To accomplish cyberspace missions and tasks, 24 AF is assigned three wings and is directly supported by the Air Force Intelligence, Surveillance and Reconnaissance Agency (AFISRA).24 AF Commander is also the Air Force Network Operations (AFNETOPS) Commander and, under the direction of the USCYBERCOM Commander, will execute C2 over the AF portion of the GIG. As a focal point for all AFNETOPS, 24 AF has established the 624 Operations Center to ensure that global network components essential for mission success are defended, survivable and available to support air, space and cyberspace operations, and that cyberspace operations are integrated and synchronized with USCYBERCOM. The USAF will seek an expanded concept of operations that integrates air, space and cyberspace capabilities, streamlines command and control, advances doctrine and creates a security framework to facilitate integration and to allow cross-ideation for air, space and cyberspace.

New Style of Partnerships

Because of the shared risk and to reduce vulnerabilities, the USAF must establish new relationships and actively strengthen and expand its partnerships with interagency, joint, industry, academia and international entities. Cyberspace transcends military domains and national boundaries and has changed the way we interact globally. The USAF operates a small percentage of the global cyberspace infrastructure. Industry currently provides over 90% of the cyberspace infrastructure, which potentially correlates to DOD mission success. This necessitates that the USAF must continue to foster existing relationships to enable and support the execution of the mission while fulfilling national objectives. The USAF must create new patterns of interaction with the cyber research and innovation communities and anticipate and articulate new needs for the science and technology community. Rapid technology advancements inherent in this domain require the USAF to continually strive to pioneer the future by developing new partnerships with academia and industry. The USAF needs to rapidly exploit technical advances by establishing a continuous process for working with the science, industry and academic communities that form the leading-edge information technology sector to shape our activities in the cyberspace domain.

Capability Integration

The USAF will develop unique cyber capabilities that originate in its distinct missions and take full advantage of the integration of air, space and cyber capabilities. Each service brings its own cyber strengths and capabilities to the joint team and the nation. Since air, space and cyberspace are inextricably linked both operationally and technically, the potential exists to integrate capabilities across these domains to exponentially increase each other's power. This integration promises to give joint force commanders unrivaled global access, persistence, awareness and connectivity capabilities and to rapidly restore critical infrastructure via a cross-domain network-of-networks approach. The USAF will seek to develop cyber capabilities that complement those of other services and will explore the combination of cyber with other non-kinetic capabilities to achieve synergies. The speed and nature of operations in cyberspace domain dictates a fusion of mission competencies and skills. The traditional cyber tasks must be integrated to present a full spectrum of seamless and synchronized capabilities and operations. Airmen will stop thinking of themselves as operators, communicators, intelligence experts, etc. but rather as an integrated team of multi-disciplined well-trained cyber professionals with the technical and tactical skills needed to execute any and all missions. The USAF will revolutionize its operations by establishing an integrated cyber operations center that is fully integrated with those of our joint partners to serve as the intersection for a full range of cyber capabilities. Expeditionary cyber forces comprised of team members with the appropriate training and experience will provide leading edge, tailored capabilities to meet USAF component and Joint Force Commanders' needs worldwide, from Irregular Warfare to high-end conflict.

Like offense and defense in the other operational domains, operations and intelligence in

cyberspace must not be separated. The USAF will optimize the fusion of intelligence and operations by significantly expanding and exploiting the full range of our intelligence resources and analytical capabilities. It is the USAF's goal to move from situational awareness to situational comprehension and ultimately situational projection with data that is easily shared across organizational boundaries. Since there are many common operating pictures (COPs) being assembled across the services and agencies, it is desirable to improve and consolidate COPs while making relevant USAF tools and data6
available to the joint COPs. The USAF will work to integrate space and cyberspace indicators and warnings to develop an advanced early warning architecture across the AF-GIG. Seamless operations and the strength of USAF partnerships will act as force multipliers to build capacity.

Operational Responsiveness

The rapidly changing cyberspace environment demands that we create a new acquisition strategy that is predictive, adaptive and timely and keeps us on the cutting edge of new technology. COCOM needs will emerge quickly and our goal is to deliver operational capabilities at the speed of need; therefore, the USAF will improve the process of indentifying cyber requirements and delivering responsive cyber capabilities. The re-engineering of requirements and acquisition to better support COCOM needs necessitates a tiered approach to meet operational needs in this dynamic environment. Our cyber adversaries attack 24 hours a day, seven days a week, 365 days a year and act and react in real time. This reality requires real-time modifications to existing capabilities and also a rapid hours-to-weeks acquisition process to meet these constantly evolving threats. The USAF will develop requirement thresholds to determine whether the need is real-time, rapid or foundational. An agile and adaptive requirements process will ensure that the USAF is optimizing limited resources while responding to future operational demands. *Cyberspace Culture* The USAF will strive to change its cultural mindset in the day-to-day execution of cyber operations. The importance of cultivating a new mindset cannot be overstated. It demands a fundamental shift in leadership that encourages creative, yet critical thinking and rewards innovative activities and solutions. Cyberspace does not function independently of other capabilities provided by the USAF or other DOD agencies. For example, the question of capability integration is broader than just the USAF and requires an understanding of how USAF cyber capabilities may leverage or be leveraged by the capabilities of the other military services and mission partners. In addition, the integration and acculturation of cyberspace must permeate doctrine development, accession and advanced training, professional military education, exercises, war games, recruitment and day-to-day operations. A cultural change is also critical in the USAF operation and defense of the AF-GIG. Every USAF airman, government civilian, and contract partner must become a cyber defender. The United States is vulnerable to cyber attacks by relentless adversaries attempting to infiltrate our networks- at work and at home- millions of times a day, 24/7 planting malicious code, worms, botnets and hooks in common websites, software and hardware, such as thumb-drives, printers, etc. Once implanted, this code begins to distort, destroy and manipulate information, or "phone" it home. Certain code allows US adversaries to obtain higher levels of credentials to access highly sensitive information. Adversaries attack computers at work and at home knowing Airmen communicate with the AF network via email or transfer information from one system to another.

Airmen have a critical role in defending the USAF networks. They can significantly decrease the adversary's access to the USAF networks by:

• Not opening attachments or click on links unless the email is digitally signed, or directly verifying the source directly • Not connecting any hardware or download any software, applications, music or information onto our networks without approval
• Encrypting sensitive but unclassified and/or mission critical information
• Installing the free Department of Defense anti-virus software on home computers7

As always, USAF Airmen are the core of our mission success; and the civilians and contract partners of the USAF also play a unique and critical role. Technical competence alone is not sufficient to meet the challenges of the 21st century. Airmen must be technically astute, tactically competent, armed with warrior ethos and equally prepared to deploy forward or operate in place to accomplish the mission. The USAF will increase cyber expertise by implementing a focused recruitment strategy, a specific and carefully managed cyber career pathway and career-long professional development.

The USAF will increase opportunities for education and provide specialized organic cyber operational training to include a centrally managed force of trained personnel with forensic and other specialized skills. The USAF will develop procedures to identify and track cyber professionals within the USAF personnel system and leverage the contributions of the Air National Guard and Air Force Reserve Command to develop and present unique capabilities.

The Specific Role and Training Methods of the 26 Network Operations Squadron

The 26 Network Operations Squadron

The 26 NOS is a vital part of the USAF cyberspace defense strategy. The squadron is part of the 24th Air Force, 67th Network Warfare Wing. The approximately 200-man 26 Network Operations Squadron located in Montgomery, Alabama was activated by Special Order GD-018 on 11 Aug 2009. The invaluable mission of the squadron is as follows:

The responsibilities of the 26 NOS are paramount to the successful operation of the USAF intranet. The 26 NOS operates the AF Enterprise computer network that consist of 16 Gateways and LAN equipment at over 250 locations that rely on over 600 WAN circuits supporting warfighting efforts for Operations IRAQI and ENDURING FREEDOM while executing 24/7 around the clock situational awareness and direction over the underlying network infrastructure and critical application operations. The squadron provides full service helpdesk for command and control and operational support network applications. The squadron also manages the AF authorized service interruption process to ensure minimal impact to sustaining base and deployed operations. 26 NOS directs the AF network security patch management process to ensure security of information riding on the AF networks. It also provides and monitors embedded implementation to detect network anomalies before mission impact to operations of all Air Force Active Duty, Air Force Reserve and Air National Guard classified/unclassified services.

The squadron pursues two- major avenues of training, Initial Qualification Training and Mission Qualification Training (MQT). Both are tailored to the specific outcome they represent.

The 26 NOS training program consists of requirements and programs directed by the Air Force by way of general and specific documentation. The primary referenced documents in this NOSI are the AFNOC NOD *Master Training Plan,* AFI 36-2201V1, *Training Development, Delivery,* *and Evaluation,* AFI 36-2201V2, *Training Management,* AFI 36-2201V3, *Air Force Training Program on-the-job Training Administration*, and AFI 21-116, *Maintenance Management of Communication-Electronics*. Supporting documentation is also found in AFI 33-115V1, *Network Operations (NETOPS)*, AFI 33-115V2, *Licensing Network Users and Certifying Network Professional,* and 26NOGI 13-302V1, *Training Program.*

Initial Qualification Training (IQT)

IQT is mandatory for all new employees to the squadron, whether they are military, DoD civilian or contractor. All new hires report to the Training Manager after their initial on-day orientation on their first day of hire for the upcoming IQT schedule. During IQT, employees report to the Chief of Training and not to the Team Lead. After successfully completing the IQT, trainees are released back to their assigned Team Lead and begin MQT.

IQT addresses both administrative issues and technical concepts such as:

- USAF History and Customs
- Resource Protection
- Classified Handling
- Information Assurance
- Operational Security
- Safety
- Records Management
- Fraud, Waste and Abuse
- Secure Communications
- Office of Special Investigations
- Supply
- Customer Care
- Change Management
- AF Network Operations
- The 26 NOS Organization
- Information Operations
- Technical Orders
- Networking Fundamentals
- Network attack methods
- Defense in Depth
- CyberLaw
- Network applications and Access
- Site-specific applications
- RF/Emissions Security

An example of the coverage of one of these can be found in Appendix A. Upon completion of the five day course, the trainer and trainee sign the trainee as qualified on the Training Record. If the trainee or trainer feels the trainee is not qualified, then the instructor must schedule one-on-one time with the trainee.

At the conclusion of the five-day IQT and the signing of the Training Record, the new employee has seven days in which to take the Initial Qualification Exam. This exam is a 250 question assessment of their learning during the five-day period and is given by the Standards/Evaluation manager. A score of at least 85 is required. If the employee fails, then the employee must attend IQT again. If the employee fails the IQE again, then a meeting is set up with the Team Lead, Chief of Training, Standards Evaluation Manager and the Squadron Commander to address what action(s) need to be addressed.

Mission Qualification Training (MQT)

Trainees proceed to MQT immediately following completion of IQT and passing the IQE. MQT is completed NLT 6 months from the employee's orientation date. Team Leaders shall decide which tasks are applicable to the employee and load those blocks and tasks to the trainee. MQT is essentially on the job training held between the trainee and the Team Lead and other training personnel in th specific position field. For example, a new trainee might be assigned to be a router technician and so, over the next six months, learn the fundamentals of how this is performed in the 26 NOS. Two examples of this training can be found in Appendix B.

Trainers, Certifiers, Supervisors, and Team Leads document the Supervisor Record of Training (SRT) in the trainee's record for significant training actions. This is especially important for delays in training due to TDY, illness, etc.

The DoD requires maintenance technicians with privileged access to obtain and maintain the appropriate Information Assurance (IA) certification. If required, these certifications must be obtained within six months of employment (DAA may grant a six month waiver). Supervisors shall immediately notify new hires of this requirement and annotate the trainee's SRT of this notification. The trainee and the supervisor shall digitally sign the SRT.

Those individuals that do not meet DoD 8570 requirements, as specified in the contract, will not perform any maintenance actions on AF networks without a certified individual supervising the action.

If an individual does not obtain the required certifications within the allocated time will have all privileged accounts disabled.

Teams may break into duty positions for MQT purposes. Therefore an individual is deemed Fully Mission Qualified (FMQ) when finished with assigned MQT tasks. For example, the Firewall Team may break into a LAN and WAN. To be FMQ an individual only has to complete the tasks required for one position.

Upon receiving FMQ status, an employee may train and certify on other tasks associated with the respective team, outside the duty position. For example, a trainee receives FMQ status for the LAN duty position within the Firewall Team. The trainee then may train on WAN duty position tasks. However, a trainee may not train on Operations Team or System Administration tasks without meeting the requirements described in the 26 NOS Master Training Plan, Chapter IV.

Certification and all other requirements still apply when training into other duty positions.

Currency Training

Currency Training is required periodic training. This training may be directed by the Higher Headquarters, 26 NOS Commander, Site Lead, Chief of Training, MTM, Team Lead, or Shift Lead. Training intervals are determined by the individual or office requiring Currency Training. These are examples of currency training:

- Resource Protection
- Classified Handling
- Information Assurance
- Operational Security
- Safety

Currency Training is documented on the Recurring Training Document (RTD) in the employee's training record.

If a trainee is overdue on a task, the trainee is to complete the training immediately. Until the trainee meets currency requirements, the trainee may not perform the task without supervision, train or certify others on the task.

If a trainee is overdue on a task for more than 30 days, then the team trainer decertifies the trainee and annotates the SRT.

Conclusion

Cyberspace is a fairly new arena where both good and bad coexist. It can be argued that without cyberspace, information can no longer be effectively disseminated throughout the world. Yet, cyberspace is also rife with dangers. Effective training is one way to mitigate these dangers. Training is highly regarded in both the United States Air Force and the 26 Network Operations Squadron. It is only through the diligent and effective efforts of many qualified personnel that incoming personnel are properly trained so as to become proficient warfighters in the ever-changing cyberspace arena.

APPENDICES

APPENDIX A

Classified Handling Agenda

1. Identify and Explain Classified Handling Procedures
2. Identify and Explain Courier Procedures
   a. Identify and Explain Packing and Wrapping Procedures
   b. Identify and Explain Transporting Procedures
   c. Identify and Explain Hand Receipting and Storage Procedures

3. Identify, Explain and Report Security Incidents
4. Identify, Explain and Report COMSEC Incidents
5. Identify Classified and Unclassified Information Categories
6. Identify and Explain Physical Security Requirements
7. Identify and Explain Safeguarding and Controlling Access
8. Identify and Explain Destroying Classified Information

APPENDIX B

<table>
<tr><td colspan="6">TASK TRAINING GUIDE PART I</td></tr>
<tr><td>BLOCK #: 202</td><td>MQT Yes ☐ No X</td><td colspan="2">IQT-A Yes X No ☐</td><td>IQT-T Yes ☐ No X</td><td></td></tr>
<tr><td colspan="2">BLOCK TITLE: PORTS, PROTOCOLS & FIREWALL CONFIGURATION</td><td rowspan="2">REV
A</td><td rowspan="2">DATE
25 Sep 09</td><td rowspan="2">STAN/EVAL
Yes X No ☐</td><td rowspan="2">TIME
25 Hours</td></tr>
<tr><td colspan="2">COURSE CONTENT</td></tr>
</table>

<u>EQUIPMENT</u>

Windows enabled SIPR computer with Monitor and Mouse
Access to Lynx and Trigger servers

And/Or

Whiteboard with multi-colored markers

<u>VISUAL AIDS</u>

Port List Student Handouts
Three-Way Handshake Handout
Configuration Practice Worksheet

<u>REFERENCES</u>

Newton's Telecom Dictionary, 17^{th} Edition
AnswersThatWork.Com

<u>CERTIFICATION REQUIREMENTS</u>

None

TASK BREAKDOWN

- *Define a Port
- *Identify the common Ports and their Usage
- *Define a Protocol
- *Identify the common Protocols and their Usage
- *Perform Firewall Configurations to Allow or Block Port and Protocol Traffic

* Denotes a Critical Task

APPROVAL OF LESSON PLAN

	SIGNATURE	DATE
Training Manager		
Team Leader		
Site Leader		
Commander		

TASK TRAINING GUIDE PART II	
BLOCK #: 202	
BLOCK TITLE: PORTS, PROTOCOLS & FIREWALL CONFIGURATION	
COURSE CONTENT	

TASK BREAKDOWN

• *Define a Port	• A logical interface between a process or program and a communications device or facility. *Ports range from 0 to 65,536 *Well known ports are 0 to 1023 and are assigned by IANA *Used in context with Transmission Control Protocol (TCP), TCP/IP and User Datagram Protocol (UDP).
• *Identify the common Ports and their Usage	• Refer to Port List Student Handout *Discuss various other ports such as VOIP, VTC, etc that are not on the list*
• *Define a Protocol	• A protocol is a specific set of rules, procedures or conventions relating to format and timing of data transmission between two devices.
• *Identify the common protocols and their Usage	• Common Protocols 10. Internet Protocol (IP) – integral part of the TCP/IP suite 11. Transmission Control Protocol (TCP) – connection oriented, such as web 12. User Datagram Protocol (UDP) – protocol for sending messages or information without requiring a continuous connection 13. Three-Way Handshake

• Perform Firewall Configurations to Allow or Block Port and Protocol Traffic *Denotes a Critical Task	• To properly allow or block traffic flow through a firewall, the syntax must be in correct order and without error. 14. Use the following flow chart to ensure correct configurations: Action (Permit or Deny)–Protocol-Source Host-Source Port-Destination Host-Destination Port Example #1 – Allow workstation IP 192.112.90.230 to a IP 198.118.80.9 for web server traffic SYNTAX: Permit tcp host 192.112.90.230 host 198.118.80.9 eq 80 Example #2 – Block the above web server IP from accessing the workstation IP via web port SYNTAX: Deny tcp host 198.118.80.9 host 192.112.90.230 eq 80 *DISCUSS AND ANSWER QUESTIONS* *Provide Configuration Practice Worksheet for students to accomplish. Evaluate and discuss discrepancies.

Adventures in Computing for Teens: Revitalizing a Summer Exploration Camp

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Abstract.

In 2008, the IPFW Computer Science Department redesigned its summer computing camp in an effort to attract greater participation. Previous offerings had targeted high school students and emphasized Java programming. These camps were organized similarly to a traditional course: Daily lectures on language features followed by laboratory assignments. Little interaction occurred between instructor and participant or among the participants themselves. The new design took a significantly different approach. Java was jettisoned in favor of Alice. Students in grades 8-12 were invited. Lectures were replaced by short tutorials, demonstrations, and follow-the-leader exercises. Enrichment activities, such as videos on computer science milieu and presentations on educational and career opportunities, were integrated with daily programming adventures. Participants were encouraged to explore and experiment with Alice and show each other what they could do. All participants completed an individual project which they demonstrated to family and friends at the end of the camp. The redesigned camp has been received enthusiastically, recording the highest levels of participation since being first offered in 2000.

Introduction

The IPFW Department of Computer Science, largely on the initiative of a single faculty member, offered its inaugural summer computing camp in June, 2000. Christened the Summer Program in Intensive Computer Education (SPICE), it targeted high-school students who desired “the opportunity to sharpen their computer skills in programming, writing software, and to explore a computer-based career.” It also promised to give participants the ability to create games or websites of their own design. Response was modest; a total of 12 participants signed up with all grade levels represented. The camp was organized into 10 half-day morning sessions and met in the Department's computer laboratory. These sessions were organized similarly to a traditional course in computer programming: Wide-ranging daily lectures that covered a plethora of programming concepts and Java language features followed by laboratory assignments. For the most part, participants were left on their own to solve the programming problems; little intentional interaction occurred between instructor and participant. Likewise, the participants, who were all strangers to one another and tended to be introverted, seldom communicated.

Most of the campers soon became overwhelmed by the complexity of the material and discouraged by lack of success in completing the laboratory exercises. As a result, the pace of the camp had to be slowed to almost a crawl during the second week, and little material on Java features for gaming or web technology was covered.

Except for a substantial reduction of material and addition of less ambitious programming problems, SPICE utilized this organizational model for the next seven years and experienced a modest amount of success. However, as interest in computing waned at the high-school level, fewer and fewer students were eligible to benefit from SPICE, and it, too, suffered declining enrollments. In 2007, it became evident that a new approach had to be taken to reach out to students who might not want an enrichment program, but an exploration one.

SPICE and ETCS Outreach

While remaining firmly rooted in the Computer Science Department, in 2002 SPICE was grafted into the then newly created IPFW College of Engineering, Technology, and Computer Science (ETCS) Outreach Office. The Office was founded in order to centralize coordination and support for a variety of outreach activities initiated by faculty. With its mission to build awareness, interest, and self-efficacy in engineering, technology, and computer science among K-12 students, the Office organizes, promotes and partially funds project-based educational experiences for pre-college youth sponsored by constituent departments. Funding for outreach programs is generated yearly from 30-35 northeast Indiana businesses and professional organizations. These organizations often also supply volunteer judges and members who serve on various event planning committees.

The Office has established a highly successful K-12 outreach presence in northeast Indiana. An estimated 3500 students, 800 adult volunteers, and 1100 observers participated in IPFW outreach events last year. In addition, 105 schools from northeast Indiana and over 50 counties were represented in at least one event. Outreach activities include statewide championships (Indiana FIRST® LEGO® League Championship, Indiana Future City® Competition), regional competitions (Northeast Indiana Regional Science and Engineering Fair), career days (Middle School Career Days), and summer exploration camps (Girls Leading Others, VEX Robotics, Adventures in Computing for Teens nee SPICE, Math and Science Camp, Physics Camp).

The Office strives to offer engaging and challenging events and camps that generate excitement while encouraging youth to expand and explore STEM (Science, Technology, Engineering and Math) skills. Programs also involve exposure to community professionals as presenters or mentors. All of the competitions provide youth with opportunities to earn recognition, special awards, scholarships, and potentially advancement to higher levels of competition. Highly motivated youth can engage in multiple outreach activities at the university and develop a sense of direction, self-confidence, and enthusiasm toward doing well in school in order to pursue these fields of study later in their academic careers. This outcome correlates with the broader university mission to provide educational service to northeast Indiana communities. Outreach programs thus serve as both a mechanism for community service and a method to acquaint youth with the university environment.

Since 2002, the ETCS Outreach Office has provided a number of invaluable services to summer exploration camps. These include design, production and distribution of promotional materials, processing of applications, funds management, onsite logistics, and ad hoc administrative support. This has freed instructional personnel to focus on content design, preparation and delivery.

Revitalizing the Computer Summer Exploration Camp

In 2008, a new faculty member agreed to take charge of SPICE. After reviewing SPICE's history and recent difficulties in attract participants, an entirely new approach was taken. The first step was replacing the name with a less intimidating one, Adventures in Computing for Teens (ACT). Java was jettisoned in favor of Alice. Participation was broadened to include middle-school students. Formal lectures were replaced by short tutorials, demonstrations, and follow-the-leader exercises. Enrichment activities, such as videos on computer science milieu and presentations on educational and career opportunities, were integrated with daily programming adventures. Participants were encouraged to explore and experiment with Alice and show each other what they could do. All participants completed an individual project which they demonstrated to family and friends at the end of the camp. The remainder of this paper details the design, implementation and evaluation of ACT.

Camp Organization and Content

ACT runs Monday through Friday from 8:00 AM to 4:30 PM. Lunch is provided each day as well as a mid-morning snack break. Daily activities are organized around three major themes: explanation, exploration, and excitation. Table 1 details the distribution of time across these activities for the ACT 2009 camp. Table 2 provides sample activities for a typical day. A single faculty member conducts all sessions.

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00	Orientation	Q/A & Teaser	Q/A & Teaser	Q/A & Teaser	Q/A & Teaser
8:30		Explanation	Explanation	Explanation	Explanation
9:00	Excitation	Excitation	Excitation	Excitation	Excitation
9:30	Explanation	Explanation	Exploration	Exploration	Exploration
10:00	BREAK	BREAK	BREAK	BREAK	BREAK
10:15	Explanation	Explanation	Explanation	Explanation	Exploration
10:30	Exploration				
11:00			Exploration	Exploration	
11:30	Excitation	Excitation	Excitation	Excitation	Excitation
12:00					
12:30	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1:00	Explanation	Exploration	Exploration	Exploration	Exploration
1:30					
2:00					
2:30	Exploration				
3:00					Showcase
3:30					
4:00					
4:15	Preview	Preview	Preview	Preview	Awards
4:30	End	End	End	End	End

Table 1. ACT 2009 Summer Exploration Camp Activity Schedule.

Explanation activities are aimed at learning fundamental programming skills, Alice features, and basic animation techniques for story-telling and video-game construction. These activities include instructor demonstrations, hands-on tutorials, and brief presentations of material from the Alice textbook, *Learning to Program with Alice* [1]. Chapters 1-5 and Appendix A comprise the educational content from the textbook. Just enough explanation is provided to give participants a foothold in new territory; additional learning is accomplished through independent exploration, peer collaboration, and individual help from the instructor. Participants tend to be fiercely independent and have a high tolerance for the trial-and-error method of learning.

Exploration activities give participants the opportunity to gain skill—and occasionally show-off—what they have learned about programming. These activities are a combination of exercises chosen from the Alice textbook or created by the instructor. The exercises are of varying difficulty to better ensure that all campers are able to complete at least one of them per content unit. Participants are encouraged to modify exercise in creative ways. This motivates them to take greater ownership in skill acquisition.

The exploration activities culminate with an animation project, either a story or a video game, which is designed by the participant. The project allows the camper to experience the entire software development process, practice with a variety of Alice features, and express their creativity or indulge their interests. The project activity is introduced after lunch on Monday with a review of past projects. Participants are then asked to brainstorm ideas and then write a half-page description of their desired project. Upon approval, the camper then works independently to create a simple storyboard and bring it to life. The instructor lends assistance as needed.

The projects tend to vary greatly in complexity which is ultimately a reflection of the camper's knowledge level and time commitment. Sample projects from ACT 2009 include: An interactive lunar lander game; a math quest educational game; an animated fairy-tale; a star-wars space chase; and animation of hand-signs from a Japanese manga fantasy series.

One other note about exploration activities: Each afternoon except Monday and Friday is wholly dedicated to this activity. One might anticipate that this is too long a period of time for teenagers to be focused on one activity. The first offering of ACT did have an excitation activity in the middle of the afternoon, but this was not well-received. Feedback indicated a distinct desire for more time to devote to exploration, specifically to bringing their projects to completion. Not only do most participants remain on-task during this time, they almost universally report spending additional hours at home on their projects or exploring Alice features not covered during the day.

Excitation activities are designed to create awareness of, interest in, and excitement about the field of computing. Such activities are often aimed at dispelling myths about who can become a computing professional and the nature of the computing profession. Participants are often quite surprised to discover how pervasive computer technology is and how even "normal" people (i.e., those who do more than hunch over their computers 24/7) can be successful as computing professionals. Many times these activities include guest speakers, among them a former beauty queen, who share their own stories about how they chose computing as their vocation. Another well-received activity is an interactive poll that explores knowledge and perceptions about computing, e.g., On average, how many text messages are sent by a teenager per month. Results for each question are displayed instantly and serve as a springboard for further discussion.

	Sample Daily Schedule
8:00	Teaser: "Walkin' Around" Alice program demonstration
8:30	Chapter 3Tutorial: Using built-in functions and expressions
9:00	Interactive Presentation: "Computer Science: More Than You Think"
9:30	Chapter 3 Exercises
10:15	BREAK
10:30	Chapter 3Tutorial: Simple control structures
11:00	Chapter 3 Exercises
11:30	Video: "The Machine That Changed The World"
12:30	LUNCH
1:00	Chapter 3 Exercises; Project Development
4:15	Preview of Chapter 4 Content
4:30	End

Table 2. ACT Summer Exploration Camp Sample Daily Schedule.

Several other activities are an integral part of the camp. An hour-long orientation session is held on Monday. During this session the instructor gives an overview of the camp, distributes the Alice textbooks, asks participants to complete a background survey, and gives them the opportunity to introduce themselves. An ice-breaker activity is also done to better acquaint the participants with each other and to create a more friendly and familiar environment.

On Tuesday through Friday, the day begins with a Question and Answer session to clarify or reinforce material from the previous day. The instructor then offers a "teaser" which is an Alice animation incorporating new features and programming concepts for the upcoming day.

The final hour on Friday is dedicated to a project showcase. Participants are invited to introduce and demonstrate their Alice projects. Family members are encouraged to attend. Outstanding projects are given achievement awards—usually movie tickets or restaurant gift cards—and all are given t-shirts and handsome certificates of participation. The camp concludes with a pizza party.

Funding

The ACT budget is approximately $3,000 for 20 participants. Included in this amount are the instructor's salary, food, promotional materials, books, awards and certificates. ACT is funded with a combination of corporate grants (Franklin Electric, Inc.) and participant fees. Participant fees are currently $120 but may be reduced if additional corporate funding is obtained. A small number of camp scholarships are available to support participation by underrepresented groups.

Promotion and Participation

As part of the ETCS Outreach program, ACT is promoted through four formal marketing channels. A description of ACT is included in IPFW's Continuing Studies Summer Programs booklet, which is mailed to several thousand homes in the nine-county university service region.

Secondly, the ACT trifold is mailed to all former participants and a broad selection of high-school and middle-school guidance counselors. The camp description and trifold are also hosted on the ETCS website. Finally, ACT is promoted at local summer camp information fairs. Of course, ACT is informally promoted by word-of-mouth and the camp instructor always has a trifold handy to share when the opportunity arises.

Renewed promotional efforts and more engaging camp content have resulted in full capacity the last two years and similar participation is expected for 2010. Participants have been drawn from more than 20 different schools including public, private and homeschools. Table 3 profiles age and gender distribution. Of particular note is the participation of younger teens. We view this as an ideal opportunity to foster early consideration of computing as a career and to encourage an academic path that would prepare them for a STEM major (hopefully, Computer Science!) This has also motivated us to design an additional component for ACT 2010 (see Section x below) to attract more teens in grades 10-12. Female participation is disappointing, but consistent with national surveys of women pursuing computing degrees. We plan to reorient some of our promotional materials to improve this situation. Based on a pre-camp survey, all participants are avid computer users with over 90% using the computer for four activities: surfing the internet, word processing, playing games, and social networking. Few of them, however, have any programming experience prior to the camp. They universally have a naïve view of what computing professionals do, who they work for, or what it takes to become one. Finally, though they admit to having little knowledge of programming, they are eager to learn how to create programs, especially those that look and feel like video games.

Secure Cloud Computing in the Chemistry Laboratory: A Budget-Friendly Approach to Computational Work

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Abstract

The design and implementation of a web-based, cloud computing system at a small undergraduate college will be discussed. This cloud uses freely available and low cost software to create a robust, user-friendly environment for high-level chemical structure modeling free of licensing limitations. The web-based implementation allows users to access the system from any computer connected to the Internet by entering a common web-portal into a server machine that then relays computational chemical modeling calculations to remote compute nodes via a local area network. The configuration of the web-based portal, network design and limitations, and some freely available computational chemistry packages will be presented from the system administrator's perspective. Portal usage and some common computational chemistry exercises are presented from the end user's perspective.

Background

The proliferation of computers and molecular modeling software in the organic chemistry classroom and laboratory has exploded over the past several years.[1-2] Many organic chemistry textbook publishers have begun to incorporate proprietary and popular molecular modeling software packages with their lecture textbooks and laboratory manuals.[1,3] Several stand alone courses built around software packages have also been developed by academicians, textbook publishers and software manufacturers.[2] The Internet is riddled with tutorials and guides to perform basic and complex computational experiments. These tutorials, however, can be very specific, proprietary and even out of date at times. With so many choices, selecting a computational chemistry software package for an organic chemistry course can be a daunting task.

Very broadly defined, computational chemistry uses computer software to elucidate a chemical problem.[4] A branch of computational chemistry, molecular modeling, uses software packages to compute atomic coordinates by finding a lowest energy conformation or representation of a molecule or ion.[4] Once a conformation is discovered, many complex chemical and physical properties of molecules can be calculated. These include: heat of formation, electrostatic potential, highest occupied molecular orbitals and lowest occupied molecular orbitals, amongst many others.

Several very popular commercial software packages exist to perform these types of studies. Quite possibly the most popular software package used in research and industry is the Gaussian software package.[5] This package allows for very robust calculations on a wide variety of molecules and ions to be determined via a command line or graphical user interface. As the industry standard, Gaussian remains the computational software package of choice for many organic chemistry courses at major research universities. Since many research universities have encompassing site licensing agreements for Gaussian this is a natural fit. But what software is right for a small college organic chemistry classroom? To answer this, one must consider four questions: (1) Is this software package affordable? (2) Is this software package user friendly? (3) How many students will be using this software and where? and (4) How easy is this software package to maintain? To begin, consider two of the most popular computational chemistry packages available, Gaussian and Wave Function's, Spartan Pro.

Gaussian can be prohibitively expensive for many small college organic chemistry instructors. A single academic license can cost thousands of dollars and a multi-user or multi computer site license can be much more. The standard Gaussian package does not include a graphical user interface that must be purchased separately, increasing the cost. A single license of Gaussian will allow installation on only one computer making it very difficult for multiple students to use the program simultaneously. However, if cost is not a factor, then a site license option exists that allows for installations of the software on multiple computers. Gaussian is very easy to maintain as many service agreements are available and upgrades can be as simple as pushing the "check for updates" button as with many other software packages. So, if cost is not an issue, Gaussian can be a very attractive alternative.

Spartan Pro[6], available from Wave Function, can also be a very attractive candidate. A single user license, which allows for one complete installation on a single physical machine can cost over $1000 with a multi-user, multi-processor option increasing the cost significantly. A very attractive feature of Spartan is that many textbook publishers offer a limited student version of Spartan as a bundled supplement to their textbook. However, this usually increases the cost of the textbook and therefore the cost to the students. One of the greatest features of Spartan is its graphical user interface. Students can easily draw molecules and perform computational tasks with very little guidance. However, students must physically access the computer running Spartan. If many students are accessing the software simultaneously, then each student would need a computer running Spartan. Like Gaussian, Spartan is also very easy to upgrade and maintain. If Spartan is bundled with the chosen organic chemistry textbook, or if the software can be easily installed in a campus computer lab, then Spartan may be a viable alternative.

If cost, ease of use for students and student accessibility are paramount issues, then a web-based cloud-computing platform may be an attractive alternative. The platform outlined here uses several open-source and shareware software packages over a WAN/LAN system to provide students a web-based graphical user interface to draw molecules and perform many computational task at little or no cost to the instructor or institution.

Platform Design

As a student, one accesses the platform via a cloud-computing web-based interface using a unique username and password. Then molecules can be drawn and edited using a Java based editor and parameters can be configured for the computational task chosen and calculations can be submitted to the server all via the web-based interface. Once submitted, students can check the status of their computational jobs and perform data analysis over the Internet.

Once a student submits a calculation from the cloud interface, the server then creates an input file for the appropriate computational software package and adds the job to a scheduling/queuing system. The job is then submitted to an available remote LAN node for completion. The server then has the ability to check the status of every remote node and reports that status back to the server. Once a remote node completes a computational task, the appropriate output files are copied back to the server for storage and data analysis.

The cloud design includes four steps (1) WAN/LAN server configuration, (2) node configuration,(3) computational software configuration and installation, and (4) web-based interface configuration. This must be performed as needed on either the server or remote computer nodes or both.

To configure the server, it must first be equipped with dual network interface cards, one for the WAN and one for the LAN. Also, a valid external IP address must be provided that allows for WAN http and https access. WAN SSH access can be very advantageous to allow for remote administration. For the implementation described here, Scientific Linux Version 5.2[7] was chosen as the operating system on a Gateway E-Series Intel Pentium IV, 2.0 GHz computer with a 250 GB hard drive and 2 GB of DDR RAM. Scientific Linux is freely available and can be easily configured to run all necessary software. The Gateway E Series computer was a campus surplus computer replaced from a campus laboratory. Scientific Linux version 5.2 was also installed on each remote LAN node.

Once the operating system was installed, the machine was configured to act as a LAN server using the open source application Firestarter[8]. The basic configuration was used, with access only provided to the remote machines via IP address verification. Also, WAN access was restricted to allow only HTTP, HTTPS and SSH incoming WAN connections, and SSH was configured to allow access to only specific IP and MAC addresses. Students access the cloud via HTTP and HTTPS, SSH is only used to access the server for administration and maintenance.

Next the computational chemistry software was installed on the server. For this implementation, the General Atomic and Molecular Structure System (GAMESS)[9] was configured and installed. The GAMESS software package is made available to interested academicians as precompiled platform dependent binary executable files or as source code to be compiled later. Since GAMESS has been developed for years as a research tool, it can be very cumbersome to use. This is overcome by the use of WebMO, a shareware software package that provides the web-based graphical user interface and scheduler/queuing system used in this implementation. The WebMO software package is free available to perform most of the tasks outlined here, but WebMO Pro was purchased that adds many analysis tools as well as the scheduler/queuing system to manage jobs on remote LAN compute nodes. The WebMO Pro software package was installed on the server by following the standard installation instructions found a on their website. A WebMO user and group was created on the server that will be used by WebMO Pro to perform necessary calculations on both the server and remote compute nodes.

The remote compute nodes access the server via a LAN. Currently, this installation contains 8 computers that range from Pentium 3, 350 MHz with 250 MB of SD RAM to Pentium IV, 1 GHz machines with 1 GB of DDR RAM. All of the remote LAN computers were donated to this project from campus surplus. Scientific Linux version 5.2 was installed on each of the nodes, configured to access the server via SSH and a WebMO user and group was created that was identical to that on the server. The WebMO software requires passwordless exchange of information between the server and nodes for the WebMO user. This was achieved using the RSA protocol within SSH. Finally, the GAMESS computational chemistry software package was installed on each node and the WebMO program on the server was updated to include each LAN remote compute node.

WebMO Configuration

The WebMO[10] installation and configuration is very straight forward, and the directions from the developer are readily available from their website. Briefly, the server software is installed on the server with the supplied Perl script installer. Builds exist for Windows, Macintosh and Linux operating systems; however, in this installation, the Linux version was implemented. WebMO installation is achieved in three steps. First, create a WebMO user and group on the server and each node. It helps to assign the same UID and GID on each machine. Second, install the WebMO software on the server. Finally, configure WebMO to access each node and computational software package available as well as adding users to the WebMO system. Once this is completed, a WebMO administrator account is created within the WebMO software for access via a web portal. This can be different than the Linux account where WebMO will be accessed and for security reasons should be different than the administrator for the machine's operating system.

One point to note, WebMO utilizes a common work area for all jobs submitted. The default for Linux is to use /tmp for this purpose. This can have a disadvantage as Scientific Linux periodically removes files from /tmp that have not been updated or accessed for a specified period of time. Since some calculations can take long periods of time without accessing some or all of the necessary files in /tmp, the operating system could potentially delete a file needed by WebMO causing the WebMO job to crash.

Once the WebMO software is installed on the server, the computational software must be installed on each computer that WebMO will access for job submission. The GAMESS software is available at no cost from the Gordon Research Group at Ames Lab – Iowa State University. Simply follow the guidelines on their web page to gain access to the program. The GAMESS application is available as precompiled binary files for most major operating systems, including 64 and 32 bit versions. For this work, the precompiled binary files of GAMESS for 32 bit Linux was obtained and simply copied to /usr/local in a newly created GAMESS directory.

Next, WebMO is configured to access each node, computational chemistry package, and users added from a web based interface using the WebMO administrator's password. This is a very straight forward process that requires the IP address of each node to be assigned computational jobs, the location of the scratch directory for each node, and the path to the computational chemistry software package. Users can now be added and the entire system tested.

Example Usages

Many classroom examples could be provided[11], but fundamentally, most are based on (1) molecular energy calculations, (2) molecular equilibrium geometry optimization and (3) graphically displaying chemical properties.

(1) Molecular Energy

Molecular energy calculations are perhaps the most fundamental application of computational chemistry. In this process, a student would draw a representation of a molecule on the computer using the ball and stick approach. Then, once a reasonable representation has been drawn, the molecule is submitted to the computational chemistry engine (GAMESS in this example) to calculate the energy of the molecule drawn by the student. From this energy calculation, students can then calculate several relevant chemical and physical properties that include dipole moment, atomic charges, bond orders, and molecular orbital analysis.

(2) Molecular Geometry Optimization

Molecular geometry optimization is a refinement to the molecular energy calculation outlined previously. Here the student-drawn representation of a molecule is submitted to a computational engine (GAMESS in this example) to determine the minimum energy of a molecule by an iterative process. The iterative process performs several molecular energy calculations in sequence by perturbing bond distances and angles and comparing the molecular energy of each. The lowest energy wins. Once a threshold is reached, called the energy minimum, the calculation is finished and chemical and physical properties similar to those outlined above can be calculated. The advantage to this procedure is that mathematical equations are used to determine the energy of the molecule and not the student's original structure, which could be a very poor representation. The major disadvantage is the time associated with this type of calculation. A typical optimization can take many individual energy calculations, as described in the previous section, and can therefore take much longer to complete.

(3) Graphically Displayed Three-Dimension Potential Energy Maps

Once the energy of a molecule is computed, students can then represent the 3-dimensional structure using potential maps. The potential energy of Metformin, a common diabetic drug, is shown in **Figure 1**. Here the charges of Metformin are overlaid on the molecule to illustrate charged regions. Typically, the highest charged portion of molecules are colored red, and the lowest charges are colored blue. This allows students to visually interpret areas of the molecule where chemistry is most likely to occur.

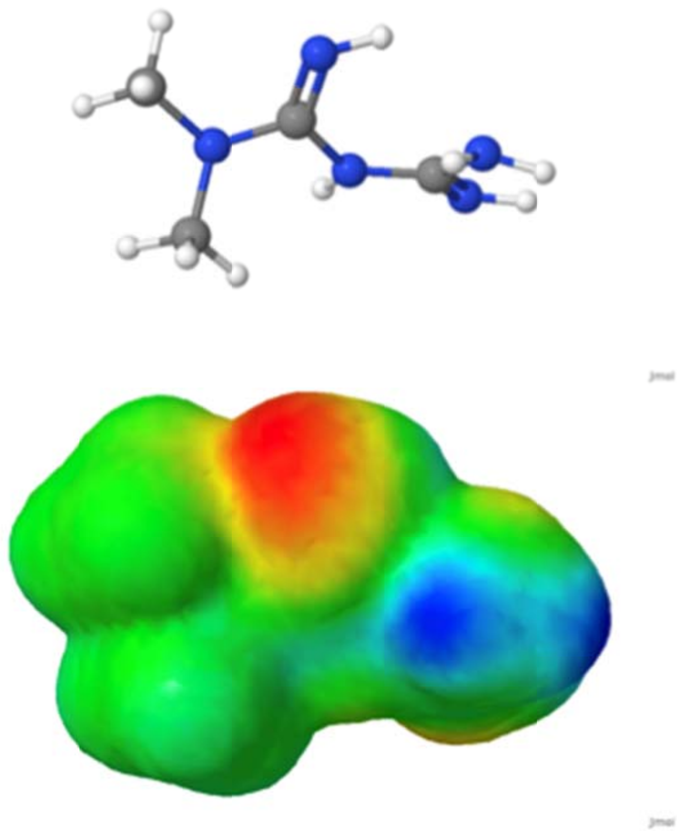

Figure 1: Top, shows the RHF 6-31G(d) representation of Metformin. Bottom, shows the charge potential energy map of the same structure of Metformin.

Conclusions

Several software packages exist to calculate molecular representations. The WebMO application has proven to be a valuable tool that balances ease of use versus cost to the instructor. While there is a good deal of configuration and maintenance on the part of the instructor, it provides a consistent, user-friendly graphical, web-based interface for students to access research level computational chemistry packages. Using this implementation, organic chemistry students are able to visually interpret fundamental chemical properties such as atomic charges and molecular dipole moments that are commonly used to identify chemical reactions and mechanisms.

Acknowledgements

The author would like to express his gratitude to the WebMO development team, especially to William F. Polik and Jordan R. Schmidt, for their help and assistance to install and configure the WebMO Pro software; as well as the University of Pittsburgh at Titusville for funding and donation of computers to this project.

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Web-Based Case Study Development for Mobile Platforms

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Over the past four years, our University's Center of Excellence for Remote and Medically Under-Served Areas (CERMUSA) has developed a web-based Case Study framework. The purpose of this tool is to simulate patient interactions to students in the healthcare field. Instructors and instructional designers use the framework to create simulated patient records and upload videos of doctor/patient simulation interactions. Using a standard web browser, students view the patient records, ask questions of the patient, examine the patient, and then create an appropriate diagnosis and care plan for the simulated patient (Figure 5).

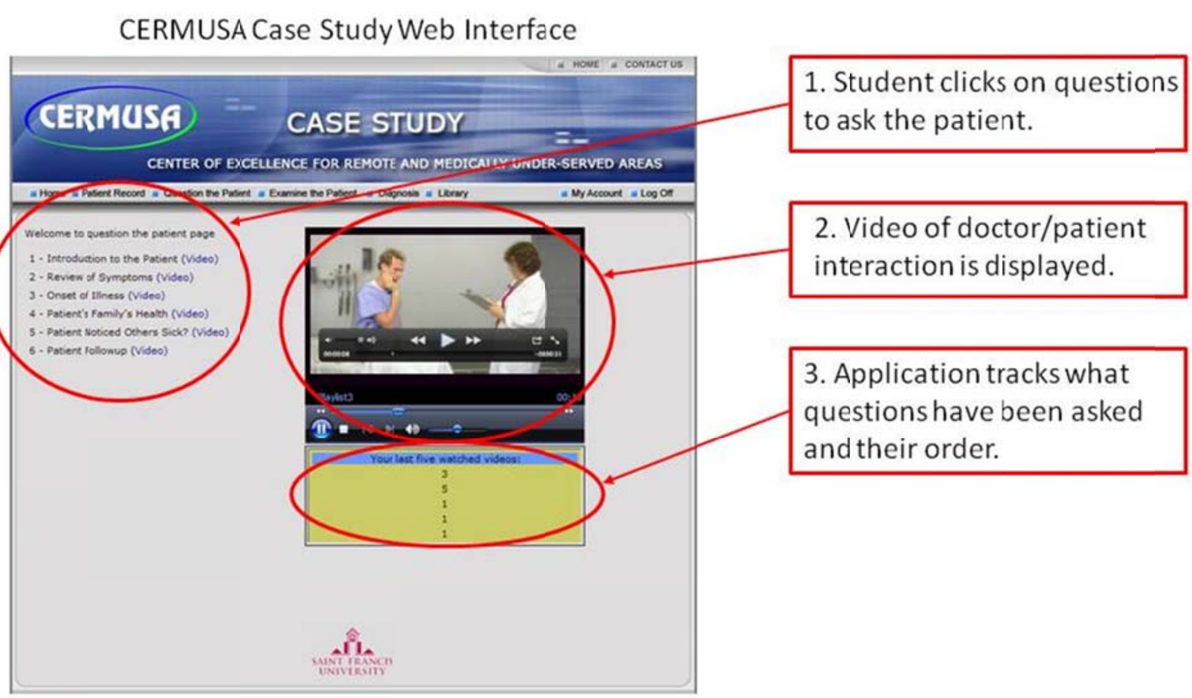

Figure 5 - Case Study Traditional Web Interface

All interactions with the Case Study are carried out using a traditional web browser, typically either Internet Explorer or Mozilla Firefox. As part of CERMUSA's Technology Test Bed protocol, CERMUSA investigated how to replicate the Case Study from a typical desktop experience to a mobile learning experience so that students could access the course content from anywhere. The following constraints were identified as limiting factors for this project (listed in order of importance from top to bottom):

- The Case Study content should be available on standard mobile devices such as the iPhone, the iPod Touch, and any other mobile device that has web-browsing capabilities,
- The underlying functionality of the Case Study should not be modified,
- The underlying database structure for the Case Studies should not be extensively modified,
- Maintaining the mobile version of the Case Study should not add a burden to the Case Study developer. Once a case study has been developed and uploaded, it should be made available on both platforms.

CERMUSA first researched the existing user base and market trends for web-enabled mobile devices. According to Nielson Mobile, the top four web-enabled mobile device manufacturers as of the second quarter of 2008 were RIM, HTC, Palm, and Apple. With nearly 57 million units sold (Meeker, 2009), Apple's iPhone and iPod Touch platform represented the fastest growing segment (Golson, 2009).

The decision was made to focus development on Apple's platform due to the fact that it appeared to be the most capable for video streaming, which is used heavily throughout the Case Studies. Both the iPhone and the iPod Touch can connect to wireless (802.11) networks, which permit the required bandwidth speeds for streaming video. Additionally, the iPhone utilizes AT&T's 3G cellular data network (dependent upon geographic availability) for connectivity which is advertised as fast enough for mobile video.

The final outcome of the project would be a prototype for an iPhone optimized version of the CERMUSA Case Study. While CERMUSA's focus would be on the iPhone, the mobile site (with the exception of the video streaming) should be workable on other mobile devices as well. Video on other mobile devices would be investigated after initial research was completed on the iPhone platform.

CERMUSA purchased the text "iPhone in Action, an Introduction to Web and SDK Development" by Christopher Allen and Shannon Appelcline. This text was one of the first iPhone development texts published after Apple released the iPhone software development kit (SDK). The text identified a third-party library called the iPhone User Interface (iUI), which provides a very powerful framework for developing iPhone optimized web-based graphical user interfaces. Information about iUI and the appropriate downloads can be found at http://code.google.com/p/iui/.

iUI is designed to give developers the ability to create user interfaces that are very similar to the native applications that are intrinsically a part of the iPhone operating system. Figure 6 shows a native iPhone application, the Contacts application, and compares it to a web interface designed with iUI. The two interfaces are very similar; therefore, iPhone users should already be familiar with the ways to interact with an iUI web interface the first time that they see one.

iPhone's Contact Book Application

CERMUSA Case Study Sample Page

Figure 6 - iUI Screen Comparison

iUI uses cascading style sheets (CSS) and various HTML elements to style web pages specifically for the iPhone operating system. iUI includes graphic files used to represent common elements within the display and a common JavaScript library to handle the animations between pages. CERMUSA found that building pages using iUI was straightforward for individuals familiar with HTML.

The largest paradigm shift in the website design between the traditional browser-based Case Study and the iPhone version was that multiple pages within the traditional Case Study had to be combined into one page on the iUI version of the application. For instance, the traditional Case Study uses separate web pages to handle navigation from the main menu to a submenu; conversely, the equivalent design using iUI requires that all of the menus are present in a single HTML page and navigation between the menus is performed through the use of hidden list elements and same-page anchors.

Using iUI and the Active Server Pages (ASP) programming language, CERMUSA developers created new web pages designed for mobile devices. The new pages populate their dynamic data fields from the existing Case Study database; therefore, no new content is created.

Figure 7 shows the menu system for the iPhone Case Study website. As with the traditional browser-based version of the Case Study, users first are presented with a list of available case studies. After choosing one, they can view the case study patient record, ask the patient questions, or perform examinations on the patient. The latter two options require the student to choose from a list of populated options.

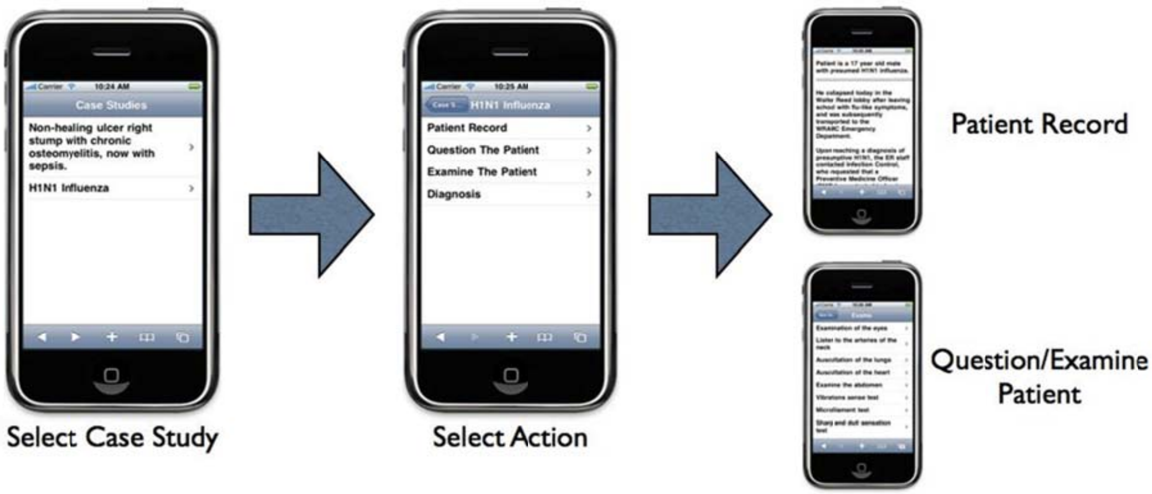

Figure 7 - Case Study Menu System

Videos for the Case Study had been rendered in Window's Media Video (WMV) format and thus would not display properly on an iPhone, which requires Apple's Quicktime video format. Therefore, the Case Study videos had to be converted from WMV to Quicktime format. Fortunately, Red Kawa Inc. (http://www.redkawa.com/) had developed an application called "Videora iPod Converter" and makes it freely available to perform such conversions. This program was used to convert approximately 20 WMV Case Study videos to the Quicktime format. The videos were placed on a Macintosh computer running the Snow Leopard operating system which acted as the media server in this prototype. Figure 8 shows an example of how a doctor/patient simulation appears on the iPhone platform.

Figure 8 - Case Study Video

The final aspect that needed to be added to the mobile version of the Case Study was the assessment measurement tool. Assessment within this product is performed through a series of diagnostic questions that are presented to the student. Each series of questions is unique to a particular case study and is entered into the system during the Case Study creation process. The same techniques were used in the creation of the mobile assessment page that were used in the creation of the menu system. Figure 9 shows an example of an assessment screen.

Figure 9 - Assessment Screen

Students utilize the mobile device's on-screen keyboard to complete the series of questions and then submit the answers to the database, where they are stored for grading and comments in the same manner as the original Case Study application. The only display difference between the original Case Study and the mobile version is that the mobile version displays the questions one at a time, while the original Case Study showed all of the questions on the same page.

In total, two new iPhone-friendly web pages were created. The main page handles all of the application's menus, questions, and examinations. The second page handles assessment through the use of diagnostic text boxes.

Validation Strategy

As current use of the Case Study application is for demonstration purposes only, the validation of the mobile version was purely technical.

In addition to verifying that the content was identical to the traditional Case Study, developers tested load time for the videos. The iPhone can connect to the network hosting the Case Study in one of three different manners:

- Wireless Networking (802.11g)
- AT&T Edge Network
- AT&T 3G Network

Each network connectivity type was tested by measuring the amount of time it took for three separate videos to load on each network. Figure 10 summarizes these results and Appendix A shows the data used to create the summary.

Average Video Load Times		
Network	Load time in seconds	Range in seconds
Wireless LAN	6	6-7
AT&T 3G	13	12-13
AT&T EDGE	64	44-91

Figure 10 - Average Video Load Times

The data show that the video load times for both the wireless LAN and AT&T's 3G network were acceptable (under 30 seconds). However, the slower AT&T's EDGE network leads to a significantly longer load time of over 60 seconds. Unfortunately, as of 2009, this is the AT&T network that serves the Saint Francis University geographic area which would mean that the Saint Francis students would not receive the video files in a timely manner.

Successes to date

- The Case Study has been formatted in a manner suitable to mobile devices running the iPhone operating system.
- The mobile Case Study website has been tested on a Motorola Droid phone and the result has been identical to the iPhone display in all regards except for the video playback.
- Videos have been converted to a format usable by Apple mobile devices (the iPhone and iPod Touch).

Challenges to date:

- Displaying this version of the Case Study does not format well on some mobile platforms, including the RIM Blackberry.
- While the HTML pages display correctly on the Motorola Droid, video playback has proven difficult due to the Droid's lack of an integrated video player plugin within its web browser application.

- The AT&T EDGE network services Saint Francis University and proved to be slow enough that users may experience frustration with video load time. Fortunately, the University maintains a campus-wide wireless network so that students would not have to utilize the EDGE network while on campus.

Conclusion

This project shows that database driven web applications can be moved to mobile-friendly formats using freely available frameworks, such as iUI. The factors that need to be considered before making an application on a mobile device include:

- Determining a target audience/platform
- Identifying any rich media constraints such as video formats
- Determining any bandwidth constraints and designing the application to scale appropriately

There is a need for a cross-platform framework to aid in building mobile web applications. Such a tool would eliminate the need to create platform-specific versions of an application, as CERMUSA did with the iPhone. Further research is warranted to identify and test such products. One potential solution in the mobile development space is PhoneGap (http://www.phonegap.com), which claims to be a device-agnostic open source tool that can be used to build applications that display consistently across the three major mobile platforms.

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Appendix A – Video Load Times

Video #1 - 14 Seconds	
Network	Load Time
Wireless LAN	0:06
AT&T 3G	0:12
AT&T EDGE	0:44

Video #2 - 33 Seconds	
Network	Load Time
Wireless LAN	0:06
AT&T 3G	0:12
AT&T EDGE	0:57

Video #3 - 58 Seconds	
Network	Load Time
Wireless LAN	0:07
AT&T 3G	0:14
AT&T EDGE	1:31

Note: Wireless LAN testing was done on the same LAN that hosted Case Study. AT&T testing utilized a Virtual Private Network (VPN).

An introduction to open source and low-cost text-to-speech technologies

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Abstract

Traditionally expensive to acquire and license, increasingly lower cost voices are becoming available and have spawned many open source and low cost technologies for text-to-speech applications. The author/presenter has recently done extensive commercial research and software development work in text-to-speech technologies. This paper/session will cover background, working examples, and applications of text-to-speech technologies that can be used for student projects, classroom teaching, and institutional computing applications.

Introduction

This paper/session will cover background, working examples, and applications of text-to-speech technologies that can be used for student projects, classroom teaching, and institutional computing applications.

Background

Sound is created from vibrations in a medium, usually air, that is transferred from a source creating the sound to a detector that can recognize the sound. A sound recorder will save the sound as an audio signal. A human ear will pass the sound on to the brain for recognition and possible understanding.

We will not be concerned with philosophical discussions of the form, "If a tree falls in a forest, does it make a sound". Nor will we be concerned with defining information as that leads to metaphysical implications that may or may not be of interest to the reader.

The issue here is that of speech to text. Speech to text is the conversion of sound via audio to textual form (i.e., the textual syntax). Speech recognition is the conversion of spoken audio to textual form such that the meaning of the text is clear (i.e., the textual semantics).

Obviously the speech recognition problem is much harder than speech to text problem. Any text to meaning problem suffers from the inherent ambiguities of the language being used. Example: The man saw the woman with a telescope. Who has the telescope? Natural language is inherently ambiguous. As then President Bill Clinton testified, "It depends on what the meaning if is is".

This paper is concerned with the automatic conversion of text to voice using open source and low-cost technologies. Some ending comments will be made on text to singing voice.

The text to voice problem is easy to solve such that people can understand the text to audio. This has been done for years with text readers to greatly benefit deaf or hard-of-hearing people. But it does not help very well with hard-of-listening people - the Dilbert managerial approach recommended as "if they don't understand, repeat yourself slower and louder". My mother often said about her children that "You all can hear well, you just don't listen.".

However, the text to voice problem is far from being solved such that the voices sound very natural. Since the first full length animation movie Toy Story appeared, computer animation has become more and more life-like. EA Sports with their motto of "If it's in the game, it's in the game" has been producing sports games that are more and more realistic.

The movie and game industry would greatly like to not pay Tom Hanks, etc, millions to do the voice tracks for their animations, but, unlike animation, the technology is not ready for totally realistic voice effects.

There are many text-to-voice demos on the Internet. An Internet search of the terms "voice text demo" should suffice to find many of them.

Microsoft TTS

A starting point for text to voice conversion is the Microsoft TTS (Text To Speech) technology since it is freely available with Windows and/or with additional downloads.

The disadvantage is that the voices sound mechanical and robotic.

Here is a simple Visual Basic script program to say "**Hello, World**".

```
Dim voice1
Set voice1 = CreateObject("SAPI.SpVoice")

voice1.Speak "Hello world."
voice1.WaitUntilDone(0)
Set voice1 = Nothing
```

To run the program, save it as a text file called **`hello1.vbs`** and run it. Here are command lines to run it.

```
wscript.exe hello1.vbs
hello1.vbs
```

Here is the same program expanded to save the spoken text to a file.

```
Dim voice1
Set voice1 = CreateObject("SAPI.SpVoice")

Dim stream1
Set stream1 = CreateObject("SAPI.SpFileStream")

Dim fs1
fs1 = "D:\hello1.wav"

stream1.Open fs1,3,false
Set voice1.AudioOutputStream = stream1
voice1.Speak "Hello world.",0
voice1.WaitUntilDone(0)
stream1.Close
Set stream1 = Nothing
Set voice1 = Nothing
```

A similar program can be written in JavaScript and run at the client browser but the user must be running Windows, have enabled or enable the appropriate ActiveX control when requested, etc. Such security restrictions and limited browser support make this an unattractive way to play sound at the browser.

Flash/Flex/ActionScript

A fairly portable way to play the audio at the web browser in a seamless way (i.e., without downloads, plug-ins, etc.) is to use a Flash component that communicates to/from with the web page via JavaScript and user interaction and communicates to/from the web server via XML transfers and other direct transfer techniques (e.g., for direct audio transfer).

Developing Flash components in Flash can be very difficult for programmers. Flash was designed by artists for artists and not by programmers for programmers. Many ways of doing things in Flash apparently make sense to artists but not to programmers. However, Adobe has packaged the ability to create Flash components in what is called Flex. Flex is much more programmer friendly and is based on the web page model with support for CSS. Behind the scenes, both Flash and Flex use ActionScript as a JavaScript-based object-oriented programming system.

What may not be obvious is that one can download the Flex system SDK (Software Development Toolkit) from Adobe for free (unlike Flash) and start programming text-based Flex programs using ActionScript that produce Flash animations and/or graphical user interfaces that can be embedded in web pages.

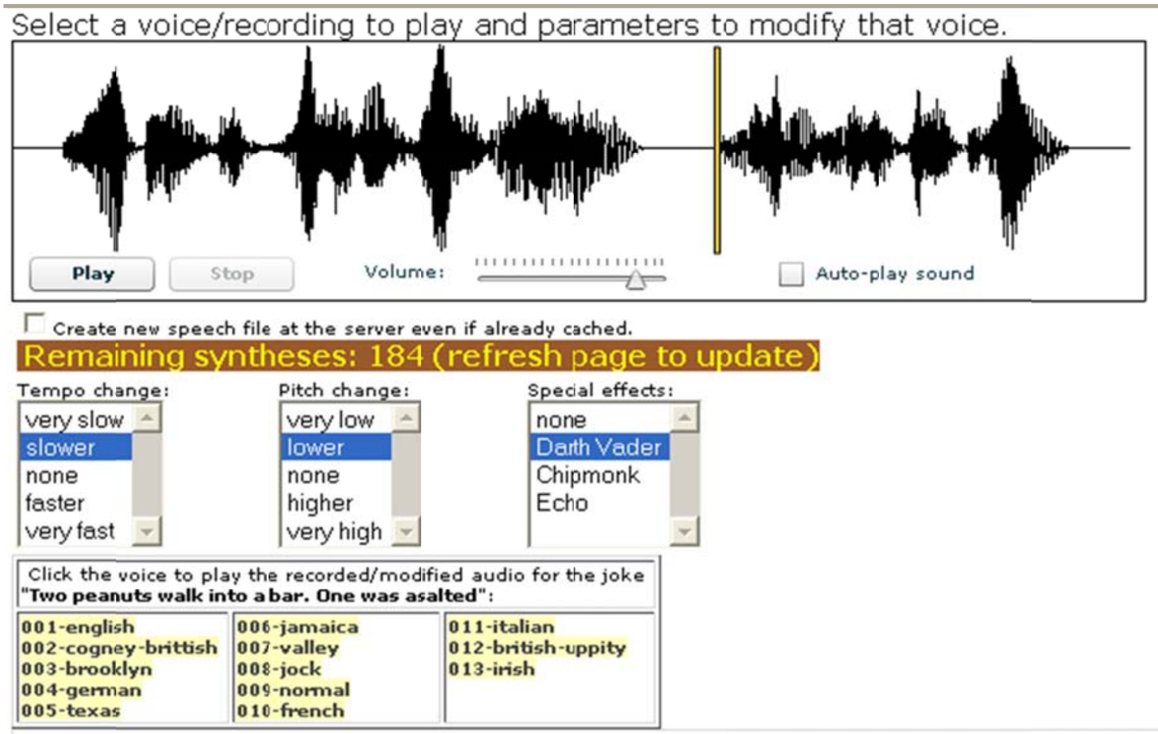
Debugging Flex/ActionScript can be difficult until one installs the debug version of Flash. All debugging text is appended to a text file. The use of an open source program like Tail can be used to reread that text file every time it changes.

Many web sites that use Flash components often leave debugging trace information in their components and it can be interesting to view such debugging information while visiting their web site.

Flash components provide the ability to store cookies without the limitations of standard cookies which may or may not be a security/privacy concern.

Like most programming systems used to develop graphical interfaces, Flex programs are not trivial for even the "**Hello, World**" program.

Here is how a Flash/Flex component, written by the author and outlined by the thin black line, appears.

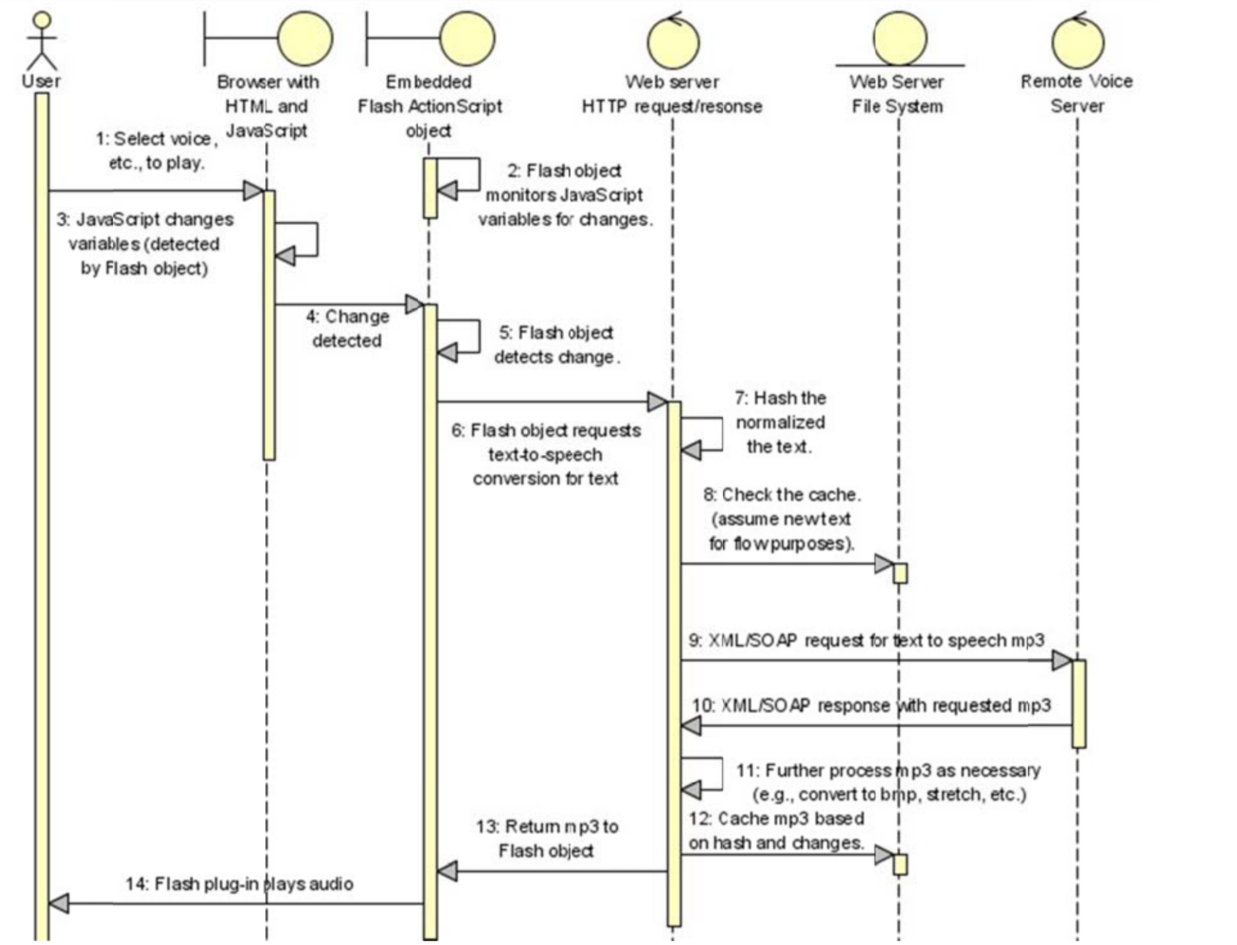


It is part of a larger web page that uses JavaScript to/from Flash/Flex/ActionScript communication as well as Flash/Flex/ActionScript communication to/from the web server.

There are various tempo changes, pitch changes, and special effects that can be done on the sound. Some sounds come from the voice server while some are recorded as spoken by a high school actress with a talent for accents and voice inflections.

Web model

The web model used is that the user will hear text converted to voice using a web browser. The web server may need to access other resources to do the conversion and may then do local conversions on the sound. Here as a UML sequence diagram for one way to do this.



Once the infrastructure is in place, the audio acquisition can be done from the voice server while additional audio processing and transformation can be done at the web server.

To do such processing and transformations a large number of open source audio processing systems can be used.

Note that, in general, open source programs can be used at the web server with significant restrictions as long as the user at the browser is not directly using the system but, instead, going through the web server as a go-between.

Audacity and Nyquist

The open source audio processing program Audacity has macro support in the form of the Nyquist programming language - which can be used without Audacity. Here is a Nyquist program to load and play a sound file.

```
(display "File: play1.lsp")
(display "Purpose: Load and play a sound file")
(setq fs1 "D:\\W\\BT.WAV\\mary0.wav")
(play-file fs1)
(exit)
```

Here is the output of the above program.

```
File: play1.lsp :
Purpose: Load and play a sound file :
 44880  88740  132600
total samples: 173056
```

Nyquist does not appear to support MP3 files. Since the patent expiration of the mp3 file format, Audacity now supports mp3 file format conversion directly using the open source lame encoder/decoder.

Programming systems

Here are some programming systems for audio processing.

- 1. LilyPond Scheme (audio processing)
- 2. Nyquist LISP (audio processing)
- 3. Snack Sound Toolkit (audio processing)
- 4. Praat (phonetics)

Language/notation standards

Here are some languages and standards that are useful for audio processing.

- 1. WSDL - Web Services Description Language
- 2. SSML - Speech Synthesis Markup Language
- 3. Music markup notations (XML)
- 4. Microsoft SAPI
- 5. VoiceXML
- 6. IPA phonemes
- 7. Prosody (SSML support)

Command line tools

Here are some open source command line tools that are useful for processing audio at the web server.

- 1. SoundStretch (change WAV tempo/pitch)
- 2. LAME Encoder (convert WAV to MP3)
- 3. Mp3splt (split MP3)
- 4. SoX: Sound eXchange (convert formats, pitch/tempo)
- 5. Div's MIDI utilities (MIDI)
- 6. C# wave editor (WAV properties to XML)
- 7. LilyPond command line tools (open source)
- 8. eSpeak (open source text-to-speech)
- 9. Madplay.exe (convert MP3 to WAV)

GUI tools

Here are some GUI tools for audio processing.

- 1. Audacity (free audio acquisition and processing)
- 2. MDVP - Multi-Dimensional Voice Program (commercial voice analysis)
- 3. Syng2 plugin for SynthEdit
- 4. Nuance Cafe (telephone-based speech applications)
- 5. Yamaha Vocaloid2 (commercial singing synthesizer application)
- 6. NaturalSoft NaturalReader (commercial Windows desktop)
- 7. Microsoft TTSApp demo for SAPI
- 8. Microsoft Narrator (Windows screen reader)
- 9. Audio Level Meter (sound levels)
- 10. Sound recorder

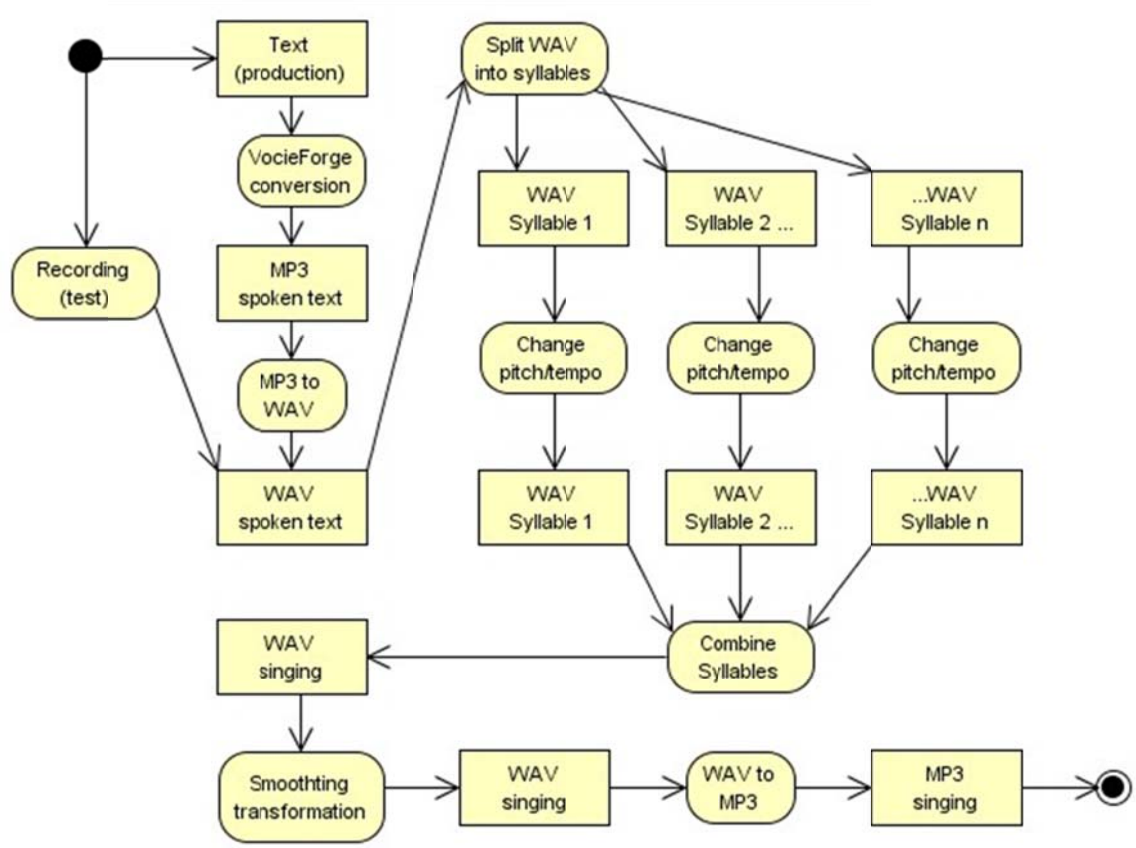
Converting text to a singing voice

Part of the research involved converting text to a singing voice. Not a great singing voice, but a singing voice. A problem statement is the following: Given the melody and words of a song, convert the words to audio text and then to what sounds like the voice singing the song.

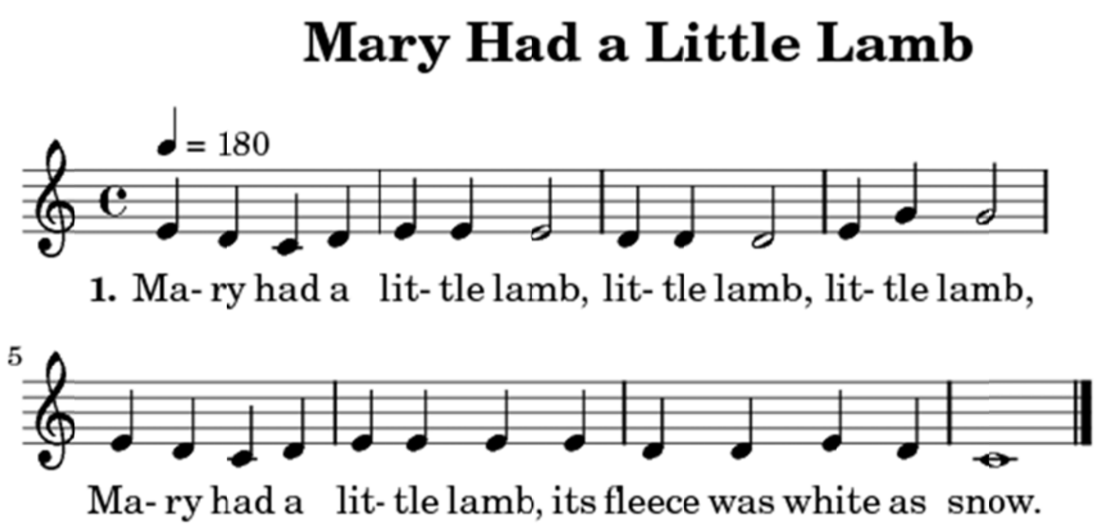
The approach was the following.

- Use system like LilyPond to specify the melody and word synchronization. A MIDI note sequence in generated.
- Convert text to MP3 word by word.
- Stretch words to the proper time
- Change the pitch of the combined words to the proper pitch.
- Merge and smooth the resulting audio.

The UML for this approach is as follows.



LilyPond will take a simple text specification of a song and create an image using music notation. Here is an example.



The main obstacle in the above approach was in that the voice server did not support certain breaks in VoiceXML that would have allowed the splitting of the generated voices. The company providing the voice conversions stated that it was not possible even though I presented them with a simple XML mode (and way to implement it) that would have made it possible.

The approach was implemented using the Microsoft voices (not the best voice quality) and with manually-split voices recorded with Audacity (not amenable to automation).

Summary

This paper/session has covered background, working examples, and applications of text-to-speech technologies that can be used for student projects, classroom teaching, and institutional computing applications.

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An introduction to information security using DNS vulnerabilities

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Abstract

Networking is for sharing resources. Security is for insuring that resources are not shared too much. The DNS, Domain Name System, converts names into IP addresses and, without it, the Internet would not work the way it does. Recent DNS security vulnerabilities have caused concern in the Internet community. This paper/session will introduce some fundamental principles of security, ways to keep up-to-date on security, and some current and common security issues and solutions, all done in terms of how DNS works, sometimes does not work, and DNS security vulnerabilities and how they impact the end user.

Introduction

This paper/session introduces some fundamental principles of security, ways to keep up-to-date on security, and some current and common security issues and solutions, all done in terms of how DNS works, sometimes does not work, and DNS security vulnerabilities and how they impact the end user.

Background

The Internet works on IP (Internet Protocol) addresses but people work better with domain names such as **`amazon.com`**, **`audible.com`**, etc. A DNS (Domain Name System) server provides a way to convert domain names into the associated IP (Internet Protocol) address. The DNS is a distributed hierarchical (tree-like) naming system database that removes the requirement to create and maintain a centralized database of names and IP addresses. The following are some top-level domain extensions.

- .com
- .edu
- .gov
- .mil

A reverse lookup can also be done. That is, find one or more domain names associated with an IP address.

In Windows, the **`nslookup.exe`** command provides a simple and quick command-line approach to doing DNS and reverse-DNS queries.

Command:

```
nslookup robinsnyder.com
```

Output:

```
Server:  google-public-dns-a.google.com
Address:  8.8.8.8

Non-authoritative answer:
Name:    robinsnyder.com
Address:  69.51.22.77
```

A domain name may have more than one associated IP address. Large domains such as **`microsoft.com`** need more than one IP address for a domain name to avoid bandwidth congestion through a single IP and to redirect traffic when subject to DOS (Denial of Service) attacks.

Here is a command for a reverse-DNS lookup

```
nslookup 69.51.22.77
```

Output:

```
Server:  google-public-dns-a.google.com
Address:  8.8.8.8

Name:    bellsdriving.com
Address:  69.51.22.77
```

There may me more than one domain name assigned to an IP address. An ISP (Internet Service Provider) may use one IP address to handle many domains. The domain requested is part of any request to that IP address so that the server at that address can route the request to the appropriate server. Note that a server can be a piece of hardware running server software or one of many processes running server software on the same piece of hardware.

In Windows, each computer connected to the Internet has two DNS servers specified by IP. Question: Why will a domain name not work? Answer: One should not assume a solution to the problem being solved. A domain name would need to be looked up, but that is what the DNS server is for, so an IP is needed.

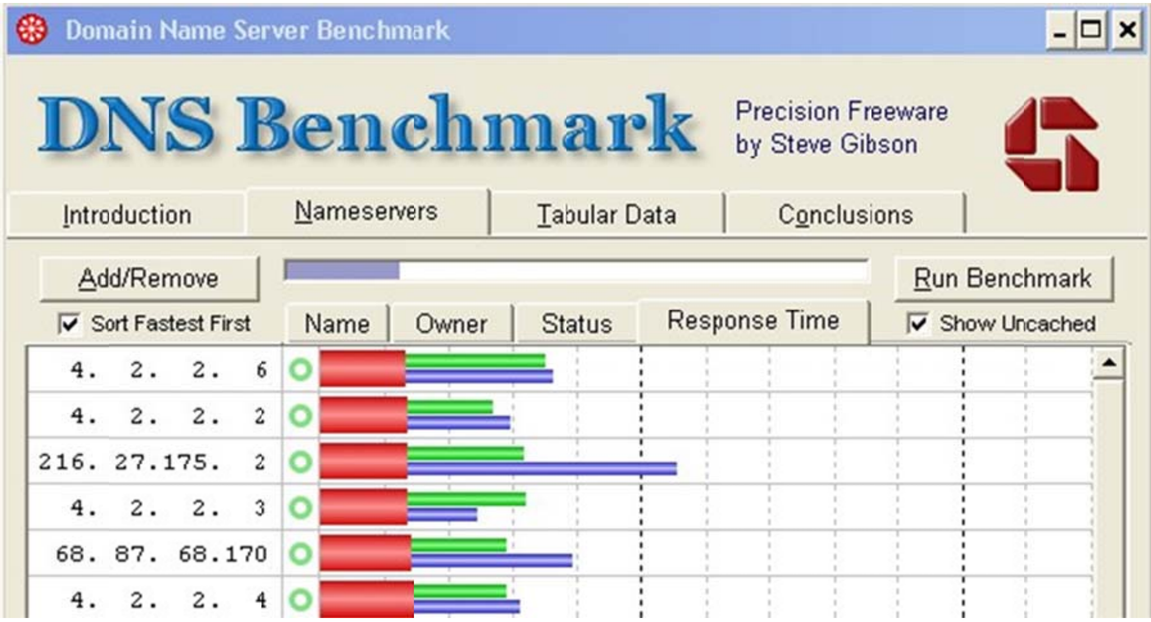
In Windows, DNS servers for a resource can be automatically obtained from a local resource using, for example, DHCP (Domain Host Configuration Protocol) or the DNS servers can be explicitly specified by the administrator of the resource.

Some popular DNS servers are the following.

- Google at **`8.8.8.8`** and **`8.8.8.4`**
- OpenDNS at **`208.67.222.222`** and **`208.67.220.220`**

An internet search for "**public DNS servers**" will return a list of many public DNS servers.

An ISP (Internet Service Provider) will often run their own DNS server. This may or may not be the best solution for a given user. A good well-known and free benchmark program is the "**DNSBench**" program from Gibson Research Corporation. Written by security expert Steve Gibson, author of the disk recovery tool Spin-Rite, DNSBench can be downloaded from http://www.grc.com/dns/benchmark.htm. Here is how a typical result might appear.

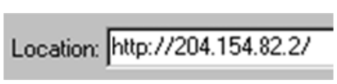


Some DNS servers will display advertising when a domain name cannot be located. Some DNS servers, such as OpenDNS, may convert simple misspellings into the possible intended domain name, such as converting **`amazo.com`** to **`amazon.com`**. Some offer choices when a domain name is not found.

The more popular and used a DNS server is, the more likely it is to be both fast (from caching, etc.) and secure (from having the latest patches).

OpenDNS provides accounts whereby one can restrict and control access to domains. This can be useful for, say, parent administrators who wish to restrict Internet access of their children on family computers.

If the DNS server is not working, the user can always use the IP address directly instead of the name. To do this, type the IP address instead of the domain name.



Knowing the IP of a domain name and entering it into a web browser may be of limited use in circumventing such domain name blocking unless the entire web site uses relative references and works as desired with just an IP address.

Another way to control access of domain-to-IP lookup on a Windows computer is to use the **`hosts`** file.

Hosts file

In Windows, the hosts file is used to map host names to IP (Internet Protocol) addresses at the local machine level. It is a text file that provides a way convert domain names to IP addresses for the machine on which the hosts file is located. The **`hosts`** file in Windows provides some flexibility and some security problems. The **`hosts`** file location varies by Windows operating system, such as the following Windows XP default location.

```
C:\WINDOWS\SYSTEM32\DRIVERS\ETC\
```

A sample **`hosts`** file is called **`hosts.sam`** (for sample) and is located in the same directory as the **`hosts`** file.

Here is an example hosts file.

```
# my hosts file
127.0.0.1 localhost
168.20.203.67 www.mybank.com
127.0.0.1 ad.doubleclick.net
# ... all other mapped domain names ...
```

Note that the character "#" at the start of a line causes that line to be ignored. For example, the domain name **`ad.doubleclick.net`** has been mapped to the **`localhost`** IP address of **`127.0.0.1`**.

There are Internet sites that will provide lists of thousands of web sites that you probably do not want to visit nor do you want such hacking or marketing sites collecting personal information about you or your computer. You can download and install a text file from one of those sites to restrict access of your computer to marketing sites, etc.

The hosts file can be a major security problem as any program that can change the hosts file can redirect you to their site. For example, the above host file causes any request for **`www.mybank.com`** to go to my web site.

Security

How does the user know that the server is who the server claims to be? For example, when the URL **`http://www.company.com`** is typed and **`Enter`** is pressed, how do you know that you have reached the company who owns that URL. The DNS (Domain Name System) is a distributed database system that is responsible for converting domain names, as used in web URL's, into IP addresses. It is possible, and it has happened, that a hacker could do the following.

- Copy a companies web site from the Internet and modify it on their own site as a Trojan horse web site.
- Break into one of the primary DNS computers and have the domain name point to their Trojan horse web site. Another, perhaps easier, way is to call the right office and use what is called social engineering to talk someone into making the switch.
- Now, the Trojan horse web site can pose as the real web site, at least until the company whose web site has been hijacked finds out and takes some form of effective action.

DNS interrogation

DNS interrogation can be used

- to determine the IP address for a given domain name, or
- to determine one or more domain names for a given IP address.

Linux/Unix systems:

```
host 2.0.0.127.b.barracudacentral.org

2.0.0.127.b.barracudacentral.org has address 127.0.0.2
```

Windows systems:

```
nslookup 2.0.0.127.b.barracudacentral.org
Server: {Your DNS server hostname}
Address: {Your DNS server IP addresses}

Non-authoritative answer:
Name: 2.0.0.127.b.barracudacentral.org
Address: 127.0.0.2
```

Blacklisting

About 90% of Internet email traffic is SPAM. A white-list is a sender IP address that is considered not to be SPAM. A black-list is a sender address that is considered to be SPAM. A quick blacklist test can be obtained from sites such as Spamhaus.

Sites such as Spamhaus collect anti-spam complaints and/or then make spammer IP addresses or domain names available. Email servers and/or clients that use these sites may then block email from those sites. Two common identifying attributes provided by anti-spam sites are domain names and IP (Internet Protocol) addresses.

A DNSBL (DNS-based Blackhole List), or block list, or blacklist, is a list of IP addresses published via the Internet DNS. A black list is a list of email domains or addresses that are to be considered spam. Many black lists available on the Internet are called RBL (Realtime Black List) which allows the list to be dynamically modified. Clients using the service will contact the service periodically to update their black lists - much in the same way as anti-virus software is updated periodically for new virus definitions.

These sites do not block email directly. Rather, email servers that use these services may decide to block email because of the presence of a domain or IP address on a list.

There are sites that will check many different RPL services and provide information as to which services have a IP address black-listed.

Here is an example of a link in an email message purporting to be "**Amazon.com Deal of the Day**".

```
http://84489.standbegan.ru/?47846
```

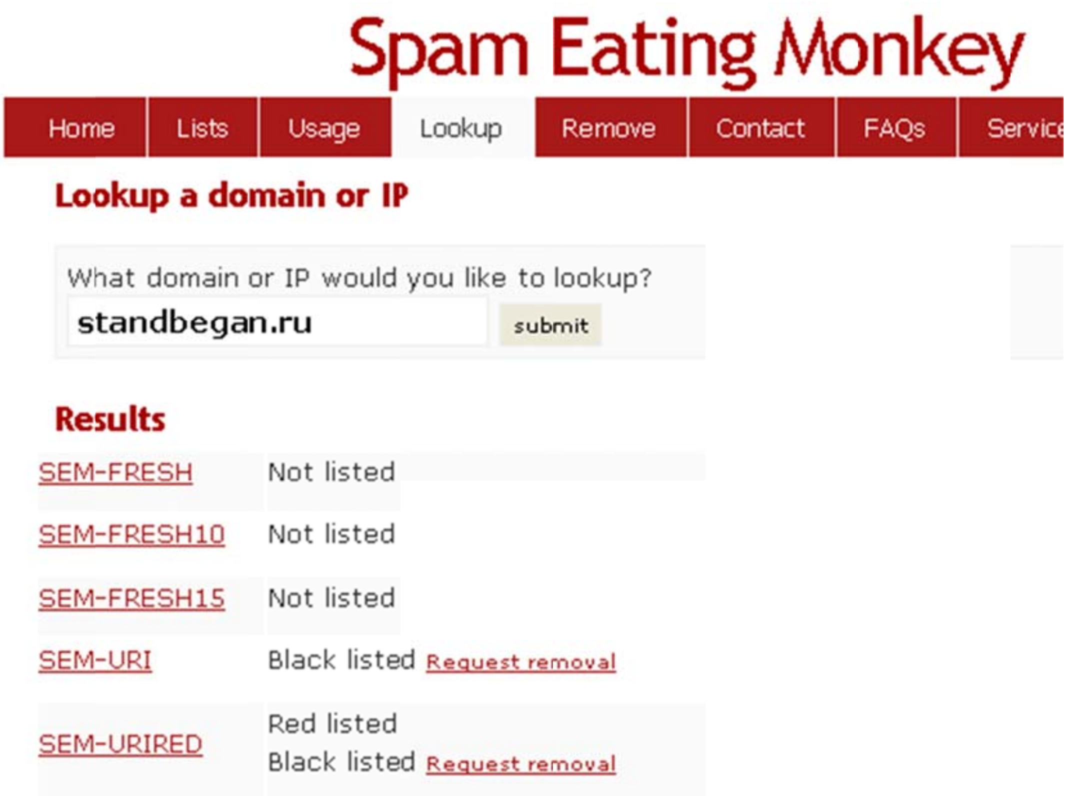
The first step is to find the IP for the domain name of **`standbegan.ru`**.

```
nslookup standbegan.ru
Server:  google-public-dns-a.google.com
Address:  8.8.8.8

Non-authoritative answer:
Name:    standbegan.ru
Address:  61.136.59.69
```

The next step is to query a RBL using DNS and interpret the results.

There are many web sites that allow such checking, such as the one at http://www.spameatingmonkey.com.



In this case, the IP was not blacklisted but the domain name was blacklisted. This might mean that the same domain name is being used but moved from IP to IP.

The web site text for SEM-URI is "# URIs found a requisite number of times in unwanted messages. Domains automatically expire after 15 days of inactivity.".

The web site text for SEM_URIRED is "URI early and preemptive detection list that lists URIs before they appear in the flow of unwanted mail. Domains automatically expire after 30 days of inactivity. This zone also includes all of SEM-URI.".

Sites such as **`spameatingmonkey.com`** provide documentation on how to incorporate their site into SPAM tagging systems such as SpamAssassin.

The following is how to obtain the above results using **nslookup.exe**.

```
nslookup standbegan.ru.uribl.spameatingmonkey.net
Server:  google-public-dns-a.google.com
Address:  8.8.8.8

Non-authoritative answer:
Name:    standbegan.ru.uribl.spameatingmonkey.net
Address:  127.0.0.2
```

Note how the IP or domain name is prefixed to the DNS server doing the lookups. In this case, the DNS server to be queried (though the regular DNS server) is **uribl.spameatingmonkey.net** while the domain name to be checked is **standbegan.ru**.

There is no standard for how to return the results so the documentation for each web site returning blacklisting information must be checked. Many such sites return the local host address **127.0.0.1** where the last number is modified to be the result code. So, for the above results, **127.0.0.2**, the returned result is **2** which means that that domain or IP is blacklisted.

DNS lookup

Obviously these methods become much more useful when the process is automated. If a large number of queries are to be done, thread programming becomes more and more important in obtaining faster overall results. See, for example, (snyder, 19154).

One way to do a DNS lookup and a reverse DNS lookup is demonstrated by the following Python program.

```
# Purpose: Demonstrate DNS lookup

import socket

print "Host to IP to IP to host:"
for host1 in ["www.amazon.com", "www.acm.org"]:
 ip1 = socket.gethostbyname(host1)
 try:
  host2 , alias2 , ip2 = socket.gethostbyaddr(ip1)
 except:
  host2 = "not found"
  ip2 = [ip1]
 print "host=" + host1
 print " -> ip=" + ip1
 print " -> ip=" + str(ip2)
 print " -> host=" + host2
```

Here is the output.

```
Host to IP to IP to host:
host=www.amazon.com
 -> ip=72.21.206.5
 -> ip=['72.21.206.5']
 -> host=206-5.amazon.com
host=www.acm.org
 -> ip=63.118.7.16
 -> ip=['63.118.7.16']
 -> host=acm25-7.acm.org
```

Note how the assignment statement supports extracting the results of a function that can return more than one result (e.g., as a list). Note that there may be more than one host name that maps to the same IP address. In some cases, a reverse lookup of IP to host may not work. The **try**/**except** construct can be used to handle such exceptions.

IP to country

An interesting use of DNS is to access a DNS server that provides an IP to country lookup. Such a DNS server works an a manner similarly to the DNS servers providing services for blacklist, whitelist, etc. Here is how **`spameatingmonkey.net`** does it to determine if an IP is outside the country.

```
nslookup 61.136.59.69.us.country.spameatingmonkey.net
Server:  google-public-dns-a.google.com
Address:  8.8.8.8

Non-authoritative answer:
Name:    61.136.59.69.us.country.spameatingmonkey.net
Address:  127.0.0.2
```

Keep in mind that anyone can use an anonomizing service such as Tor (or other proxy server) so that the IP one sees may or may not be where the originating IP is located.

Security issues

Technically, the DNS protocol uses UDP (User Datagram Protocol) rather than TCP (Transmission Control Protocol). TCP is reliable, cannot be spoofed, insures delivery, but has move overhead - and not used for that reason. UDP has less overhead and is a try and see approach to data communication. The basic issue arises in that UDP can be spoofed. That is, a DNS server has no way of knowing, for sure, from where the packet originated.

BIND

DNS security is related to the DNS server software being used. BIND is a popular open source DNS protocol system maintained by the ISC (Internet Systems Consortium).

> *BIND is open-source software that implements the Domain Name System (DNS) protocols for the Internet. It is a reference implementation of those protocols, but it is also production-grade software, suitable for use in high-volume and high-reliability applications.* https://www.isc.org/software/bind [as of Wed, Aug 26, 2009]

Summary

This paper/session has presented some fundamental principles of security, ways to keep up-to-date on security, and some current and common security issues and solutions, all done in terms of how DNS works, sometimes does not work, and DNS security vulnerabilities and how they impact the end user.

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Globalization of the Workforce: Virtual Teams a Must

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Abstract

Purdue University, Computer and Information Technology (CIT) and Organizational Leadership and Supervision (OLS) are proposing to add more innovation into the senior level, capstone Project Management course by adding a virtual component. Currently, this course is team taught with professors from CIT and OLS, and includes students from CIT, OLS, and Indiana University Business students. The students get "real world" experience by working in diverse teams while applying the project management body of knowledge on a project. Working in teams requires the members to meet regularly in order to share information and complete all the components of a project. In the "real world" this face to face meeting is not always feasible, due to the globalization of the workforce. Because of this, we are proposing to add a virtual component to the course. This paper will provide an overview of how we utilized virtual teams in this course.

INTRODUCTION

With the globalization of the economy, employees find that they may be working with team members half way around the world. This presents unique opportunities and challenges for the project team. In this paper we will discuss virtual teams and how we incorporated assignments into our class to simulate virtual teams. We will evaluate the effectiveness of our efforts and what we will do in the future to improve the utilization of virtual teams in our course.

At the Columbus campus of Purdue University, we offer Computer and Information Technology (CIT) and Organizational Leadership and Supervision (OLS) degrees. Both programs offer a Project Management class in their curriculum. Several years ago faculty from CIT and OLS decided to collaborate and team teach a class that is co-listed as OLS 450 and CIT 480. The Business Department from our partner university, Indiana University Purdue University Columbus (IUPUC) was also interested in having their students take the class as part of their curriculum requirements. The class is a senior level class that typically draws a wide variety of students. One of the goals we have for this class is to provide a "real world" experience. With a makeup of students coming from CIT, OLS and Business we are able to get a diverse background that simulates what students will find in industry, working on teams with a variety of skills. Students are assigned to teams at the beginning of the semester, pick their projects at the beginning of each semester, decide who will be the project manager for the project, and apply project management tools and techniques to complete their project. In order to complete all of the phases of their project students have to meet on a regular basis. They typically need to meet during allotted class time and outside of class time to meet the requirements for each phase of their project. These meetings in the past have typically been face to face.

Virtual Teams

Globalization of the workforce is a reality in the 21st century. Companies enjoy the availability of a worldwide market but also face tough competition from competitors spanning the world. Companies face economic pressure to use low cost labor. To stay competitive companies need to use the best resources available wherever they may be located. One of the strategies incorporated is the use of virtual teams.

According to Merriam Webster dictionary a team is defined as: “a number of persons associated together in work or activity”. A variation of team is virtual team. The term virtual team has come in vogue recently with increasing globalization of the economy and outsourcing. According to Information Technology Project Management 6e the term virtual team is defined as “a group of individuals who work across time and space using communication technologies. Team members might all work for the same company in the same country or they might include employees as well as independent consultants, suppliers or even volunteers providing their expertise from around the globe.” According to Ross Phillips, Assistant Chief Engineer, Cummins, Inc., “it is a must in today’s global environment to utilize technology in order to conduct business globally. I have a standing weekly meeting, virtually, with Cummins, Inc. India besides occasional meetings with suppliers in Germany. The system that we use is Cisco WEBEX.”

The advantages of using virtual teams include:

- Expenses can be reduced because of less travel and possibly less office space required
- Teams can recruit members based upon competency instead of location
- Team availability can be increased
- Employees have more flexibility in their schedule

The challenges associated with virtual teams include:

- Increasing dependency upon technology, meaning if the technology fails the team is adversely affected
- Isolation of team members
- More difficult to use typical communication skills that occur in face to face meetings

VIRTUAL TEAMS IN THE CLASSROOM

Why we chose OLS 450/CIT 480

With the globalization of the workforce, it is imperative that universities add to their curricula a virtual component (typically called distance education in the world of academics) in order to prepare the employees of the future as well as stay competitive. So faced with this challenge, it was determined to add the virtual component to a class that was built around a team project that spanned the entire semester; is cross-disciplined (OLS, CIT, Business); already incorporates technology (Blackboard and Microsoft Project); and has relatively mature students (senior-level class). Hence, OLS 450/CIT 480 Project Management was chosen.

Virtual team class activities

The goal for this class was to simulate a global environment, warranting virtual meetings. We required that each project team (five teams total) have one team meeting that was virtual. In addition, each project team's project manager had to meet virtually with the project sponsor (professors). In order to accomplish this goal the students needed to be trained in Adobe Connect (the meeting format that was chosen for this class). During a class session, the local distance education support person trained the class in Adobe Connect. After this, the project manager was responsible for coordinating, scheduling, and running the virtual meetings. We asked that the teams not be present in the same location (campus computer lab) to truly simulate the concept of distance. "To make believe", if you will, that team members are in another building, city, state, and or country. After the team meeting and project manager/sponsor meeting, each student was asked to fill out a survey (see attached appendix) detailing their experience.

Student survey results and comments

There are 23 students in class and 17 responded to the survey. This class is diverse. We have traditional students who are taking a full load of classes and non-traditional who are taking one or two classes in the evening. As mentioned previously in the paper we have students in Business, Organizational Leadership and Supervision, and Computer and Information Technology. Also, as the technical ability varies considerably among students and even among majors, this created some interesting results and comments from the survey.

The equipment used by the students for their meetings is displayed in **Table 1**:

Equipment	Percent Used
High speed internet	82%
Webcam	41%
Microphone	41%
Headphones/speakers	47%

Table 1

From Question 1 we found over 40% of students had experience with virtual teams and all but one respondent said that that occurred at the workplace. Questions 9 and 10 dealt with problems incurred. Almost a quarter of the students had problems connecting to the software and over 40% had issues during the meeting. Most of the problems listed had to deal with sound problems mainly echoing, which the instructors have experienced as well in their use of the software. Other issues mentioned were problems with their microphones, staying connected to the meeting room, webcam problems, inadequate equipment (students had to provide their own equipment), unable to log into the meeting room and slowness of the software. For most of the students this was their first time using the meeting software Adobe Connect. As mentioned students were given a training session on the software, however the students didn't bring webcams, headphones, microphones to that session and that appeared to be the area where students struggled. Question 12 concerned whether students had a fallback plan in the case they had problems. We found 35% of students had no contingency plan in place in case something went wrong before or during the meeting. They were reminded in class a number of times to prepare for technical issues. Questions 14 and 18 dealt with the effectiveness of a virtual team meeting. The teams overwhelming agreed that they could effectively interact in a virtual team and over 70% believed they could accomplish as much using a virtual meeting as in person. In this area some interesting comments included:

- (We) talked one at a time
- It was chaos having 5 people meeting via text
- It (the meeting) took longer than a traditional meeting

Some students felt they couldn't accomplish as much because:

- Too many complications
- Meeting was disorganized
- Meeting took longer
- Students got annoyed with the environment (software/hardware)

Ninety-four percent of the students responding to Question 15 believed there were special challenges in conducting a virtual team meeting. The top challenge listed was equipment issues followed by team availability. **Table 2** lists the details for this section of the survey.

Number	Question	Yes	No
1	Have you participated in virtual teams in the past in another setting (work and/or another class)?	41%	59%
4	Were you able to attend?	88%	12%
6	Did you have someone lead the meeting?	65%	35%
9	Did you have any problems connecting to the meeting?	24%	76%
10	Did you have any technical issues during the meeting?	41%	59%
11	Did you know who to contact if/when you had technical issues?	65%	35%

12	Did you have a contingency plan, if all members were not able to attend the virtual meeting?	65%	35%
14	Was your team able to interact effectively in the virtual meeting?	93%	7%
15	Are there any special challenges in having a virtual meeting?	94%	6%
18	Were you able to accomplish as much using a virtual meeting as in person?	73%	27%

Table 2

Looking at the results from additional questions we found that only 38% of the students found it easier to schedule a virtual team meeting and 31% found it about the same and surprisingly 31% found it harder. This may have been from the fact students generally had normal team meetings either before or after class and we required them to set up something outside the classroom using additional hardware (webcams, microphones, speakers) which may have caused some of the difficulty in scheduling. Most team members met for 30 minutes or longer in their meeting. Students were ask to list the advantages and disadvantages in Questions 16 and 17.

The advantages the students listed were:

- Able to get all at meetings from different locations
- Able to save travel
- Ability to meet from home
- Flexibility

The disadvantages listed were:

- Loss of personal interaction
- If technology fails, meeting fails

Finally, we ask students for their suggestions for using virtual meetings in the class and we received the following comments:

- Use different software such as Skype
- Offer as extra credit
- Meeting is not necessary in this class
- Have additional training
- Have access to microphones and webcams

CONCLUSIONS

What we learned as faculty is that we are proposing to require that all students have headsets/microphones. We feel that more in depth training would be beneficial. The survey emphasized that the process would run more smoothly if students were assigned labs to learn the various features of Adobe Connect. Once the students do the Adobe Connect lab they would be expected to host sponsor and team meetings. The students will participate in a survey to ensure that the class evolves to provide students with the best possible experience.

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APPENDIX

Survey on Virtual Team Meeting
Name ________________________
Team Name _______________________
Points:
20 points total for participating in virtual meeting and filling out this survey
Directions:

- Please fill this out electronically and email via Blackboard to Dewey Swanson by Friday April 8th at 9:00am to receive credit.
- If you are the Project manager and participated in the team meeting and meeting with your sponsors (Julie and Dewey) please answer for both meetings where appropriate.

General Information

1. Have you participated in virtual teams in the past in another setting (work and/or another class)?
   If so please explain (when, where, how often):

Specific questions for YOUR Team Meeting

2. Who setup the virtual team meeting?
3. What was the day and time of the meeting?
4. Were you able to attend (if not, why)?
5. What location did you attend the meeting from?
6. Did you have someone lead the meeting? Who was it?
7. What was the length of the meeting?
8. Check the equipment you had available for the virtual meeting:
   - ☐ High speed internet connection
   - ☐ Webcam
   - ☐ Microphone
   - ☐ Headphones/speaker

9. Did you have any problems connecting to the meeting? Explain
10. Did you have any technical issues during the meeting? Explain
11. Did you know who to contact if/when you had technical issues?
12. Did you have a contingency plan, if all members were not able to attend the virtual meeting? Explain

Reflective questions from your virtual team meeting and your thoughts and feelings

13. Are there any additional skills necessary to facilitate a virtual meeting versus a traditional team meeting? Explain
14. Was your team able to interact effectively in the virtual meeting? Explain
15. Are there any special challenges in having a virtual meeting? Explain
16. What are the disadvantages using a virtual meeting? Explain
17. What are the advantages using a virtual meeting? Explain
18. Were you able to accomplish as much using a virtual meeting as in person? Explain
19. Was it easier, harder or about the same to find a time that all team members could participate in a virtual meeting as opposed to a typical face-to-face meeting? Explain
20. What suggestions would you have for using virtual meetings in the future in this class?

Thank you for answering the questions on this survey!

Screencasting 101: A Hitchhiker's Guide--Brief Edition!

Stephen T. Anderson Sr.
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Abstract:

In this show and tell session, participants will learn how to create their own screencasts using free or inexpensive software. You will learn how to create and produce narrated flash-based multimedia learning modules from “screen capturing” and can also transform PowerPoint slides into a narrated flash video. These can be published to your CMS, a blog, or a site like screencast.com. We will also discuss WHY and HOW to best utilize these tools in varied disciplines. The author has experience utilizing them is Statistics for the Social Sciences, Production/Operations Management, Business Statistics, Algebra, Web Design, Computer Literacy, and even his BOWLING physical education class! He will demonstrate how they can be used in the Social Sciences, Arts & Letters, Science, indeed ANY discipline where on-line or CD-based learning modules can be of service. Presenter Bio: Steve has been presenting numerous papers and workshops in the area of screencasting for over 17 years. He has been attending ASCUE for 17 years as well. He appreciates sessions where the participants walk away with something useful, at a price that does not require an NSF grant. He also makes some mean beef jerky!

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Web 2.0 Tools in the Language Classroom

Jean Bennett
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Tori Waskiewicz
Ursinus College
Collegeville, PA

Abstract:

I started this pilot with a language faculty member at the end of the fall semester and now have several others planning to use these tools during the spring semester. Student and faculty examples will be demoed. Web 2.0 tools are a practical solution to engage students in their language learning. Tori and I will demonstrate several free tools that our faculty are using with their teaching and student learning.

Presenter Bio:

Jean Bennett is a Pennsylvania Certified Instructional Technology Specialist, she brings 18 years of PK-12 experience as a Director of Technology and Technology Integrator into her current 4th year position as a Multimedia Instructional Technologist for Ursinus College. She has presented at several conferences on topics ranging from Digital Natives' Capabilities to Web 2.0 in Teaching and Learning. She was a Semi-finalist in the 2006 Technology & Learning Leader of the Year.

Victoria (Tori) Waskiewicz is a Multimedia Instructional Technologists at Ursinus College in Collegeville, PA. She brings knowledge of the corporate real estate industry through developing synchronous and asynchronous eLearning. She has presented on Web 2.0 Teaching and Learning at her own college as well as other area colleges over the past two years. She is excited about finding new technology and sharing it with the academic community. Jean Bennett is a Pennsylvania Certified Instructional Technology Specialist, she brings 18 years of PK- 12 experience as a Director of Technology and Technology Integrator into her current 4th year position as a Multimedia Instructional Technologist for Ursinus College. She has presented at several conferences on topics ranging from Digital Natives' Capabilities to Web 2.0 in Teaching and Learning. She was a Semi-finalist in the 2006 Technology & Learning Leader of the Year.

Tori and Jean have presented at ASCUE before and enjoy planning for and participating in this conference.

Sharing Student Work Using Google Sites

Judy Brophy
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Abstract:

Student projects are valuable for authentic learning, as assessment tools and as a way to increase student engagement. Sharing these projects is almost as important as creating them. Until recently, sharing projects among students has been difficult. Enter Google Sites, a free, easy to use, web platform on which students can display their work and collect comments from other students. In addition, the site provides an artifact for students to add to their e-portfolios. We will show examples of student projects shared on Google Sites that integrate research data, data analysis and marketing in fair trade companies and sports teams. We will discuss the teaching strategies that worked, the technical problems that were encountered, as well as tactics used to counter initial student resistance to learning a new technology.

Presenter Bio:

Judy Brophy began her position as an Academic Technology Specialist at Keene State College in October 2009. Her knowledge of online learning environments such as Google tools and her experience supporting the use of common applications to transfer abstract ideas into practical solutions are the mainstay of her responsibilities. Previous to her role at KSC, she worked as the Educational Technology Specialist/Instructional Designer for 6 years at Daniel Webster College in Nashua, NH. Judy earned a M.S in Instructional Technology from Rochester Institute of Technology, an M.S. in Library Science from UMASS – Lowell and her B.A. in Philosophy from Miami University.

Web 2.0: Beyond Wikis and Blogs

Andrea Han
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Miami University Middletown Campus
Middletown, OH

Abstract:

In this session we will explore several new and innovative Web 2.0 technologies. We'll look at free online tools that allow users to create non-linear multimedia presentations (Prezi), web-based forms (Google Forms), interactive mind maps (Webspiration), and both web sites and web widgets that support interactivity and multimedia (Wix). We will also discuss how these technologies are being used to support teaching and learning at Miami University.

Presenter Bio:

Andrea Han is the Educational Technology Coordinator at Miami University's Middletown Campus. She also serves on the ASCUE board.

A Blended Faculty Development Course on Designing Quality Blended Courses

Kim Hunter
College of Mt St Joseph
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Abstract:

The College of Mount St Joseph is a small, liberal arts college in Cincinnati, Ohio. Two years ago, an initiative to increase the number of blended learning course offerings was added to the College's strategic plan. A faculty learning community was formed to propose a standard definition of blended learning, a faculty compensation proposal and a faculty development course to assist faculty in developing quality blended courses. In this session, participants will review the Mount's Designing Quality Blended Courses web-based class using the Mount's version of the Quality Matters rubric. Best practices in Blended Course development will be shared.

Presenter Bio:

Kim Hunter is the Director of Instructional Technology and E-Portfolio Coordinator at the College of Mount St. Joseph in Cincinnati, Ohio. Kim earned a BBA and MBA from the University of Toledo. She has 25 years of higher education teaching experience. She has also worked as a computer system developer and analyst.

What's New in Cool Tools?

Janet Hurn
Miami University Middletown Campus
Middletown, OH
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Abstract:

See what I have found in the way of cool tools and applications over the past year. In addition bring your classroom problems that might be solved with the help of appropriately used technology. We will try to find a possible solution. Some tools will be demonstrated.

Presenter Bio:

Janet has been a regular at ASCUE for at least 12 years. She teaches physics and acts as an instructional designer with Miami Regional's E-learning group. She is a geek in the classroom and a geek at home. Her new hobby is geocaching....just ask her....

Kindled your Kampus -- Campus?

Fred Jenny
Grove City College
Grove City, PA
fjenny@gcc.edu

Abstract:

Grove City College is investigating the application the Kindle -- eReaders -- to our teaching and learning environment. This session will describe who, what, when, and why in our small pilot.

Presenter Bio:

Long time ASCUE member, twice program chair, twice president. Professor of CS, Instructional Technologist at Grove City College, Western PA.

Using Google Calendar as a Campus-Wide Calendaring System

Tom Marcais
tmarcais@sbc.edu

M.J. Stinnette
mstinnette@sbc.edu

Sweet Briar College
Sweet Briar, VA

Abstract:

Our campus implemented Google Apps for Education this year. We quickly phased out our previous antiquated and pricey calendar program, and replaced it with the intuitive, flexible, (and free!) Google Calendar system. This session will demonstrate the powerful features of Google Calendar, including: • How to quickly add calendar events just by using plain-English, instead of a complex form • Inviting guests to your events, and keeping track of who's attending • Sharing your calendar with colleagues to help coordinate meeting scheduling • Distributing your calendar via RSS, HTML or iCal feeds and/or embedding it in a website • Utilizing Resource calendars to schedule events and reserve locations and/or equipment • Enabling your Mobile device to communicate with your calendar via text-messaging or the Google SYNC app Plus, we'll cover many additional features and will share some specific examples of how we've taken advantage of this technology on our campus.

Presenter Bio:

Tom Marcais is the Instructional Technologist at Sweet Briar College. He is responsible for developing and delivering classes, presentations, workshops and consulting for students, faculty and staff in computer applications and technology supported at Sweet Briar College.

M.J. Stinnette is the Campus Technology Lab Coordinator at Sweet Briar College. She is responsible for maintaining the hardware and software in all the computer labs on campus.

Explore Web 2.0 Technologies

Vicki Mast
Franklin College
Franklin, IN
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Abstract:

Web 2.0 technologies aren't just for distance learning programs. We'll explore some new and some not so new Web 2.0 technologies that support teaching, learning and student collaboration while increasing course engagement in your face-to-face classroom. I'll also address their possible use as a part of a comprehensive "disaster plan" in case of campus shut-down due to natural disaster or pandemic. Free and low cost offerings will be discussed and evaluated for ease of subscribing, creation of learning materials/posting as well as: user friendly features for you and your students, privacy concerns, file size restrictions/archiving, speed as well as other key feature pros and cons. All workshop materials will be uploaded to ASCUEville.

Presenter Bio:

Vicki Mast, Franklin College Academic Technology Training Coordinator, is responsible for faculty and staff development including workshops, one-to-one and departmental training for most campus software and media equipment as well as the development of training materials; works with faculty to develop instructional media and other educational materials; assists the Education Department in the continuing evaluation and improvement of the educational technology plan for the seven semesters within the major.

Assessing Student Learning in Technology Enhanced Classes-2 Options

Jason Malozzi
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Paul Herman
pherman@lccc.edu

Lehigh Carbon Community College
Schnecksville, PA

Abstract:

This session will be a demonstration of two student assessment tools: Cengage's SAM and Pearson/Prentice Hall's MyMathLab (MML). SAM is used at USC Sumter to teach MS Office 2007 in our CSCE 101, Intro to Computers courses. There are 3 main components, Training, Testing, and Projects. Projects are submitted electronically and machine scored. This obviously is a tremendous time saver for the instructor. The 3 parts will be demonstrated along with the process of joining a section. MML is used by several instructors at Lehigh Carbon Community College mostly in algebra sequence and in statistics. It is an online resource that allows students to submit homework online, take quizzes, and help them focus their studies on the topics they need.

Presenter Bio:

Jason Malozzi is Assistant Professor of Mathematics at Lehigh Carbon Community College. he teachers algebra, precalculus, calculus, statistics, among other courses, and is known as the "technology guru" within his department.

The Roanoke Touch Project: Faculty Gone Wild

Mark Poore
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221 College Lane
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Abstract:

What happens when you give faculty a free iPod Touch? Come to this session and find out! The Roanoke Touch Project consisted of 30 faculty members who were interested in exploring the pedagogical and productivity uses of the iPod Touch during the 2009-2010 academic year. In exchange for an iPod Touch funded by a grant, faculty met on a monthly basis to learn the technology and exchange ideas on how the iPod Touch could be used to augment and enhance instruction in addition to being used as a productivity tool. Participating faculty researched, evaluated, and implemented various iPod Touch applications in their discipline. They shared their findings at monthly meetings and via a wiki to other members of the group. This session will describe the Roanoke Touch Project and highlight many of the useful applications the faculty discovered for the iPod Touch.

Presenter Bio:

Mark Poore is the Director of Instructional Technology at Roanoke College. At Roanoke his major duties are faculty training and Blackboard administration. Before coming to Roanoke College in 1997, he held several IT positions in private industry. He holds a B.A. from Roanoke College and an M.S. from Baylor University. Mark was a Fulbright Scholar to Germany. He likes to camp with his family and play the cello.

TutorTrac – Software to use for your Learning Center on Campus

Jenifer Riddei
Horry-Georgetown Technical College
Conway, SC
jeniferriddei@hgtc.edu

Abstract:

TutorTrac is a Learning Center Management Tracking Software, which is completely web-based; it was developed by Redrock Software Corporation. Horry-Georgetown Technical College purchased TutorTrac in the fall of 2008; began implementation January 2009. TutorTrac has been a vital component in our learning center, the Student Success and Technology Center: it has enhanced our services, helped increase student awareness of and access to our services, and assisted in a complete transition from paper to digital record keeping, saving much personnel time and decreasing costs. TutorTrac allows for simple/fast configuration, creating simple and detailed reports, and monitoring of individual tutors & students. TutorTrac saves you money and time through its useful features and applications. You can also use TutorTrac to record progress reports for particular groups of students who need special attention or those on Academic or Early Alert. In my session, you will learn how HGTC's Student Success and Technology Center uses TutorTrac.

Presenter's Bio:

I graduated from Elon University, NC, with a Bachelor of Arts degree in Human Services, & a minor in Business Administration. I anticipate getting a Masters in Higher Education or Social Work in the near future. I have been the Director of the SSTC since July 2007. I am married to my wonderful husband Steven, and we have a beautiful baby girl Kailyn, born October 22, 2009.

Using Web 2.0 Free Tools to Create a Digital Educational Project

Tori Waskiewicz
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Jean Bennett
jbennett@ursinus.edu

Ursinus College
Collegeville, PA

Abstract:

We will demonstrate from start to output several free web 2.0 tools to create a digital educational project that can be tailored to any curriculum. To create the final output we will combine image manipulation, audio, screen capture, and other tools, that may be viewed online or submitted for grading.

Presenter Bio:

Victoria (Tori) Waskiewicz is a Multimedia Instructional Technologists at Ursinus College in Collegeville, PA. She brings knowledge of the corporate real estate industry through developing synchronous and asynchronous eLearning. She has presented on Web 2.0 Teaching and Learning at her own college as well as other area colleges over the past two years. She is excited about finding new technology and sharing it with the academic community.

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Tori and Jean have presented at ASCUE before and enjoy planning for and participating in this conference.

Drupal - A CMS For Everyone

Steve Weir
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Abstract:

This session was presented last year, but due to the popularity of the session, I thought it might be good to offer it again with a few new items. Drupal is one of the more popular Content Management Systems (CMS) out there. This session will cover a brief overview of what a CMS is, how a simple Drupal website can enhance your web presence, and how it can be used in an educational environment to facilitate discussion and social networking. Themes & modules relating to Drupal will also be discussed. Examples sites will be given (including the ASCUE website and its custom modules) and a list of helpful Drupal resource websites will also be provided.

Presenter Bio:

Steve currently serves as the Web Coordinator for ASCUE and has been working with Drupal since 2007. He holds a Master's degree in Education and has taught as an adjunct professor at Philadelphia Biblical University. Steve also moonlights as a free lance web programmer and designer.

Presenters Index