Association Supporting Computer Users in Education
"Our Third Quarter Century of Resource Sharing"

Proceedings of the 2018 ASCUE Summer Conference
51st Annual Conference
June 10 – 14, 2018
Myrtle Beach, South Carolina
Web: http://www.ascue.org

ABOUT ASCUE

ASCUE, the Association Supporting 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 Third Quarter Century of Resource Sharing"

ASCUE's LISTSERVE

Subscribe by visiting the site http://groups.google.com/a/ascue.org/group/members and follow the directions. To send an e-mail message to the Listserve, contact: members@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 2015 Conference to M.J. Clark, Program Chair, ASCUE 18, Lynchburg College, 1501 Lakeside Drive, Lynchburg, VA 24501, 434-544-8340, clark_mj@lynchburg.edu Web: http://www.ascue.org

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(years remaining in office including current year)

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Keynote Speaker

Barry Moltz is a nationally recognized speaker who has given hundreds of presentations to audiences ranging in size from 20 to 20,000. As a member of the Entrepreneurship Hall of Fame, he has also taught entrepreneurship as an adjunct professor at the Illinois Institute of Technology. He has appeared on many TV and radio programs such as CNBC's The Big Idea with Donny Deutsch, MSNBC's Your Business and NPR's The Tavis Smiley Show. He hosts his own radio show, Business Insanity Talk Radio on AM560, and writes regularly for the American Express Open Forum and other online and offline periodicals.

WHO IS BARRY?

- He worked for one of the largest companies in the world.
- He has been fired more than once.
- He started three businesses.
- He sold his last business, but also went out of business AND was kicked out of his business (luckily, not in that order).
- He has hired hundreds of people and unfortunately, had to fire some of them.

QUOTES HE LIVES BY:

- "Love everyone, trust a few, and paddle your own canoe."
- "Every exit is an entrance somewhere else."
- "Start from where you are."

WHAT HE LEARNED PRACTICALLY:

- It's always about people.
- Success can seem like a near death experience.
- Focus, Focus, Focus.
- Be humble.
- Watch your cash flow.

Conference Workshops

Workshop 1
Using Student Portfolios in Excel
Date: Monday, June 11
Time: 3:30pm - 5:00pm
Karen Harris-Sweetman, Central Carolina Technical College

A quick look at how using a Student Portfolio in CPT 174 Microcomputer Spreadsheets (MS Excel 2016) has helped our students performance. It gives them a way to organize their work, to reinforce the learning objectives, a study aid (you could use them as resources on a test), and leaves them with a take away that they can use in a professional setting or on a job interview. I will share the methodology we use with the notebooks and some examples of student notebooks from previous classes.

About the Presenter

A graduate of the USC and Winthrop, Karen worked in business before becoming a classroom teacher. After 23 years teaching business, information technology, and math in the middle & high schools of SC; she came on full time with CCTC. Teaching Excel led her to develop a notebook approach to class.

Workshop 2
How to Create a Sustainable, Volunteer-Based, Cost-Saving, Educationally-Grounded Computer Recycling Program
Date: Tuesday, June 13
Time: 3:15pm - 4:45pm
Michael Bachman, Towson University

Towson University conceived the EduCycle Program, a 2017 winner of a Campus Technology Impact Award, to address a problem many educational institutions face: What is the environmentally and socially responsible solution to deal with slightly out of date technology that still has remaining useful life? EduCycle, which started in 2013, extends the useful lifespan of technology on campus, and once campus needs are met, redistributes surplus computers that would otherwise be discarded to neighboring public schools. The program has already saved the university over $1.8 million dollars and donated over 1,400 computers, plus audiovisual equipment, to K-12 public schools where it enjoys a second life. We propose a workshop in which participants who want to replicate a program like EduCycle will work with TU facilitators to: 1. Identify potential partnerships in their institution that can result in voluntary contributions of time, space, and resources; 2. Assess and demonstrate return on investment for a new program; 3. Identify relationships between primary, secondary, and higher education; 4. Anticipate and overcome obstacles and critics; and 5. Establish a timeline and action plan.

About the Presenter

Michael Bachman serves as Director of IT Client Services at Towson University and as part-time faculty in the Department of Computer and Information Sciences. He co-chairs CCUMC's professional de-

velopment committee and previously led TU's professional development and continuing education division.

Workshop 3
Internet Safety & Cyber Weapons: Protecting Our Children in the Digital World
Time: 3:15pm – 4:45pm
Chris Lombardozzi, Jacksonville Sheriff's Deparment

 The Internet has drastically changed the way our children interact with the world. It provides them with seemingly infinite opportunities to discover new things, ways to express themselves, the ability to communicate globally and to make new connections with just the click of a button. Yet along with offering rapidly emerging and fascinating ways to connect with the world, technology also brings new risks. This presentation will explore techniques for monitoring child Internet activities as well as the unique threats that exist while using computers, mobile devices and the Internet: popular social media applications; sexual predators and child sexual exploitation; the dangers of public Wi-Fi; cyberbullying; online impersonation; pornography; sexting and other high-risk behaviors.

About the Presenter

Chris Lombardozzi is a certified law enforcement instructor and graduate of the United States Secret Service NCFI and of FLETC's Cyber Division with over 15 years of experience in serving the criminal justice system. He has presented to fortune 500 companies, conferences and adult and child audiences on cyber-crime matters.

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, session with paper where the author submits a paper but it is not reviewed, and session without paper 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 section, up to page 77, will contain the approved refereed papers, the second section, from 78 to 102, will hold the papers from the sessions with paper, and the last section will list the abstracts for the other sessions.

ASCUE BOARD OF DIRECTORS FROM 1967 to 2017

At this conference we celebrate the 51st 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 prede-cessor CUETUG for the last fifty 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
Treasurer	Howard Buer Principia College	Al Malveaux Xavier University	Al Malveaux Xavier University	Al Malveaux Xavier University
Secretary	John Robinson	Dorothy Brown South Carolina State	Dorothy Brown South Carolina State	Dick Wood Gettysburg College
Board Members	James Folt Dennison University	James Folt Dennison University	James Foit Dennison University	John Orahood U. of Arkansas, LR
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				
Sponsor Relations Coordinator				
Location:	Tarkio College	Principia College	Muskingum College	Christian Brothers

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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				
Sponsor Relations 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	Harry Humphries	Fred Wenn	Doug Hughes
	Oklahoma Christian	Albright College	Caspar College	Dennison University
Program Chair				
	Harry Humphries	Fred Wenn	Doug Hughes	J. Westmoreland
	Albright College	Caspar College	Dennison University	U. Tenn Martin
Past President				
	Larry Henson	Jack McElroy	Harry Humphries	Fred Wenn
	Berea College	Oklahoma Christian	Albright College	Caspar College
Treasurer				
	William Roeske	William Roeske	James Foit	James Foit
	Houghton College	Houghton College	Central Ohio Tech	Central Ohio Tech
Secretary				
	Doug Hughes	Doug Hughes	Dave Dayton	John Jackobs
	Dennison University	Dennison University	Grove City College	Coe College
Board Members				
	Dave Dayton	Dave Dayton	Jan C. King	Wally Roth
	Grove City College	Grove City College	Chatham College	Taylor University
At Large				
	Fred Wenn	John Jackobs	John Jackobs	Jan C. King
	Casper College	Coe College	Coe College	Chatham College
Public Relations				
	Dan Kinnard	Sister Keller	Sister Keller	Sister Keller
	Arizona Western	Clarke College	Clarke College	Clarke College
Librarian				
	Jack Cundiff	Jack Cundiff	Jack Cundiff	Jack Cundiff
	Muskingum College	Muskingum College	Muskingum College	Muskingum College

Equip. Coordinator

Web Coordinator

Sponsor Relations Coordinator

Location: OK Christian   Albright College   Casper College Dennison University

ASCUE BOARD OF DIRCTORS FROM 1980 to 1984

	1980-81	1981-82	1982-83	1983-84
President				
	J. Westmoreland	John Jackobs	Jan Carver	Wally Roth
	U. Tenn Martin	Coe College	Chatham College	Taylor University
Program Chair				
	John Jackobs	Jan Carver	Wally Roth	Dudley Bryant
	Coe College	Chatham College	Taylor University	Western Kentucky
Past President				
	Doug Hughes	J. Westmoreland	John Jackobs	Jan Carver
	Dennison University	U. Tenn Martin	Coe College	Chatham College
Treasurer				
	Ron Klausewitz	Ron Klausewitz	Harry Lykens	Harry Lykens
	W. Virginia Weslyan	W. Virginia Weslyan	Mary Institute, St L.	Mary Institute, St. L.
Secretary				
	Jan Carver	Ken Mendenhall	Ken Mendenhall	John Jackobs
	Chatham College	Hutchinson CC, KS	Hutchinson CC, KS	Coe College
Board Members				
	Dudley Bryant	Dudley Bryant	William Roeske	William Roeske
	Western Kentucky	Western Kentucky	Houghton University	Houghton University
At Large				
	Wally Roth	Chuck Mcintyre	Chuck Mcintyre	Bob Renners
	Taylor University	Berea College	Berea College	Kenyon College
Public Relations				
	Sister Keller	Sister Keller	Sister Keller	Sister Keller
	Clarke College	Clarke College	Clarke College	Clarke College
Librarian				
	Jack Cundiff	Jack Cundiff	Jack Cundiff	Jack Cundiff
	Muskingum College	Muskingum College	Muskingum College	Muskingum College

Equip. Coordinator

Web Coordinator

Sponsor Relations 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
	Western Kentucky	Vincennes University	Horry-Georgetown	Central College
Program Chair				
	Paul Pascoe	Jack Cundiff	Keith Pothoven	David Cossey
	Vincennes University	Horry-Georgetown	Central College	Union College
Past President				
	Wally Roth	Dudley Bryant	Paul Pascoe	Jack Cundiff
	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

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ASCUE BOARD OF DIRCTORS FROM 1988 to 1992

	1988-89	1989-90	1990-91	1991-92
President	David Cossey Union College	Tom Warger Bryn Mawr College	David Redlawsk Rudgers University	Bill Wilson Gettysburg College
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				
Sponsor Relations 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	Rick Huston	Mary Connolly	Paul Tabor
	DePauw University	South Carolina/Aiken	Saint Mary's College	Clarke College
Program Chair				
	Rick Huston	Mary Connolly	Paul Tabor	Carl Singer
	South Carolina/Aiken	Saint Mary's College	Clarke College	DePauw University
Past President				
	Bill Wilson	Carl Singer	Rick Huston	Mary Connolly
	Gettysburg College	DePauw University	South Carolina/Aiken	Saint Mary's College
Treasurer				
	Tom Pollack	Tom Pollack	Tom Pollack	Tom Pollack
	Duquesne University	Duquesne University	Duquesne University	Duquesne University
Secretary				
	Dagrun Bennett	Dagrun Bennett	Dagrun Bennett	Dagrun Bennett
	Franklin College	Franklin College	Franklin College	Franklin College
Board Members				
	Mary Connolly	Gerald Ball	Gerald Ball	Rick Huston
	Saint Mary's College	Mars Hill College	Mars Hill College	South Carolina/Aiken
At Large				
	Tom Gusler	Tom Gusler	Tom Gusler	Tom Gusler
	Clarion University	Clarion University	Clarion University	Clarion University
Public Relations				
	Don Armel	Don Armel	Don Armel	Peter Smith
	Eastern Illinois U.	Eastern Illinois U.	Eastern Illinois U.	Saint Mary's College
Librarian				
	Jack Cundiff	Jack Cundiff	Jack Cundiff	Jack Cundiff
	Horry-Georgetown	Horry-Georgetown	Horry-Georgetown	Horry-Georgetown
Equip. Coordinator				
Web Coordinator				
Sponsor Relations Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

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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	Chris Schwartz Ursuline College	Bill Wilson Gettysburg College	Dagrun Bennett Franklin College	Carol Smith DePauw University
Past President	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	Dagrun Bennett Franklin College	Dagrun Bennett Franklin college	Tom Gusler Clarion University	Nancy Thibeault Sinclair CC
Board Members	Richard Stewart Lutheran Theological	Richard Stewart Lutheran Theological	Nancy Thibeault Sinclair CC	Fred Jenny Grove City College
At Large	Rick Huston South Carolina/Aiken	Rick Rodger Horry-Georgetown	Rick Rodger Horry-Georgetown	George Pyo Saint Francis 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				Rick Huston South Carolina/Aiken
Web Coordinator				
Sponsor Relations 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
President				
	Carol Smith	Fred Jenny	Nancy Thibeault	Barry Smith
	DePauw University	Grove City College	Sinclair CC	Baptist Bible College
Program Chair				
	Fred Jenny	Nancy Thibeault	Barry Smith	George Pyo
	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
Secretary				
	Nancy Thibeault	Kim Breighner	Kim Breighner	Kim Breighner
	Sinclair CC	Gettysburg College	Gettysburg College	Gettysburg College
Board Members				
	Barry Smith	Barry Smith	David Frace	David Frace
	Baptist Bible College	Baptist Bible College	CC Baltimore County	CC Baltimore County
At Large				
	George Pyo	George Pyo	George Pyo	Jim Workman
	Saint Francis College	Saint Francis College	Saint Francis College	Pikeville College
Public Relations				
	Peter Smith	Peter Smith	Peter Smith	Peter Smith
	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
Sponsor Relations Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 2004 to 2008

	2004-05	2005-06	2006-07	2007-08
President	George Pyo Saint Francis College	Jim Workman Pikeville College	Lisa Fears Franklin College	George Pyo Saint Francis College
Program Chair	Jim Workman Pikeville College	Lisa Fears Franklin College	George Pyo Saint Francis College	Fred Jenny Grove City College
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
Board Members	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

Sponsor Relations Coordinator

Location: Myrtle Beach   Myrtle Beach   Myrtle Beach   Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 2008 to 2012

	2008-09	2009-10	2010-2011	2011-2012
President	Fred Jenny	Janet Hurn	Janet Hurn	Andrea Han
	Grove City College	Miami U Middleton	Miami U Middleton	U of British Columbia
Program Chair	Janet Hurn	Dave Fusco	Andrea Han	Tom Marcais
	Miami U Middleton	Juniata College	U of British Columbia	Sweet Briar College
Past President	George Pyo	Fred Jenny	Fred Jenny	Janet Hurn
	Saint Francis College	Grove City College	Grove City College	Miami U Middleton
Treasurer	Tom Pollack	Tom Pollack	Dave Fusco	Dave Fusco
	Duquesne University	Duquesne University	Juniata College	Juniata College
Secretary	Kim Breighner	Kim Breighner	Kim Breighner	Kim Breighner
	Gettysburg College	Gettysburg College	Gettysburg College	Gettysburg College
Board Members	Dave Fusco	Thomas Marcais	Thomas Marcais	Jeffery LeBlanc
	Juniata College	Lee University	Lee University	U of NW Ohio
At Large	Andrea Han	Andrea Han	Mark Poore	Mark Poore
	Miami U Middleton	Miami U Middleton	Roanoke College	Roanoke College
Public Relations	Peter Smith	Peter Smith	Peter Smith	Peter Smith
	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	Hollis Townsend	Hollis Townsend	Hollis Townsend	Hollis Townsend
	Young Harris	Young Harris	Young Harris	Young Harris
Web Coordinator	Steve Weir	Steve Weir	Steve Weir	Steve Weir
Sponsor Relations Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 2012 to 2016

	2012-13	2013-14	2014-2015	2015-2016
President	Tom Marcais Sweet Briar College	George Pyo Saint Francis College	Jeffery LeBlanc U of NW Ohio	Jeffery LeBlanc U of NW Ohio
Program Chair	George Pyo Saint Francis College	Jeffrey LeBlanc U of NW Ohio	Terri Austin Roanoke College	Terri Austin Roanoke College
Past President	Andea Han U of British Columbia	Tom Marcais Sweet Briar College	George Pyo Saint Francis College	George Pyo Saint Francis College
Treasurer	Dave Fusco Juniata College	Dave Fusco University of Colorado	Mark Poore Roanoke College	Mark Poore Roanoke College
Secretary	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Jean Bennett Coastal Carolina Univ
Board Members	Jeffery LeBlanc U of NW Ohio	Luke VanWingerden USC Upstate	Bruce White The Apprentice School	Bruce White The Apprentice School
At Large	Mike Lehrfeld E. Tenn. State Univ.	Mike Lehrfeld E. Tenn. State Univ.	Mike Lehrfeld E. Tenn. State Univ.	Anthony Basham Berea College
Public Relations	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Tom Marcais Sweet Briar College	Tom Marcais Sweet Briar 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	Steve Weir	Steve Weir	Steve Weir	Blair Benjamin Cairn University
Sponsor Relations Coordinator	Mark Poore Roanoke College	Mark Poore Roanoke College	Berte Thompson Messiah College	Jeffery LeBlanc U of NW Ohio
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Digital Notebooks and Collaboration

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Introduction

An exploratory project on the use of digital notebooks and collaboration is currently underway in four courses over the span of five semesters at two North Carolina universities. The team currently teaches at two different universities. Professor A is at a private institution and Professor B is instructs at a state university. The team has partnered together to increase collaboration in online and face-to-face classes. The professors instruct teacher candidates enrolled in licensure programs at the elementary and secondary levels. The team focuses on active engagement and collaboration for today's digital learners. A key component of the partnership's instruction is in the *Active Learner approach* practices of researchers Michael, Prince, and Weimer.

In the "Five Key Principles of Active Learning," Michael explains that individuals are likely to learn more when they learn with others than when they learn alone (Michael, 2006). The research supports this model because many faculty members lean towards being independent learners and they struggle to an extent with accepting this principle. These findings are based on "impressive results" in different disciplines "that support the power of getting students to work together to learn" (p. 162). Throughout instruction, the goal of the project is to provide guidance in the creation of digital notebooks and to offer engaging tools that can be implemented with ease to increase collaboration. Students are consistently engaged in assignments, research, and service projects that require active engagement and collaboration (Prince, 2004).

What are Digital Notebooks?

Digital notebooks are interactive notebooks gone digital, which merely means that they are a digital form of paper-pencil notebooks. Digital notebooks can also come in the form of interactive notebooks, e-portfolios, or LiveBinders which all allow students to showcase their work while sharing with teachers, peers, and parents. High school students seeking to go to college can share their work with

potential colleges and universities. One of the significant positives about digital notebooks is that student work is stored online which provides students with unlimited access even after courses are completed. Students can reflect on what they have learned during each school year and how they have grown from year to year ("LiveBinders", 2018).

Reasons to Use Digital Notebooks
- Paperless
- Students work directly in the file
- Preservation of ideas and references
- Improvement in student writing skills
- Allows for creativity
- Infuse technology
- Access anywhere
- Functionality is similar to paper and pencil notebook (Knight, 2015).

Additionally, digital notebooks are used to help students organize and synthesize their thoughts. The notebooks act as an online textbook owned and created by the student that contains notes, practice tasks, journals, resources, and reflections. Students can quickly go back and refer to notes that may assist with future assessments and projects. As students go back and review notes from prior assignments, they are repeatedly exposed to the materials which increase student achievement.

Digital notebooks are not just for students; teachers can integrate a variety of online resources with the content that students need for study guides, assignments, and research projects. Digital notebooks promote differentiation as teachers can accommodate multiple learning styles in (and out of) the classroom and teachers can track a student's growth over time. Teachers can also declutter their desk and classrooms because the process is paperless. Other advantages to using digital notebooks are that the notebooks are interactive. Therefore, teachers can place hyperlinks, videos, graphic organizers, resources, and other materials at student's fingertips for immediate use (Grissom, 2017). School districts create staff handbooks that can be easily kept up-to-date and companies create online employee handbooks. Digital notebooks make it easy for companies, school districts, and employers to present online resources from one location.

The most popular platforms used by educators today to create digital notebooks are Google Slides available through Google Drive and OneNote accessible in Microsoft Office 365 (Robinson, 2018; Miller & Martin, 2016). Each professor will explain the process used to implement digital notebooks in higher education courses through the use of Google Slides in the "Implementation of the Project" section of this paper.

Literature Review

To keep up with today's digital learners, educators must be tech savvy on some level. Research shows that going digital enhances student engagement and performance. Digital resources help students to personalize and individualize learning along with increased collaboration for teachers and peers. Students can become better authentic creative communicators and more appropriately express their thinking through videos, apps, text, voice recordings, and pictures. These flexible digital resources increase collaboration by integrating multimedia literacy technologies (Miller & Martin, 2016). The

incorporation of digital notebooks enables teachers to create learning templates to drive instruction and students can layer information for themselves and for their peers helping them become innovative designers. Also, students can link to third-party applications.

Weimer, an American professor and author of *Learner-Centered Teaching,* developed a list of questions that support the characteristics of learner-centered teaching. Some of the items suggest the importance of collaboration among students which professors Hampton and Holder use to incorporate in the use of digital notebooks in their courses: 1) "Is collaboration emphasized more than the competition in the course? 2) Does the course contain activities that put students in positions to learn from and with each other? 3) Do students talk more than the teacher during class discussions? Do students respond to each other or only to the teacher? 4) Are students voluntarily participating or do they sit silently until called on to answer questions and make comments? 5) Does their nonverbal behavior indicate they would rather not speak? 6) Is the teacher modeling how expert learners handle problems, find answers, deal with failure, and celebrate success?" The team uses the characteristics of these questions to drive the instruction in their online and face-to-face courses. Weimer's research on the question set is a work in process and has not yet been validated systematically; however, updates can be reviewed on the Faculty Focus at (Weimer, 2018).

To engage learners who have mastered the digital world, teaching with relevant and innovative tools is a necessity in education (Sulisworo, Sulistyo, & Akhsan, 2017). Additionally, today's learners are moving beyond the basics and embracing the 4C's - Super Skills for the 21st century which are communication, collaboration, critical thinking, and creativity (Kivunja, (2015). Students become global collaborators through sharing thoughts, ideas, questions, and solutions. They work together to reach a common goal by collectively sharing their skills and talents. Students learn to link learning across curricula and disciplines to solve problems (National Education Association, 2012).

Research reveals that "digitized textbooks" (digitalization of paper bound textbooks) are enriched with animated pictures, videos, and interactive exercises. When students assume an active role in their learning, their motivation and engagement gain a substantial boost. Students ability to move and explore the digital world leads them to the "in charge" position over their learning capacities leading them to become empowered learners. The possibility of changing and acting upon the virtual environment in search of a fit for each individuals need, strengthens one's feeling of "Yes I can." The use of digital notebooks increases collaborative problem-solving, curiosity, and exploration attributes (Groff, 2013).

Advantages of Digital Notebooks in Higher Education

Educators are allowing students to use digital notebooks as a note taking tool, digital locker, and project-based learning platform. Teachers have the option of creating a template for all students to use or they can foster student creativity and personalized learning by allowing students to create their notebooks with their unique themes. While taking notes, students can embed videos, images, and links to help them better understand the class content. Another plus is that students no longer have to carry large binder notebooks or worry about losing their notes since digital notebooks are available on multiple devices including personal computers, iPads, or Smartphones (Robinson, 2018).

Teachers are also able to capture student interaction within their digital notebooks which allows educators to monitor course involvement and engagement in real time. While traditional notebooks may minimize the interactive options for writers, using this technology tool enhances writing skills and prepares students for the 21st-century as they are becoming producers of new information (Miller & Martin, 2016). Lastly, access to digital notebooks is unlimited for future reference. This becomes extremely valuable when students are preparing for future teacher licensure assessments (i.e., CORE, Pearson, Praxis I, Praxis II and edTPA). In Gunuc and Kuzu's (2014) study, the researchers found that using technology in higher education contributes to an increase in student engagement. Digital notebooking is a great technology tool that enables students to record what they are doing and reinforce their learning (Miller & Martin, 2016).

Disadvantages of Digital Notebooks in Higher Education

The disadvantages that are being noted are based on actual experiences of Professor A and Professor B. There are a few disadvantages that may occur while using digital notebooks in higher education courses. From the team's experience, students who attended class without charged devices were not readily prepared to participate in collaborative exercises and activities. To prevent this from recurring, the team set expectations and norms concerning the use of digital devices. Norms included the following: 1) Students should have at least 70% battery life on personal devices, 2) students should be prepared to download applications related to instruction, 3) Students should be prepared to collaborate with one or more class members, 4) Students should turn ringers off during class, and 5) Students should bring devices with them to each class meeting. Even college students forget to remember or save passwords, and this can cause a few hiccups or delays during classroom lectures and collaboration efforts (Robinson, 2018). For students who are working on their personal device, the team urges them to save their passwords on their computer to prevent this distraction. If there are students who do not have their own personal device to work on, it is recommended to use a classroom with computers available or write grants to support your digital notebook project. There are many technology grants that will assist you with purchasing technology for your classroom projects.

Implementation of Project - Professor A

Digital notebooks for this project were created through Google Slides (the presentation editor in Google Drive) and Google Classroom (a free web service that allows the teacher to manage classes, assignments, and grades). Google Slides and Google Classroom work hand-in-hand and will enable the teacher to provide direct, real-time feedback, and grades. To implement the use of digital notebooks through Google Slides the teacher will need to have access to G Suite for Education account or to a personal Gmail account. The G Suite for Education is preferred so that all of the tools Google offers for educators can be accessed. The teacher also will need the Gmail address for each student (personal or school-based). Learning institutions that provide G Suite for Education will give teachers access to a bank of student emails so that the teacher can create separate Google Classrooms for each course or class. It should be noted that teachers can create a Google Classroom without G Suite for Education through their personal Gmail account. To learn more about the many unique tools Google offers for learning institutions go to Google for Education on the web. A step-by-step guide for how to setup Google Classroom can also be accessed (Google for Education, 2018).

Creating the Digital Notebook Template in Google Slides

The types of lessons that work best for implementing digital notebook assignments include journals, how to guides, lecture notes, and projects that require interactive and collaborative discussions. Digital notebooks are also a great resource for housing graphic organizers and daily essential questions. In Professor A's teacher education courses, prospective teacher candidates are required to create a Classroom Management Binder using a digital notebook. The average notebook is approximately seventy-five pages in Google Slides. The length of the notebook will vary depending upon the requirements for the assignment. Once Google Classroom has been set up, a template can be created in Google Slides. The features in Google Classroom allow the teacher to make a copy of the model for each student so that students are not able to edit the teacher's original copy of the template. To access the template students go to Google Classroom at https://classroom.google.com or by using a Google Classroom code unique for the instructor's Google Classroom. A different code is provided for each Google Classroom created.

Professor A created the Classroom Management Binder template and the students completed each assignment in their personal copy of the file. The professor started by accessing Google Slides through Google Classroom (if you do not have Google Classroom go directly to Google Slides to begin this process). The first page of the digital notebook template is the cover page which includes the student's name and education major (see Figure 1). The copy the candidates work in is their personal revision of the template. Candidates can make edits and change the color, background, or add graphics to their cover page. The second and third pages should be the table of contents which list each assignment to be completed for the Classroom Management Binder. To make it easier to access each assignment to prevent scrolling down a long list of slides for review or grade a task, Professor A creates two columns in the table of contents, one for the title of the assignment and the other for the hyperlink marked "Home." This allows the user to click on the task and go directly to the Google Slide housing the assignment (see Figure 2). The notebook contains approximately twenty-five assignments. This makes the Table of Contents at least a two slide document. It is not necessary to know every assignment in advance because instructors will be able to add or delete assignments. In this project, teacher candidates are required to have their Classroom Management Binders completed at the end of the semester as a final project for the class. The pages that follow the cover page and the table of contents contain assignments that pertain to managing a classroom from parent letters to discipline contracts.

Figure 1 Sample Cover Pages

Figure 2 Table of Contents and Sample Assignment with Hyperlink to the Home Page

The Classroom Management Binders are intended to be a reference for beginning teacher candidates. The concept of creating the digital notebook is introduced as a binder for housing classroom management strategies and techniques. Some of the tasks include good pedagogy practices and strategies for increasing engagement. Theses pages are added because candidates are potential beginning teachers and will need resources that they can access with ease. Today's students are familiar with Google Drive, so it makes sense to use tools that our students are already using on a daily basis.

In addition, Google Drive is what college students use for multiple avenues of learning (Miller & Martin, 2016). At the conclusion of the project, teacher candidates have personal projects that include relevant, current, and ready to use information to become a successful classroom manager. Digital notebooks are easily uploaded to most Learning Management Systems, class websites, and blogs to provide additional collaborative opportunities. Students always have the option to decide who they want to share their work with. Also, students can determine if they would like their collaborator to edit or view their digital notebook (Miller & Martin, 2016).

Finally, students enjoyed creating their digital notebooks and customizing their classroom management binder to suit their needs. Teacher candidates often contact Professor A when they are hired as classroom teachers and share their appreciation for their digital notebooks. One of the beginning teachers that Professor A taught was named, Beginning Teacher of the Year in the spring of 2018. The students shared that the digital notebook attributed to his success in the classroom. Furthermore, Professor A continues to use digital notebooks in courses, and conduct staff development on the implementation of digital notebooks in and outside of the university to increase the use of the tool in the classroom. A plan to conduct a survey in the following semesters will reveal the outcomes of the digital notebook for students that participated in courses.

Implementation of the Project - Professor B

Professor B integrated digital notebooks in READ courses through Google Slides. Teacher candidates were to create a Gmail account to get started with their digital notebook. Candidates are not provided with a template, as Professor B would like to see their creativity and uniqueness shine through their digital notebook. There is a substantial focus on terminology for all READ courses to teach prospective teachers the five domains of reading and how to implement them in future classrooms. Also, these courses are used to prepare students for the Pearson Foundations of Reading assessment which is required for all teacher candidates who wish to become a certified teacher in the state of North Carolina. Teacher candidates used their digital notebook to define terminology and provide a picture or video to support their terms, which assisted them in retaining the word. Candidates also shared worked cooperatively within their notebooks to enrich their vocabulary knowledge. Students were able to share their digital notebook with partners easily, and both were able to interact in the notebook at the same time. Since Google enables users to save work automatically, candidates were able to see immediate feedback from their peers and instructor. Research has proven that the brain retains a word well when it can associate an image or video with the term. Also, having meaningful conversations with peers about the terms helped candidates to retain them and use them in more meaningful ways (Sprenger, 2017).

Using digital notebooks has enabled teacher candidates to better prepare for the Pearson Foundations of Reading assessment, and it has helped them to become better teachers of reading in the field. It is a notebook that students will always have access to for future reference. Therefore, Professor B plans to continue using digital notebooks in the following semesters.

Conclusion

Though the International Society for Technology in Education (ISTE) standards assists teachers and administrators in integrating technology through Digital Learning Competencies, instructors need access to tools that can be integrated with ease. A well-executed digital notebook is an incredible tool for higher education. This resource provides institutions with forms of authentic assessments. The digital notebook promotes the desired deeper learning that compels students to broaden knowledge, increase intellectual and practical skills, enhance personal and social responsibility, and fosters the ability to integrate years of learning into a connected functional whole. This rich resource provides opportunities for candidates and faculty to learn about the achievement of essential learning outcomes over time, make connections among disparate parts of the curriculum, gain insights leading to improvement, and develop identities as learners or as facilitators of learning. Digital notebooking enables students to engage in multiple opportunities to communicate their thinking and creativity, assisting them in becoming creative collaborators. In fact, digital notebooking takes collaboration to a new level for 21st-century learners. Digital notebook users can share their work across devices, which enables peers and instructors to provide timely feedback. Candidates have the option to share their work with resources such as Dropbox, Email, Blogs, Facebook, Twitter, and Learning Management Systems (Miller & Martin, 2016). In addition, students critically curate a variety of resources using digital tools to construct knowledge, produce original artifacts, and make meaningful learning experiences for themselves and others.

As a team, we continue to work together to gather data for a formal study on the use of digital notebooks to further collect measurable data in the areas of achievement, engagement, and collaboration. The team wishes to collect data over multiple semesters to have a larger sample size in the study. The following questions will be disseminated to students after the spring 2018 semester.
1. Rate your level of experience with using technology
2. Rate your comfort level with using technology in the classroom.
3. I prefer the use of technology vs. the use of pencil and paper.
4. I prefer to work in a classroom environment that promotes creativity through technology.
5. Before using Digital Notebooks, I used: (Pick all that apply)
    a. 3-ring binders b. Notebook paper c. Other
6. I believe Digital Notebooks improve my academic motivation.
7. I believe Digital Notebooks improve my study habits/strategies.
8. The digital notebook helps to keep work organized.
9. I believe Digital Notebooks improve my metacognition.
10. I believe Digital Notebooks improve my academic performance.
11. I believe Digital Notebooks improve my academic performance.
12. I plan to integrate Digital Notebook into my future classroom.

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A Collaborative Project Exploring Open Educational Resources and Virtual Reality

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Abstract

The purpose of this collaborative project is to incorporate Open Educational Resources (OER) and Virtual Reality (VR) into college courses to promote student engagement and flexible learning opportunities. This project will assist teachers in the K-12 and higher education environment to better identify lesson strategies for the implementation of OER and VR. This collaborative partnership primarily focuses on the experiences of two assistant professors in the School of Education at different universities and their encounters thus far in the study with the integration of the two resources. Though the use of OER and VR are not connected, two assistant professors work as a team during workshops, consulting, and staff developments. The two explore various emerging technologies and other resources and share their experiences with K-12 and higher education instructors in the field. The two assistant professors teach literacy and instructional technology pedagogy at their institutions. Throughout this project, faculty and teacher candidates participate in lessons, assignments, and projects that incorporate the use of OER and VR. The researchers of this project strive to integrate active learning and student-centered experiences into lessons. As mentioned, the partnership hopes to glean the following outcomes from the study: enhanced student engagement and achievement and increased personalized and cooperative learning opportunities. The results will be shared after formal surveys are disseminated to students over the span of two semesters at each university. To better validate this research, from 2016-2019 formal studies are being conducted at each university. Therefore, additional data is currently being collected.

VR and Classroom Instruction

Virtual reality provides an avenue for teachers to deliver standards-based curriculum to today's tech-savvy digital learners (Tiala, 2006). According to a 2017 survey of more than 500,000 teachers, students, school administrators, and parents revealed that augmented reality applications and virtual

reality experiences might be the stimulation students need. The survey was part of the 2016 Speak Up Survey from Project Tomorrow. Results from the study revealed that 33 percent of middle school students and 26 percent of high school students chose augmented reality as part of their "ultimate school." In the study, only 12 percent of parents and administrators and 13 percent of teachers shared the same enthusiasm. In a similar 2017 study of over 8,000 teachers and media specialist, 48 percent of teachers used game-based environments, and 42 percent used G Suite for Educators, while only 6 percent used augmented and virtual reality combined (Nagel, 2017). Though Project Tomorrow calls augmented and virtual reality two of the "hottest rising stars" in technology, there is a definite gap between how kids and adults view these technologies (Nagel, 2017). Virtual reality provides a controlled environment like a classroom where students have the opportunity to test a range of theories in a way that is realistic and naturalistic. At the same time, virtual environments allow for a high sense of awareness and concern for surroundings and observations (Won, 2016).

Experiences with VR

Lecture-style teaching has become a strategy of the past and can sometimes pose a problem for millennial learners. Throughout years of teaching, the researcher of this proposal has found that some of the most challenging instructional tasks for teachers are engaging students, differentiation, and attending to the needs of multiple learning styles. Exploration with VR in the classroom began in the fall of 2016, after attending a captivating workshop during the summer. Though VR had been experienced in the past on a personal level, VR had not been considered VR as an instructional strategy. After the workshop, a decision was made to incorporate the use of VR goggles into specific technology classes to include, Educational Foundations of Technology (a course taught to undergraduate teacher candidates the semester before student teaching). VR could serve as an exciting resource to integrate into daily lessons once candidates were student teaching. Therefore, the plan was not only to increase engagement for teacher candidates, but for the learning strategy to extend to K-12 students. Teacher candidates were required to incorporate the use of VR into their syllabi and daily lessons. According to Tiala, VR can easily be integrated into teaching concepts as higher education instructors and K-12 teachers can incorporate interactive, three-dimensional, computer images, and stereographic computer images (Tiala, 2006).

The materials needed are a pair of VR goggles (headsets or glasses), a smartphone, and an app or video. The instructor experimented with virtual tours, 3-D graphics, and videos. Lessons mainly focused on how to integrate the use of VR into curricula, but not on any particular content because the class was comprised of students majoring in elementary, middle, or secondary education. Classes practiced with Google Expeditions, Youtube videos, and interactive apps (see Figure 1).
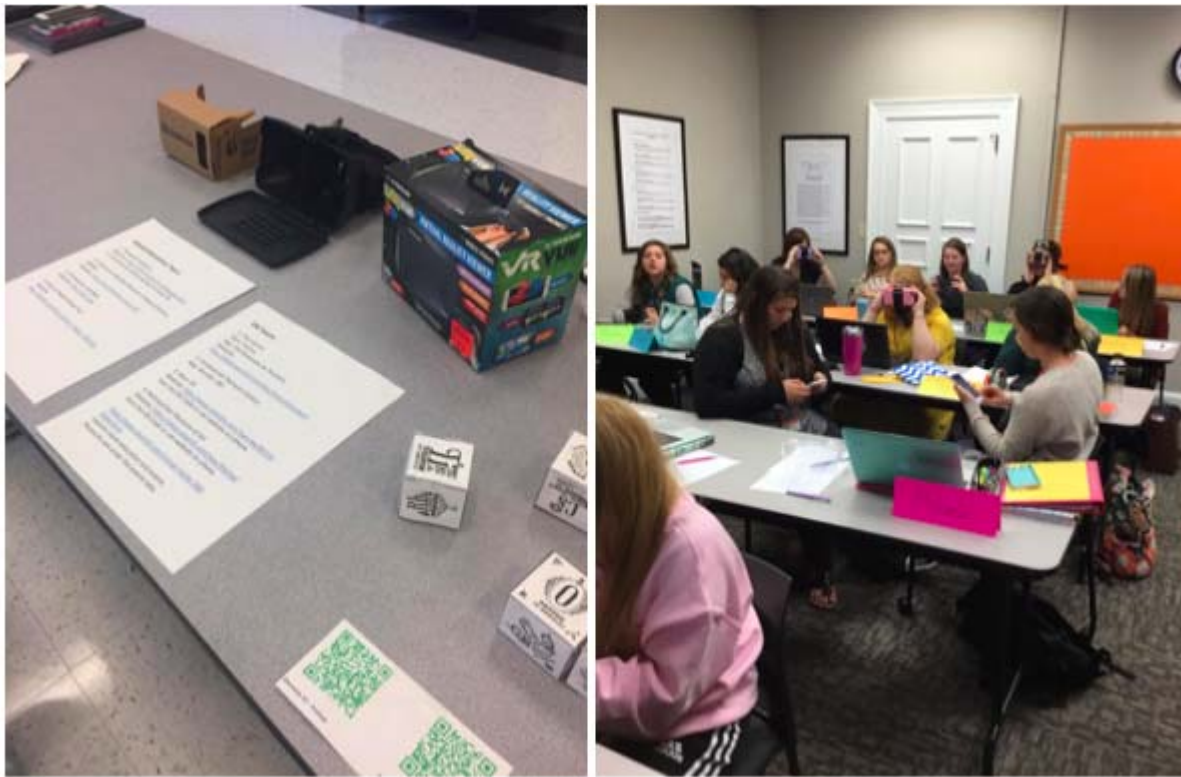
Figure 1. VR in the Classroom.

There are many platforms for VR, such as Oculus RIFT, Samsung Gear VR, and Google Cardboard. Before submitting a request to purchase VR goggles the instructor explored with three different headsets: 1. Google Cardboard - $15.00, 2. Sykro VR - $70.00, and 3. VR Text - $150.00 (these are approximate costs). To get started, set of Google Cardboards were borrowed from a STEM class at a neighboring middle school. From the researcher's perspective, neither of the sets had a much of an advantage over the other in regards to clarity of pictures, graphics, or videos. After research and practice on the subject of VR for instructional purposes, twenty-five sets of VR Vue were purchased at $10.00 each.

After much exploration with YouTube videos and VR applications, Google Expeditions was favored over GoProVR, Public Speaking VR, and Inside Abbey Road. Google Expeditions is a VR instructional tool that allows the teacher to lead in an expedition in most content areas and at the same time students can join the expeditions (Google Expeditions, 2018). These immersive expeditions can take students from the Taj Mahal to the depths of the ocean.

The instructor integrated VR into many lessons, during one particular class project, after discussing with students how to teach across the curriculum, the use of VR was integrated into a two-part social studies and writing lesson. In the first part of the lesson, teacher candidates participated in a traditional style lesson where they were required to use the Internet as a resource to research the major landmarks in countries around the world. The instructor was not specific about which websites to use. Students were to write a one-page essay about what they found in each country and share out their findings through presentations. The list included: African countries, China, Germany, Japan, United Kingdom, and the United States. In the second part of the lesson, students completed the same lesson except with

VR goggles and the use of the Expeditions app. Again, students wrote about their findings and shared their essay presentations. Each lesson experience provided students with images, videos, and facts. However, the VR experience generated more conversation among the students. There was an increase in excitement, engagement, and an increase in the number of groups that volunteered to share their presentations. An informal survey was conducted, and students overwhelmingly shared that they preferred the VR experience over the assignment without VR.

Throughout semesters teacher candidates were required to practice writing lesson plans that include the use of VR. During student teaching the candidates can execute their lessons. Student teachers that are placed at schools without VR goggles are allowed to sign-out headsets from the education department or the university's Curriculum Materials and Media Center. Most of the K-12 schools served have access to iPods for students that do not have Smartphones. Thus far, science candidates have written VR lessons with objectives that include biomes. This allows K-12 students who have never experienced a biome except for on the pages of a book or on a video to feel that they are outside in nature experiencing an actual biome. Other science candidates have created lessons on space objectives which allows for their students to travel to the moon and back without ever leaving the classroom. Social studies teacher candidates have integrated VR into their lesson plans through virtual field trips. Candidates who teach math designed lesson plans that helped K-12 students better understand geometry. Additionally, the researcher shares with psychology instructors how VR can be used concerning patients with different phobias. To gather additional data, the researcher conducts staff developments and workshops on the use of VR in the classroom and gathers feedback from teachers for a future study.

Implementation of OER

Another trending and rising star in education are OER. In a study conducted by Vojtech, Gabrielle; Grissett, Judy (2017) college students expressed that they would instead use OER in place of the traditional text due to the creativity of the course. In the same study, students reiterated that the cost was indeed a benefit as they were not expected to purchase a text when using OER. It is important to note that in a study conducted at eight colleges across the United States it was found that both teachers and students rated OER to be at least equal in quality to traditional texts (Bliss, Robinson, Hilton, Wiley, 2013).

A significant concern of instructors is the ease of use with implementing new technologies and software into classroom practices. The particular READ course used for the incorporation of OER was taken by education candidates pursuing a concentration in reading. Intellus Learning is an OER platform which was designed to assist faculty with reviewing and discovering the use of digital resources to integrate into classes. Intellus is similar to other OER platforms such as OER Commons, OpenStax, Open Textbook Library, and MERLOT. Intellus Learning enables instructors to track student activity and accelerate student engagement and course development. Additionally, Intellus Learning was designed to reduce the cost of materials for students (Marketwired, 2015). The OER chosen from Intellus Learning worked smoothly with the institution's learning management system (LMS), as the instructor was able to embed resources into course modules in Canvas.   Also, Intellus Learning enables instructors to produce a syllabus through their platform, which allows students to click on links which directly navigate them to the OER for that particular module (see Figure 2).

Figure 2. Screenshot of Intellus Syllabus with clickable links.

Intellus Learning helps instructors access high-quality resources quickly through the "Explore" database. The search capability allows faculty to narrow the search to precisely the type of resource they wish to embed in their curricula. For example, instructors have the choice to choose date of publication, source (EBSCO, Pearson, Youtube, TED talk, videolectures.net, wisc-online, article, etc.) and type (article/journal, assignment, case study, assessment, audio, data, eBook, flashcards, exam, games, interactive tutorial, lecture notes, lesson plans, podcast, video, web page, etc.) See Figure 3.
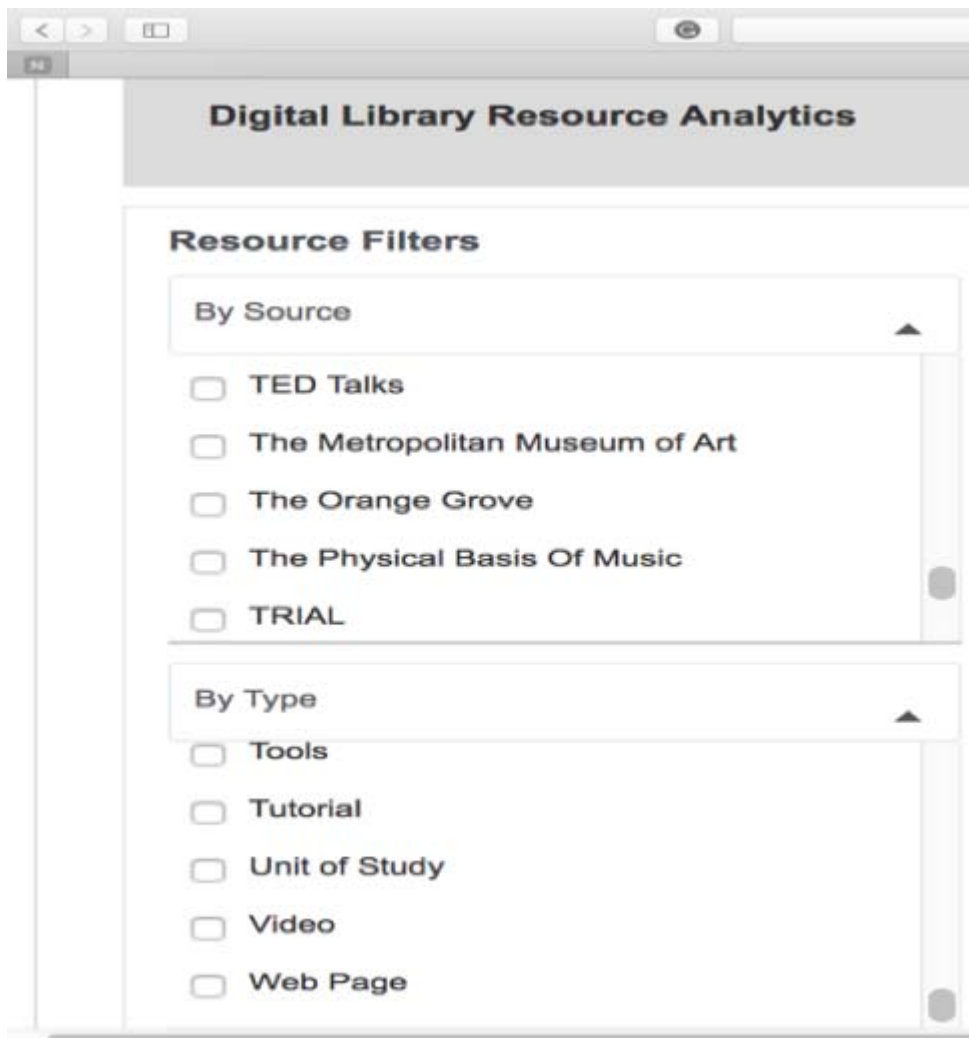
Figure 3. Screenshot of "Explore" feature in Intellus Learning.

OER and Classroom Instruction

Teacher candidates were able to engage with multiple OER throughout semesters. When learning about the importance of relationship building and motivating students to become lifelong readers, students viewed TEDx Talks and other videos to understand better the link between building relationships and student reading success. This allowed the instructor to relate to the many different cultural backgrounds of the students. For reference, the OER sources are listed below which were pulled from Intellus Learning to drive this learning outcome:
- "Get to Know Your Students" Youtube. 05 Jan. 2017. Video.
- Dr. Andy Johnson. "Motivating Students to Read: 11 TIPS" Youtube. 28 Feb. 2014. Video.

The researcher teaches literacy courses for elementary education majors. Therefore, there is a significant focus on terminology which prepares teacher candidates to become effective teachers of reading through their knowledge of the five pillars of reading. Additionally, these courses are used to develop elementary education majors for the Pearson Foundations of Reading assessment, which is a

requirement of majors wishing to become certified teachers in the state of North Carolina. A few of the OER utilized for these outcomes are listed below:

- Lucia Parry. "Whole Group Phonics Lesson - Parry" Youtube. 14 Feb. 2013. Video.
- Lucia Parry. "Phonics Small Group - Parry" Youtube. 14 Feb. 2013. Video.
- Mindset Teach. "Phonics" Youtube. 10 Dec. 2013. Video.
- "Four Corners Strategy" Youtube. 23 Feb. 2017. Video.
- AmericanGraduateDC. "Explicit Vocabulary Teaching Strategies" Youtube. 30 Apr. 2012. Video.
- "High 5!" Strategies to Enhance Comprehension of Expository Text." Library (EBSCO). Academic Search Complete [a9h], 31 Oct. 2010. Article/Journal.
- "Help with teaching reading comprehension: Comprehension instructional frameworks." Library (EBSCO). Academic Search Complete [a9h], 30 Apr. 2006. Article/Journal.
- Shannon Oden. "Teaching Reading Fluency and Comprehension" Youtube. 05 Jul. 2011. Video.
- "The Interactions of Vocabulary, Phonemic Awareness, Decoding, and Reading Comprehension." Library (EBSCO). Academic Search Complete [a9h], 31 Jan. 2013. Article/Journal.
- "Fluency: Bridge between decoding and reading comprehension." Library (EBSCO). Academic Search Complete [a9h], 28 Feb. 2005. Article/Journal.

The instructor takes pride in preparing teacher candidates to know how to reach all modalities of learners in their classrooms. Teacher candidates should leave READ courses understanding how to foster reading skills and comprehension for all students. Therefore, encouraging students to become proverbial learners of reading. OER used for this learning outcome are listed for reference below:

- "A Diagnostic Teaching Intervention for Classroom Teachers: Helping Struggling Readers in Early Elementary School." Library (EBSCO). Academic Search Complete [a9h], 31 Oct. 2010. Article/Journal.
- "Teaching struggling readers in elementary school classrooms: A review of classroom reading programs and principles for instruction." Library (EBSCO). Academic Search Complete [a9h], 31 Jan. 1999. Article/Journal.
- "PLCs in Action: Innovative Teaching for Struggling Grade 3-5 Readers." Library (EBSCO).
- "Supporting English-Language Learners and Struggling Readers in Content Literacy With the "Partner Reading and Content, Too" Routine." Library (EBSCO). Academic Search Complete [a9h], 31 Mar. 2010. Article/Journal.
- "REACHING STRUGGLING READERS." Library (EBSCO). Academic Search Complete [a9h], 30 Apr. 2015. Article.
- "Revisiting Key Assumptions of the Reading Level Framework." Library (EBSCO). Academic Search Complete [a9h], 31 Aug. 2012. Article/Journal.

Summary of OER and VR in Higher Education

Identifying new strategies to increase engagement in the classroom can often prove to be a struggle for today's learners. Classes include students with multiple learning styles and a variety of cultures and backgrounds; therefore, it can be a challenge creating an environment where individualized learning experiences can occur. This project encourages students to engage and inform one another concerning their unique perspectives and life experiences by using OER and VR as tools to promote active engagement and student participation (Martin, 2018). The team's goal is to assist other instructors with new and innovative ways to increase student engagement through individualized learning opportunities through flexible learning.

In December 2015, the North Carolina Department of Public Instruction (DPI) criticized teacher-prep programs in the National Educational Technology Plan sharing that overall teacher candidates were not proficient in the area of utilizing technology in their classrooms. DPI went on to say that teachers should be prepared to integrate apps and technologies into their curriculum to support state standards (Will, 2016). In lieu of this, Education Preparation Programs are encouraged to take initiatives to embed technology into programs. This partnership assists in the preparation of teacher candidates in utilizing OER and VR into instruction. The team continues to experience an increase in student enthusiasm, engagement, and discussions in courses with OER and VR integration. The possibilities with the two resources in the classroom are endless; therefore, the team will continue to explore avenues of learning at their perspective universities. According to the team's experience thus far, these technologies are an essential factor in assisting schools to deliver quality education.

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Teaching Online Research in the "Fake News" Era

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Introduction

For teachers and librarians helping students navigate the world of online information, the rise of fake news has created new challenges for information literacy instruction. Helping students find, evaluate, and use credible sources of online information can be more difficult than ever in the current era of "fake news", "alternative facts" and extreme political polarization. However, practical tools and strategies can be used by teachers and librarians to help students critically analyze the information they find online through social media, news outlets, and web searches and to make well informed decisions about the value of the sources they choose.

Background Information

Although fake news is nothing new, the ease and speed with which it can spread online, especially through social media channels, has given it a newly widespread influence. In the past, many people got their news primarily through print newspaper and magazine subscriptions or from watching television programs. These traditional media sources generally have long-established editorial and fact-checking processes in place. Even so, the public's trust in these mass media news outlets has been declining and by the year 2016 that trust "dropped to its lowest level in Gallup polling history, with [only] 32% [of Americans] saying they have a great deal or fair amount of trust in the media" (Swift, September 14, 2016). Just one year later in 2017, the Pew Research Center reported that one out of four adults in the US got their news from social media sites, with Facebook being the most popular choice (Grieco, 2017). Accessing news through social media has increased in popularity while trust in and use of traditional media sources has been declining.

Unlike traditional media, however, online content can be created quickly and inexpensively by anyone with an internet connected device. Social media in particular makes it easier than ever for anyone to publish anything and potentially reach a large audience: "Content can be relayed among users with no significant third party filtering, fact-checking, or editorial judgement. An individual user with no track record or reputation can in some cases reach as many readers as Fox News, CNN, or the *New York Times*" (Alcott and Gentzkow, 2017, p. 211).

On social media sites, any interaction with an item that has been posted, even comments that point out factual errors, serve to increases the visibility of that posting and helps it become a "trending" news item. Social media can encourage the spread of fake news because of the way this works. "Fake news" entrepreneurs purposely design articles that are more likely to provoke the social media interactions

that will help their articles reach more viewers. They also choose topics with high "clickbait" potential. The goal of these fake news creators is often just to make as much money as possible, and they are paid by advertisers for each click their site receives. This could be as much as $1000 an hour for particularly viral stories (Shane, 2017 January 18). While some fake news creators also have an ideological agenda they would like to promote, others simply choose to write articles on whatever subjects they believe will earn them the most social media interactions and subsequent page views. And it works: In a 2016 study, the Pew Research Center found that almost one in four Americans said that they "have shared a made-up news story--either knowingly or not" through the online social networks they participate in (Barthel, Mitchell, & Holcomb, 2016).

Fake news stories shared by social media influencing bots can also be used as a form of information warfare, manipulating public opinion (Prier, 2017). A 2017 study estimated that somewhere between 9-15% of twitter accounts are bots rather than people (Varol, 2018). These bots are created by individuals or groups who seek to influence public opinion on a grand scale, as Russia did during the run up to the 2016 presidential election in the United States (Shane, 2017, September 7). And although political fake news has gotten the most press in recent years, fake news exists on many other topics that students research, including celebrities, medicine, and science.

But the need for page views is actually true of most online content: "fake news writers, and even 'real' news writers, are heavily motivated to create the most sensational headlines they can" (Spratt and Agusto, 2017, p. 18) to get as many people as possible to click their links. Most websites are constantly vying for attention because they are paying their bills with advertising revenue rather than subscriptions. Even "real news" sites are incentivized to use overly dramatic, clickbait style headlines in order to draw in readers, which can often give the real news an air of sensationalism that makes evaluating sources difficult. And because traditional newspapers have been struggling to transition to the digital world, newspaper jobs have "declined more than 37% between 2004 and 2015", meaning there are often fewer journalists and editors working at these mass media news outlets, too (Pew Research Center, 2017). These things together create an online world in which it is more difficult than ever to navigate through the noise to find information that can be trusted.

The actual definition of fake news itself has also been debated. Fake news, in its simplest definition, is news which is intentionally false or misleading. This is separate from questions of bias and media influence--just because a news organization is perceived to have a bias does not necessarily mean their news is fake—they may still be adhering to strict standards of journalistic integrity. Fake news is also not news with accidental mistakes that are later corrected. Mistakes can happen to any media outlet, especially when covering breaking news stories. Quickly correcting mistakes is a sign of good fact-checking processes at work. More troubling, "fake news" has also come to be synonymous for any news which the reader doesn't agree with, doesn't like, or doesn't want to acknowledge: "[Fake News] is now used to mean 'I deny your reality.'" (Menand, 2018). Whether or not someone likes a news story has nothing to do with whether it is real or fake--a much deeper analysis of the facts--or lack thereof-is required. This has been called "information tribalism", the idea that people choose sides based on a sense of their own identity and believe news stories that they want to be true (Beck, 2017) whether or not the facts can be objectively verified. But what can teachers do about this?

Teach an awareness of how the Internet works

While it might not seem to be directly related, teaching students a greater awareness of how the internet operates can help them identify when something may be fake news. Many fake news sites will try to approximate the look and feel of a legitimate news website by using similar formats and URLs. When students understand how URLs are constructed they can quickly determine if the website they are looking at is commercial or not, what country it is coming from, and where it falls in the larger website's organizational scheme. Showing students how to check the official list of domain names to find out what an unfamiliar domain might say about that website can help students realize that the URL can provide essential information about a website if you know how to read it.

Another important feature of how the internet works to share with students is the idea of the "filter bubble" and how search engine algorithms tend to show you what they think you want to see based on your search history. Eli Pariser's Ted Talk, "Beware of online 'filter bubbles'", first brought this issue to a wide audience in the year 2011, and the idea of getting lost in your own echo chamber online is still important for students to be aware of. If students don't make an effort to search for information outside of their own viewpoints, they probably won't find any articles outside of their own viewpoints, but that doesn't mean that other sides of the arguments don't exist.

One activity that is easy to do in the classroom to demonstrate this is to simply ask every student in the class to use Google to look up the exact same thing, and then compare results. This may not work as well as it did in the past, because Google has made some changes to their search in order to try to limit this filter bubble effect, but differences in the advertising on the pages, especially if students search from their home computer rather than a school one and print the results to bring to school with them, should be noticeable. Another activity to try that will potentially work better is to have students search for the same thing using different ways of phrasing their question and then compare results. For example, have the class look for information on coffee and have one group search "is coffee good for you?" and have the other group search "is coffee bad for you?". Even though both groups want the same information on whether or not coffee is healthy, the group searching with the keyword "bad" will be more likely to find negative information than the group searching with the keyword "good". The search engine is anticipating what they want to find. This is still a kind of filter bubble that searchers might not even realize they are stuck in. Google, on a recent posting to their blog (Sullivan, 2018), used a similar example to explain the problem and their awareness of it. It is possible that Google will address this problem in the future, but activities like this one can help students develop an understanding that search engines are not a neutral technology and that it's important to have an awareness of all the things that might be influencing your search results. In this example, students could think of another way to search for the information that might work better.

It can also be helpful for students to be aware of how and why stories tend to "go viral" on the internet. Studies have shown that evoking strong emotions like awe or anger in readers can create a story that is more likely to be shared widely (Berger, 2012). If students are drawn to a source because of a strong emotional reaction they have to it, an awareness of this might help them realize they should further investigate its veracity. Asking students to identify the emotional reaction they have from reading a source can be a helpful step to add to their source evaluation process.

Librarians and teachers can also work to make students aware of the processes behind creating online content and how this can differ widely depending on the source: "Because the Internet does not require them, there is much less quality control of material today." (Finley, 2017, p. 8). Although one of the strengths of the internet is the fact that it gives everyone the opportunity to publish and the potential to be heard, one of the drawbacks is that editing and fact-checking is not always done. And because there are no official approvals for what is published, literally anything can be. Teaching students about the ways that traditional editorial processes work can be valuable because "now that so much available information has not undergone these vetting processes, we need to draw attention to the value of the effort involved. Some may argue that these processes were elitist. Perhaps they were, but they were and are about quality control." (Finley, 2017, p. 8). Making students fully aware that not every internet site conducts any type of review on its content can help them realize more fully the importance of doing things like fact-checking for themselves, or the value of finding and using sites that do have editors working on their content.

Fact checking websites

Another activity that can help students become better at evaluating online sources is to introduce them to concept of fact-checking and acquaint them with fact-checking websites that already exist as important tools for researchers. It may be good to start with a site like Snopes.com, where a less controversial meme or a fun trending topic could be chosen by teachers to demonstrate how fact-checking works, rather than starting off with a topic that students may already have a bias about. Another simple activity to try could be to ask students to choose a trending story from their own social media feeds and look for it on Snopes.com, which tends to fact-check trending stories, to see if they can find out more about the story there. Ask students to notice the way that Snopes.com or other fact checking websites will link to evidence when it is available and will explain when they are unsure whether something is true or false and why. For more controversial issues that have been covered by more than one fact checking service, ask students to compare reports on the same event to see if different services give different or similar verdicts.

Recommended Fact Checking Websites

Website:	Website run by:
Snopes.com	David Mikkelson
FactCheck.org	Annenburg Public Policy Center
Polifact.com	*The Tampa Bay Times* (independent Florida newspaper)

There are also many tools available that students can use to do their own fact checking, and this can be an especially valuable exercise because it can give students more insight into how the internet works. Many tools can be found in the Verification Handbook (http://verificationhandbook.com/), which is a free ebook published by the European Journalism Center to teach journalists how to verify news stories as they are researching and writing them. Students could be asked to use some of the many tools recommended in this handbook, like reverse image searching or tracing the owner of a website. A similar

free ebook written for a student audience, <u>Web Literacy for Student Fact Checkers</u>, is available from educational technologist Michael Caufield. This book recommends many fact-checking activities for students. A video like the TED talk from journalist Markam Nolan, "<u>How to separate fact from fiction online</u>", can also be a good introduction to the idea of how real news stories are written by journalists and how real journalists do their own online fact checking before publishing a story.

Bias and Confirmation Bias

Students can also benefit from an awareness of bias and how it can affect the research process. People often say that they want unbiased sources, or that they are looking for facts without bias. In reality, however, all sources will have some kind of bias, even if that bias is simply that they try to remain as neutral as possible. Because of this it is important to have an awareness of bias, the tools to spot bias, and the ability to decide whether or not the bias of an article or website would prevent it from being a good source for your research project.

Students may not be aware of their own bias, or may think that they don't have any biases. The word "bias" itself is often used with negative connotations, when it really just indicates a stance, a perspective, or a point of view. An activity that might help students develop an understanding of their own bias is asking them to use an online tool like the "<u>Rate your own Bias</u>" quiz on the website Allsides.com or the <u>Political Typology Quiz</u> on the Pew Research Center website. Understanding that everyone has some type of bias is an important step in realizing that every article has some type of bias as well, and that being aware of bias is important.

The website Allsides.com can also be a good tool for teachers to use when teaching about bias. This website is run by a team of editors from many different backgrounds who work together to rate the bias of news stories and news outlets, giving each one a rating on their five point scale categorizing each story as right, left or center. Current event articles will tend to be grouped by topic on the site, so students can easily find and read different versions of stories about the same event. An easy classroom activity to help students gain a better understanding of how bias presents itself in news articles would be to ask students to choose three articles on the same topic or event, one from the right, one from the left, and one from the center, and compare the articles. Have students answer questions like: what is the same in all three articles? What only appears in one of the articles? Do the articles tell the same story of the event?

After coming to a better understanding of what bias is and how it works, students can begin to explore confirmation bias and how it can affect their research. In confirmation bias, researchers look for articles that back up opinions they already have. Asking students to find sources they disagree with could help prevent this, especially if teachers explain the value of using sources that you don't agree with to come to a fuller understanding of your own beliefs. Good researchers are open to finding ideas they had not already anticipated and changing the focus of their research questions in response. Teaching students that they are researching in order to learn more about their topic, not to find confirmation of things they already know, is also a useful approach.

Source Evaluation Techniques

There are many source evaluation techniques that can help students analyze sources and decide whether or not they are worth using. One frequently used test, the C.R.A.A.P. test, which was originally created by librarians at California State University-Chico (2010), asks students to look at the currency, relevance, authority, accuracy, and purpose of a source. There are many variations on this test, and these kinds of tests can be a good first step to help students think about the factors that make a source credible. It's also important to give students the tools to know when an article is "sponsored content" (or other euphemistic phrases that indicate a paid advertisement which looks like a news article). In the now famous Stanford University study that looked at middle and high school students' media literacy skills, researchers found that 80% of the students they tested could not tell the difference between sponsored content and news articles at all (Wineberg, 2016, p. 10).

In the fake news era, however, this kind of analysis might not always be enough to help students make informed decisions. Michael Caufield, in his book Web Literacy for Student Fact Checkers , recommends that students employ a process called "lateral reading" to evaluate their sources. This means that instead of "reading vertically" by limiting their analysis to information found on the web page they are evaluating, students would "read laterally" by also doing a Google search to find more information about the website from outside sources. This information could be reviews of the website, information about who owns the website, or other news articles about the website that will help students get a sense of the websites' reputation. Students could also look deeper by finding out who is linking to the website and who is citing it. Knowing what others think about the website should help students decide whether or not it is a source that they also want to use. This kind of information will not usually be available on the website's own pages.

Another source evaluation activity that goes beyond the CRAAP test is the backtrack journal recommended by Andrew Revkin (Revkin, 2016) and used as an assignment in his graduate course in Multi-Platform Communications. This activity asks students to take something they found online and trace it back to its original source, whether that was a tweet, a social media posting, or another type of posting. This would work best for sources students find that aren't traditionally published, but those types of sources are often the ones students want to use most.

Students can also do a media ecosystem analysis activity to help them think more about evaluating sources and bias. This activity was suggested by the *New York Times* in their lesson plan article for teachers, "Evaluating sources in a post-truth world" (Schulten, 2017). Ask students to make a list of all of the websites they use regularly, and then have them do a lateral reading of those websites. After looking more closely at the websites they use most often, students can ask themselves if they think their media ecosystem is too limited, and if there are types of sources they may be missing. This could be a way to bring together many different concepts related to fake news information literacy into one activity.

For a more interactive way to help students practice evaluating fake news, there is an online game called Factitious created by JOLT and the American University Game lab that can be played as a group or individually. To focus the game more on evaluation, ask students to go to the actual sources used in the game and look at the about pages on those sites, then ask students to do a lateral reading of the sites used in the game. For articles in the game that cite studies, students can practice trying to locate the original study and then look at it to see if they agree with how the reporter has summarized the results of the study or not.

Teach Advanced Search Techniques

Part of the reason students may be running across dubious sources of information on the internet could be related to the search techniques they are using. Almost any keywords used in Google will return some results, but some keywords may work better than others at retrieving higher-quality sources. To find good sources, students need to figure out what keywords are being used by scholars, journalists, experts and other credible writers on their topic. Learning how to brainstorm a wide variety of keywords on their topics can be a good place to start. Make sure students know that they should try different combinations of search terms. Advanced search techniques can also be helpful: showing students how to narrow a google search by date can help them find information that is more current, for example. Limiting by domain name in Google can help students easily filter out commercial websites. Asking students to use Google Scholar instead of regular Google can help them focus on finding scholarly sources. Above all, it is important for students to be aware that research is a process in which they may have to experiment with search terms, try different strategies, and look at many articles before being able to select the articles that are going to help them the most. They should expect to have to go far beyond the first three search results that they receive for the first search terms they try. Even experienced researchers can experience frustration when looking for sources and it is important to know how to revise your search process in response to your information need and the information you are able to find.

Conclusion

Teaching students to recognize and avoid fake news requires teaching a wide range of knowledge, skills, and abilities. It's important to recognize, however, that although poor information literacy skills can help to fuel fake news, all of the blame for the fake news problem cannot solely be placed on students, teachers, librarians, and the general overwhelming need for better information literacy skills in the world at large. The fake news problem is complex and many different factors contribute to its continued existence. While it is essential for students to understand that they have an important responsibility to evaluate their sources, it is also good for students to understand how and why fake news is created. The problem is not just that people need to be better at evaluating sources, the problem is also that all of these dubious sources not only exist but proliferate. Source evaluation tends to put all the responsibility on the information user, and none on those writing and publishing dubious information. However, acknowledging that this is unlikely to change can help underline for students the importance of source evaluation as a lifelong information literacy skill that they should not leave behind when their last research paper is written. Being able to critically analyze and make informed decisions about what sources to use and choose and believe will help them become better online researchers no matter what they choose to research in the future.

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Developing an Introductory Class in Business Intelligence (BI) Using MS Excel Powerpivot

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Abstract

Asking questions about your data is a constant application of all business organizations. To facilitate decision making and improve business performance, a business intelligence application must be an integral part of everyday management practices. Microsoft Excel added PowerPivot and PowerPivot officially to facilitate this process with minimum cost, knowing that many business people are already familiar with MS Excel.

This paper will design an introductory class to business intelligence (BI) using Excel PowerPivot. If an educator decides to adopt this paper for teaching an introductory BI class, students should have previous familiarity with Excel's functions and formulas. This paper will focus on four significant phases all students need to complete in a three-credit class. First, students must understand the process of achieving small database normalization and how to bring these tables to Excel or develop them directly within Excel PowerPivot. This paper will walk the reader through these steps to complete the task of creating the normalization, along with the linking and bringing the tables and their relationships to excel. Second, an introduction to Data Analysis Expression (DAX) will be discussed.

Introduction

It is not that difficult to realize the increase in the amount of data we have generated in the recent memory of our existence as a human race. To realize that more than 90% of the world's data has been amassed in the past two years alone (Vidas M.) is to realize the need to manage such volume. Small and large businesses alike will be required to create and store large amounts of data not only for now but for years to come. The exponential increase in data accumulation would require some cleansing, storing, manipulating, and deep mining to get the benefits we expect from a costly investment. The effectiveness of decision making depends on analyzing the data to produce some Business Intelligence (BI) values to all aspects of any organization. Business Intelligence is just that, where management at all levels uses technology to acquire insight into a broad set of data. Often factors such as products, customers, employees, partners, and others play a big role in BI. This is where the execution of Power Pivot and data analysis expressions (DAX) comes in handy. It is available as Microsoft Excel Add-Ins and with the latest version of MS Excel 2016, is free. PowerPivot allows the customization of the very complicated business model that requires the of use normalized tables, based on a predetermined relationship with millions of rows.

This paper attempts to encourage educators in the Information Systems field to explore the option of using PowerPivot and DAX as an introductory class in BI. Students who will graduate soon are more likely to have to use MS Excel as a number crunching, charting, and what-if analysis software. Adding Power Pivot and DAX to their list of classes will guarantee not only deep theoretical knowledge but also will add much needed applicable skills to their resumes.

Problem Background

Many agree that MS Excel is a powerful spreadsheet. Having said that, it should be noted that Excel, until recently, could not organize data based on their relationships as entities. The other major limitation is found in the small number of rows and columns, considering the massive increase in the size of data generated by businesses.

Absences of Data Model in MS Excel

As powerful as MS Excel was, it never allowed the formation of a genuine relation among different tables as you would construct in a relational database such MS Access. In the past, to get the advantage of the best world, we need to use both database and spreadsheet applications. We had to integrate the two software applications, but they were still two separate applications. This has caused some problems since MS Access has good query manipulation but limited calculation and analytical capabilities. Excel is a great tool for performing tedious calculation but lacked the structure and the data integrity found in a relational database such as MS Access.

Limited Number of Rows and Columns

As was stated in the introduction of the paper, you could easily discover that a sheet in MS Excel is limited to 16,386 columns by 1,048,576 rows. What about if we need to bring multimillion records from a database for additional analysis in MS Excel? It is nearly impossible to move that many records into a sheet resulting in frustration and additional dependency on large but expensive software.

Literature Review

The focus of this paper is to convince educators who are interested in introducing their students to BI to use MS Excel's new Add-Ins found in PowerPivot and DAX. The availability of Excel makes it a good choice if and only if it comes with the required concepts and tools to create a three-credit class.

The use of a relational database was restricted to pure database management systems (DBMS). Now, these capabilities of linking multiple entities based on the type of their relationships are available in PowerPivot. This has been a dream that has come true. Not only we can use the traditional functions and formulas found in a powerful spreadsheet such as Excel, but also, we can reduce data anomalies especially, data redundancy in our data set. Also, this paper will introduce through screenshots some of the features found in PowerPivot and DAX.

To assist an educator who wishes to teach Business Intelligent class successfully, the literature review will be divided into three sections. These are the data model in PowerPivot, DAX relationship to MS

Excel, and reporting capabilities linked to PowerPivot as these are related to PivotTables and Power View.

PowerPivot Data Model

The paper will use MS Excel 2013, where, now, the last version is MS Excel 2016. When it comes to crunching and building complicated formulas, Excel is an absolute champion. Having said that, we need to know that Excel sheet has an obvious limitation, where it has only 2^{20} or 1,048,576 rows by 16,386 columns. PowerPivot has dealt with this issue by expanding the number of rows and columns to much larger values, to be exact 1,999,999,997 rows and 2,147,483,647 columns according to Microsoft Developer Network website.

Alexander (n.d.) stated that "At its core, PowerPivot is essentially a SQL Server Analysis Services engine made available by way of an in-memory process that runs directly within Excel and is "referred to as the internal Data Model. By using the PowerPivot Ribbon interface, you can shrink imported data to tenth its typical size." Alexander adds, a 100MB text file only takes up to 10MB in the Internet Data Model. This speed will reduce the frustration usually associated with a large spreadsheet.

With a large data set, a user has the capability of creating relationships between tables, construct table hierarchy, and, more than anything, established the relationships between these data like any relational database. It is important to note that the tables can come from many different sources, which can all be normalized into a uniform data set on which the program will operate. According to Jackson (2010), Data can be reorganized around one column to be compared to another set of data from different sources. Data can be divided by time, geography, location or many other parameters. Finally, the author stated, "since it runs Microsoft's business intelligence software on the back end, it can do much of what a full-fledged BI application can do."

Data Analysis Expressions, DAX.

DAX in Power Pivot aids in the ease of use and quick execution of calculations. DAX formulas are in some ways like Excel formulas. Users may come across DAX functions that have the same name as an Excel function but were adapted to suit more customized means of input and output (Microsoft, "Filter Functions (DAX)").

PivotTables and PowerVeiws

    PivotTables. According to Michaloudis (n.d.) PivotTables are "the most powerful features within Microsoft Excel." It allows users to have access to millions of datasets with just a click of a mouse, resulting in neatly formatted tables. From an article by Association of Business Training (2013), the author states that PivotTables have many benefits including ease of use, easy data analysis, easy summery of data, ease identification of data patterns, quick report creation, and great decision-making tool. In addition to all these capabilities, let's not forget about the powerful feature that is tightly linked to a PivotTable, that is, PivotChart.

PowerViews. According to the article "Charts and other visualizations in PowerView" (n.d.), PowerView allows a user to quickly create a variety of data visualizations based on tabulated data or matrices by converting them into a multitude of charts including the known ones, such as bar, column, and bubble chart.

Going Through a Complete Example

Setting Up Power Pivot and DAX

<u>**Getting Started with The Add-Ins.**</u> After enabling the PowerPivot Add-ins, users should take their time to familiarize themselves with the overall layout and Guided User Interface (GUI) within the new "Power Pivot" tab. Figure 1 illustrates the main options a user has when in the menu, which contains Manage, Measures, KPIs, Add to Data Model, Update All, Detect, and Settings within the tab. A tab in Excel is a part of the overall top ribbon and is how users have access to display options.
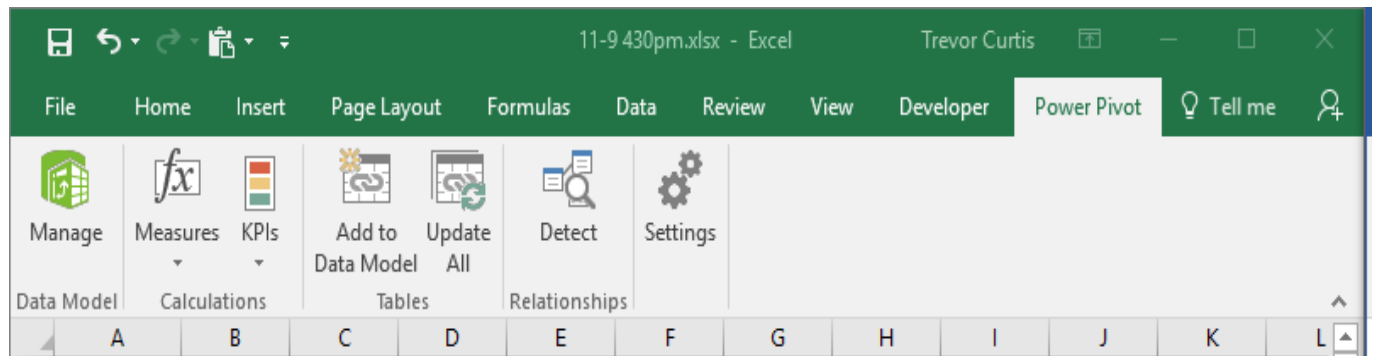
Figure 1: Power Pivot Ribbon Menu

When the Manage button is clicked, a new window opens with a new ribbon at the top. As shown in Figure 2, the Home, Design, and Advanced ribbons each contain usable tools. Data will not be automatically added to the Power Pivot data model and must be done manually.
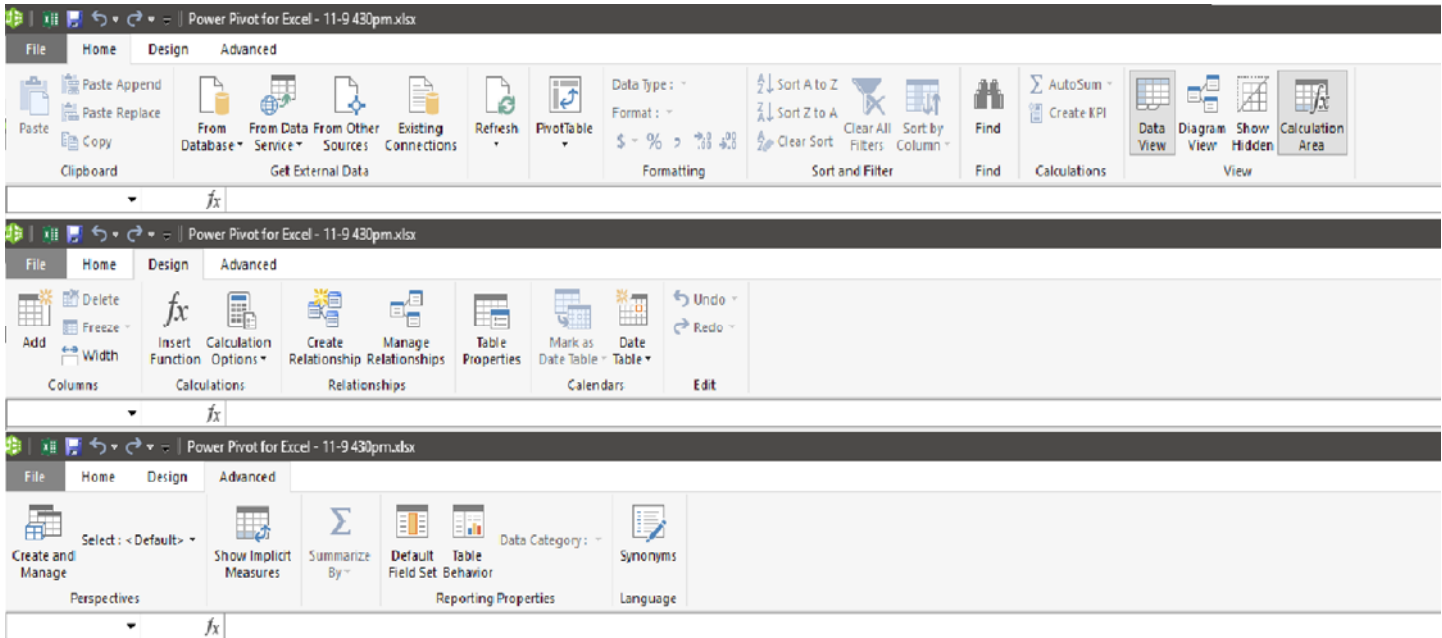
Figure 2: "Manage" Tool

Next on the Power Pivot ribbon is the Measures Tool. Measures are formulas that can be applied to the whole dataset using PivotTables/PivotCharts (Microsoft, "Data Analysis Expressions (DAX) in Power Pivot"). When considering Measures, a user must realize that a customized formula could be entered in a single cell and will affect the whole data set. Measures set up a whole new aspect of drill down techniques in PivotTables because they can pull data from other tables, and not just one like normal Excel PivotTables. Measures can be added two different ways, through the Power Pivot ribbon using the Measures button or via the Manage tab by using the Calculation Area toggled on. Figure 3 shows the simplicity of adding a measure to a PivotTable through the Measures button within the PowerPivot ribbon.
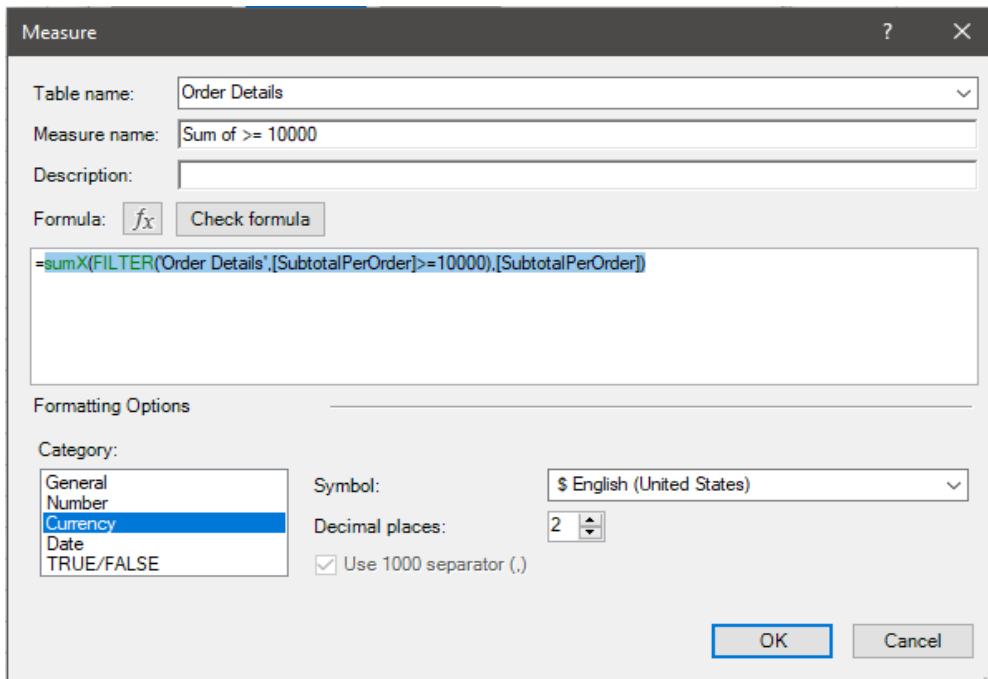
Figure 3: Adding a Measure

The formula feature can be used to illustrate the syntax and easy to use GUI. Once entered, a formula can be checked for syntax with the corresponding button, resulting in instant alerts if any errors are detected. Since the formatting option Currency is selected, it will never need to be specified in later implementations of the Measure. This measure can be found later in the PivotTable selections under the Order Details table.

Key Performance Indicators (KPIs) are the third tool available through the Power Pivot ribbon and provide for visual effects and indicators for a selected section of the data set. KPIs are most used for calendars as well as comparing historical with projected data (Parke Godfrey, Jarek G. & Piotr L.)

Add to Data Model, Update All, and Detect are options in the Power Pivot ribbon that add convenience to the user, so they are not constantly switching through the Manage and normal Excel window. While in the normal Excel spreadsheet mode, a table is either added to the data model locally through Excel or from most common sources such as Microsoft SQL Server, Microsoft SQL Azure, Oracle, and many others.

Normalizing and Importing Data

To remove most, if not all of the data anomalies within a database, the dataset must be normalized into separate tables. Relationships must be carefully examined and applied. Normalization was achieved by removing redundancies resulting in increased data integrity and by establishing relationships between columns of data amongst tables (Surajit C., Umeshwar D. & Vivek N.) To further assure the accuracy of the normalization process, the sheets were exported to Microsoft Access, where the relationships could be established correctly and with complete assurance that all relationships are created accordingly. This was performed using the Get External Data tool in Manage, pictured previously in Figure 2.

The ID for both the Shippers and Suppliers table had to be created by taking the first three letters of the Company Name and appending three random numbers to the end. This allowed for a unique ID that would follow the rules of a normalized table while providing a unique set of characters specific to the company. The formula used to complete this task was:

$$=UPPER((LEFT([@CompanyName],3))) \& RANDBETWEEN(100,999)$$

where the UPPER function stops the count at the specified three characters, and the LEFT function tells the system where to start counting from one to three.

Once the tables were imported, a user should use the Diagram View within Manage, pictured below in Figure 4, to check the relationships and the flow of data. There were no more problems with filter direction, and data manipulation could then be performed.
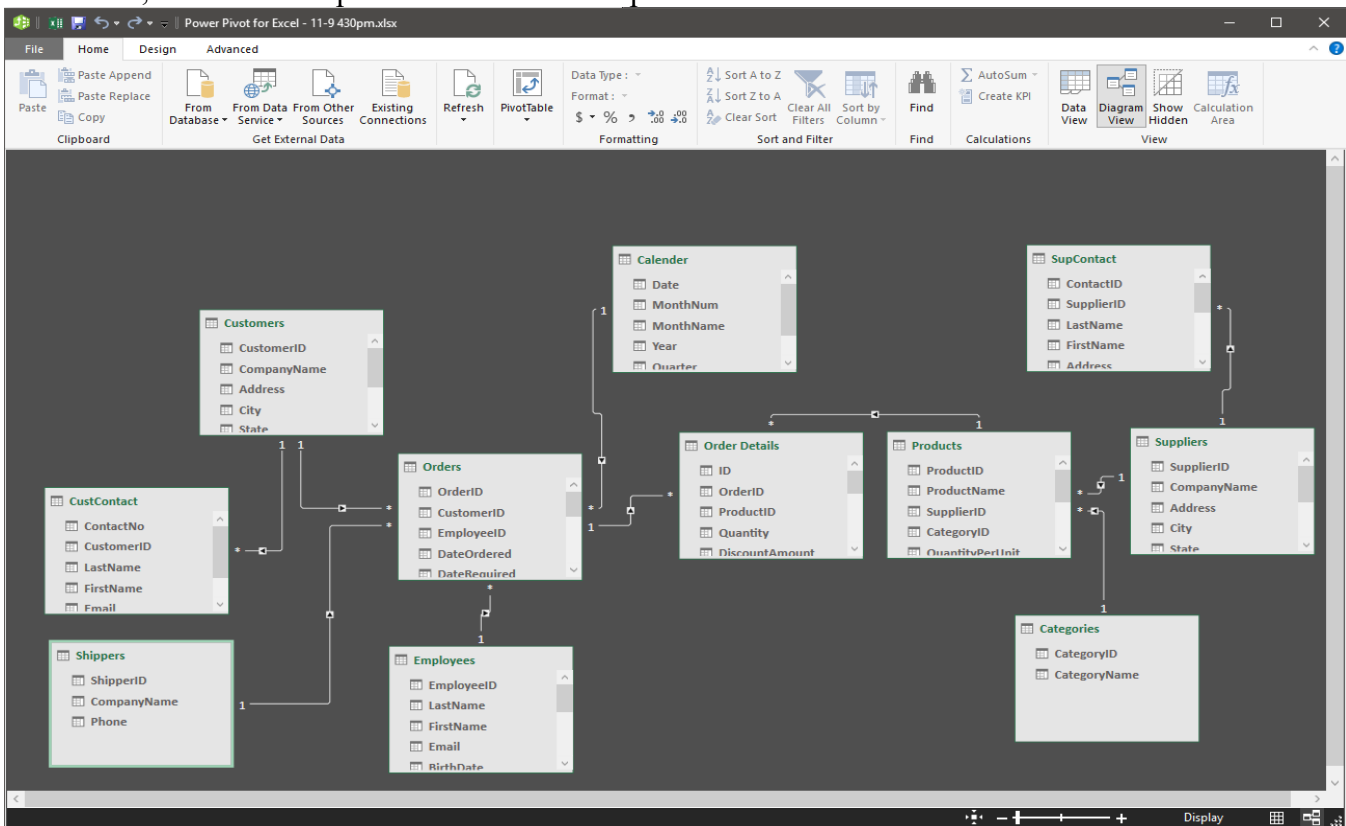
Figure 4: Diagram View of Normalized Data

Implementation

Addition of the Calendar Table. After minor experimentation with the massive data set that created, normalized, and imported, it was realized that most of the questions involved assessing the date of sales. The calendar year is important for businesses and is usually broken down into quarters (Stavros Valsamidis et al.). A user can use the local Excel workbook to import a table into the data set consist-

ing of every single day from the time the first sale was made to current time. Once imported, a user can use PowerPivot's foreign-key detection tool Detect to automatically link the Date from the Calendar table with DateOrdered in the Orders table (Zhimin C., Vivek N., and Surajit C.). Upon switching to Data View in the Manage window, seven calculated columns with the following formulas were created:

Single out the month for "MonthNum"

=MONTH([Date])

Name the month using three characters for "MonthName"

=FORMAT([Date],"mmm")

Single out the year for "Year"

=([Date])

Determine the Quarter for "Quarter"

=CEILING(Calendar[MonthNum],3)/3

Year concatenated with Quarter for "Year-Quarter"

=Calendar[Year]&"-Q"&Calendar[Quarter]

Fiscal Quarter number

=IF('Calendar'[MonthNum]<4,4,'Calendar'[Quarter]-1)

Fiscal Year

=IF('Calendar'[MonthNum]<4,'Calendar'[Year]-1,'Calendar'[Year])

Fiscal Year concatenated with Fiscal Quarter number

='Calendar'[FiscalYear]&"-Q"&'Calendar'[FiscalQuarterNumber]

The above formulas are DAX functions that also happen to be Excel formulas. It was easy to expand these formulas and apply the DAX syntax which uses Table[Column] format. The MONTH and FORMAT formulas were used to format the existing date into manageable columns. The CEILING formula refers to the MonthNum column in the Calendar table and changes the month number to a multiple of three. The formula was then divided by three to get the quarters I needed. Finally, the year was concatenated with the quarter in a visually appealing way for future manipulation and granular analysis of earlier company performance (Sumit G., William H., and Rishabh S.). Concatenation is the linking of two calculated fields together to form one uniform calculated field. The same steps were repeated for the fiscal year and quarter but months with ceiling > 4 had -1, so the fiscal calendar started in March. Figure 5 illustrates the result for the Calendar table in the Manage window.

Figure 5: Calendar Table

Applying Measures. The first application of measures in this walkthrough example was creating a Sum formula. To do this, there was a need to create calculated columns in the Order Details table that would allow the access to the numbers necessary for the Sum calculation. Calculated columns differ from measures because measures are only one cell and do not operate on scalar values (Danyel F., Steven D., and Mary C.) like normal Excel spreadsheets, and pierce through every single datasheet. Calculated Columns resemble traditional Excel formulas and do operate on scalar values.

Once the SubtotalPerOrder column was created and calculated using:

$$=RELATED(Products[SalePrice]) *(1-'Order Details'[DiscountAmount])*'Order Details'[Quantity]$$

the DAX function RELATED was implemented and introduces the calculation of calculating values that can only be achieved through relational database sets. Products[SalePrice] is related to the Order Details table so values can be used wherever necessary to obtain the calculations. Figure 6 below shows the Manage Measures tool in the PowerPivot ribbon where six more measures are entered and calculated to be used in Pivot Tables. Each measure has its cell in the Order Details table and can be edited accordingly. Any time a table name is changed in the data set, or data that formulas are related to

is changed, then PowerPivot will update the entire set. This is convenient when working with over ten tables containing more than one thousand entries.
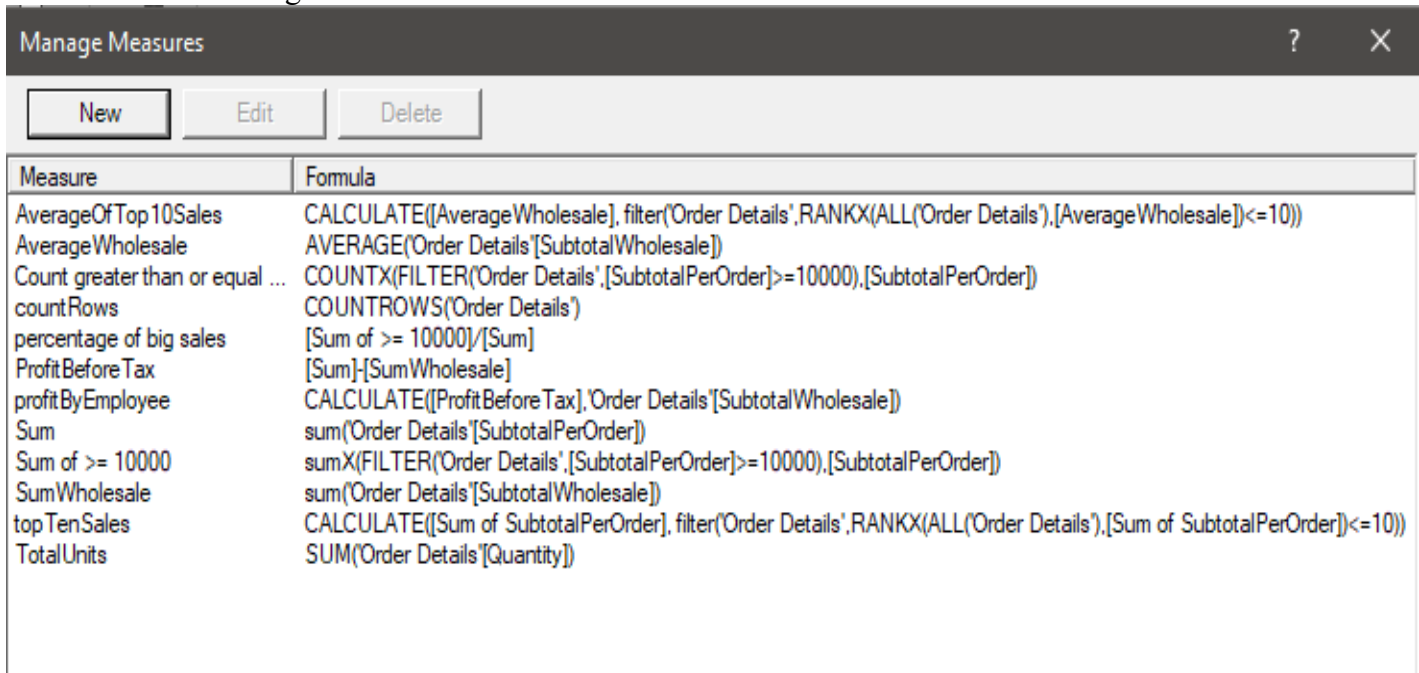
Figure 6: Managing Measures

The measure "Sum of >= 10000" was one of the first questions answered, where the SUMX formula was combined with FILTER to single out special cases where a total order was over ten thousand dollars. The syntax was easy to catch on to, but it was not for some time that I found that SUMX was to be used instead of SUM since the formulas affected more than one column. Figure 7 illustrates a PivotTable that uses both the calculated column and SUMX formula to group OrderIDs in their corresponding Customer.
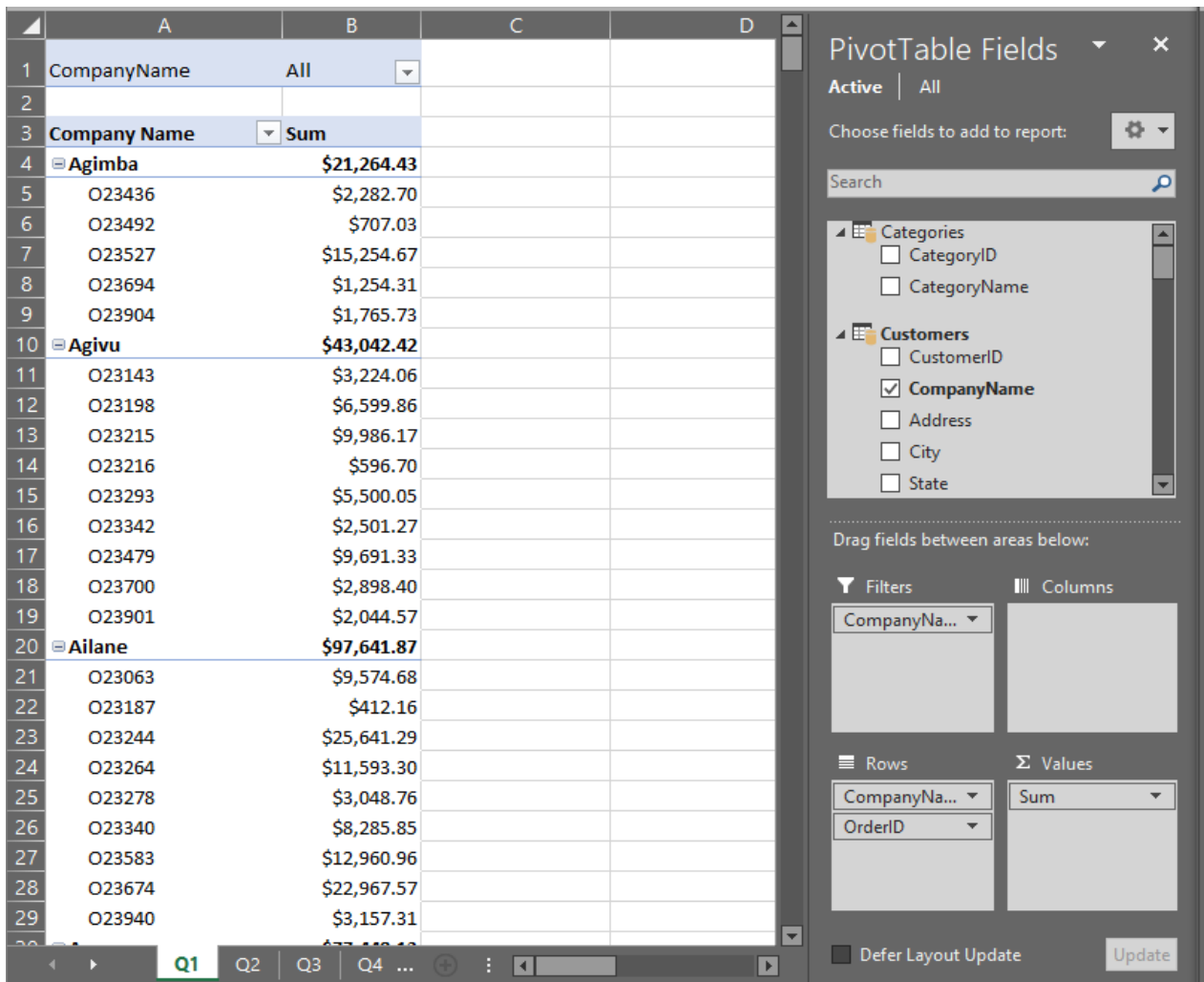
Figure 7: OrderID Grouped by Customer (Pivot Table)

For anyone who has not used a PivotTable before, the above table will give them a new understanding of Excel tables by demonstrating that values can be pulled from tables without having to do any guessing and checking. With the relational functionality, data is again updated throughout so PivotTables are constantly updated when the set is changed by the user or by calculations. The table can be filtered by additional fields and is completely customizable to show whichever range of output a user chooses.

	C	D	E
2			
3		**Row Labels** ▼	**Sum of >= 10000**
4		O23027	$10,462.06
5		O23036	$10,446.67
6		O23227	$10,495.10
7		O23243	$10,393.24
8		O23290	$10,003.74
9		O23343	$10,072.64
10		O23432	$10,444.68
11		O23449	$10,135.62
12		O23458	$10,333.38
13		O23464	$10,019.46
14		O23582	$10,664.68
15		O23674	$10,442.16
16		O23764	$10,456.09
17		O23944	$10,079.59
18		O23987	$10,543.95
19		**Grand Total**	**$154,993.06**
20			
21			
22			

PivotTable Fields

Active | All

Choose fields to add to report:

Search

▲ Order Details
☐ ID
☑ **OrderID**
☐ ProductID
☐ Quantity
☐ DiscountAmount
☐ SubtotalPerOrder
☐ SubtotalWholesale
☐ *fx* Sum

Drag fields between areas below:

▼ Filters   ‖‖ Columns

≡ Rows   Σ Values
OrderID ▼   Sum of >= 10... ▼

☐ Defer Layout Update   Update

Figure 8: Orders Greater Than or Equal to $10,000 (PivotTable)

Figure 8 shows another PivotTable where the SUMX and FILTER DAX formulas were used to single out big orders, under the FILTER expression >= 10000. Companies can use easy calculations like this to drill down to important sales and make compensations accordingly. Since the OrderID is linked to the Order Details table, an employee name or ID can be accessed and go towards determining bonuses or even employee of the month type situations.
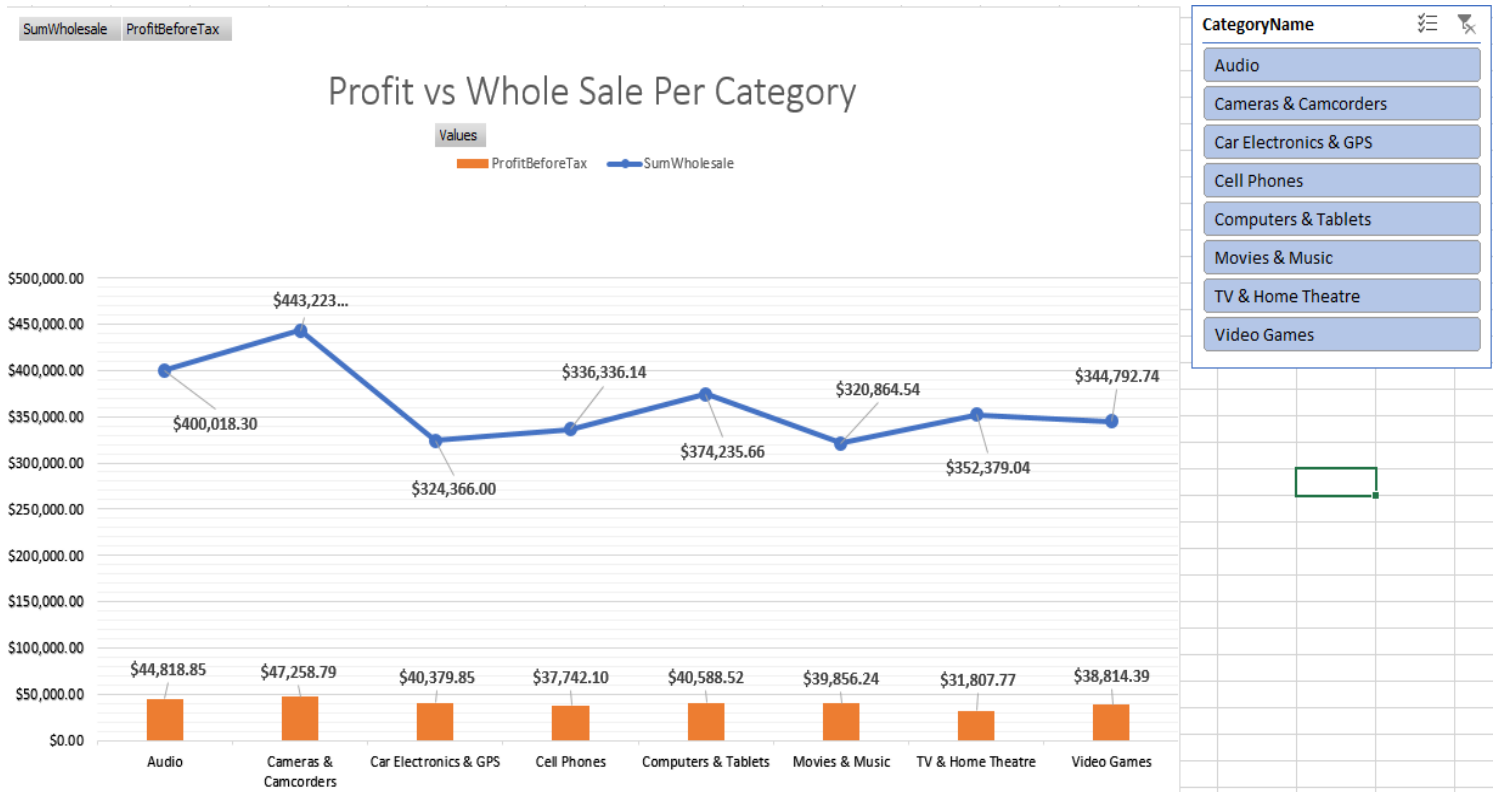
Figure 9: Profit vs. the Whole Sale Per Category

Data Slicer

The Data Slicer tool in PowerPivot allowed answering questions such as what sales looked like in each state while also breaking them down by CategoryName. A normal PivotTable is used in conjunction with the Slicer tool and a bar graph that changes every time a user selects a category from the tool. The categories: Audio, Cameras & Camcorders, Car Electronics & GPS, Cell Phones, Computers & Tablets, Movies & Music, TV & Home Theatre, and Video Games appear as buttons in the slicer tool, and the Pivot Table and bar chart adjust to the sales SubtotalPerOrder in each state. Figure 10 below shows all three aspects of this visual aid while Figure 9 above shows the slicer and a graph.
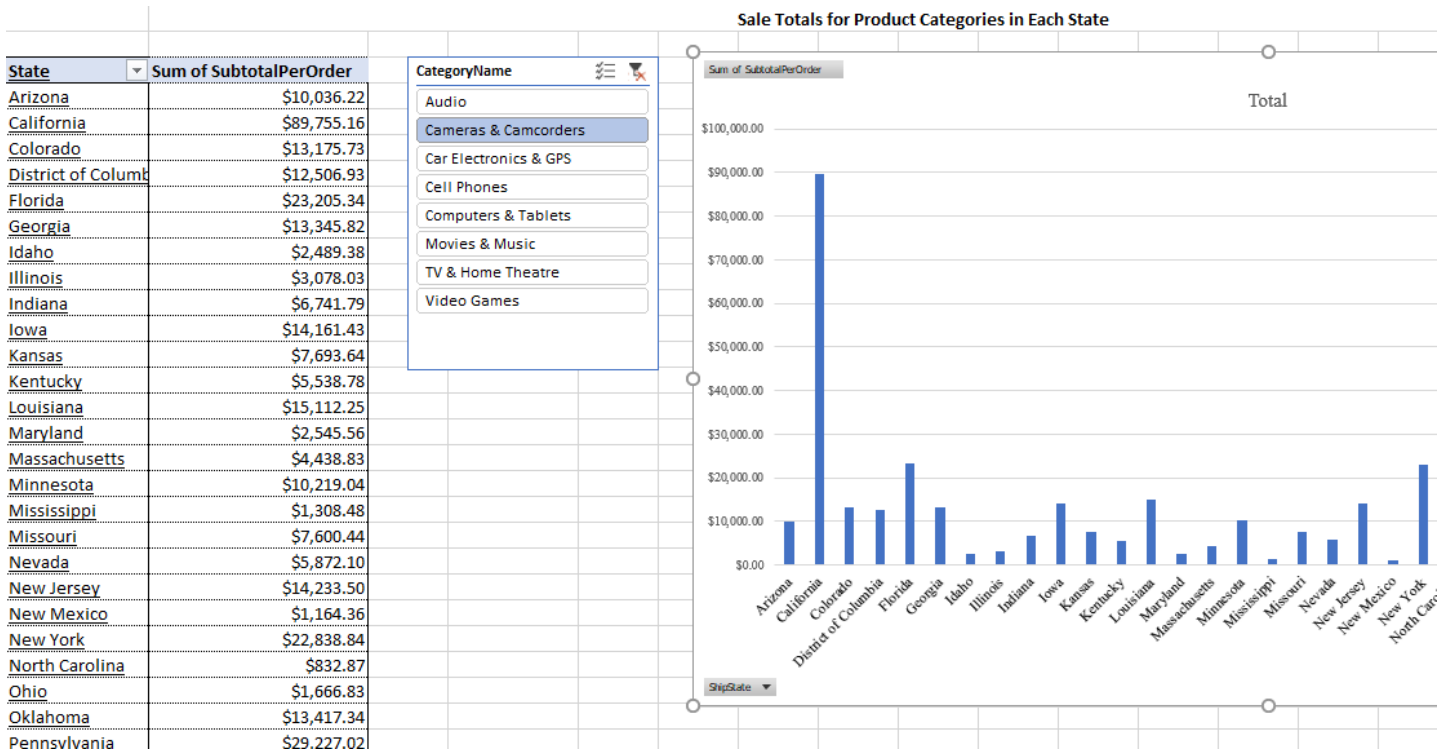
Figure 10: Sale Totals for Product Categories in Each State

PowerView

PowerView is another Add-In mentioned previously and is a visual aid tool where the measures and Pivot Tables created through the entirety of the project can be implemented to show visual characteristics of the data. Like PivotTables, the relational database can be sifted through to provide important information in sequential graphs spread throughout a map or chart. Figure 11 illustrates the use of PowerView to create a visual for the total sales originating in each state of the United States. Each circle represents at least one sale and the larger the circle, the more sales there are in that state. It is apparent that the most sales were in California, Texas, and Florida based on the graphic. Visuals like this can aid in determining where the most business takes place, but also to evaluate which employee covers the most territory in the United States.
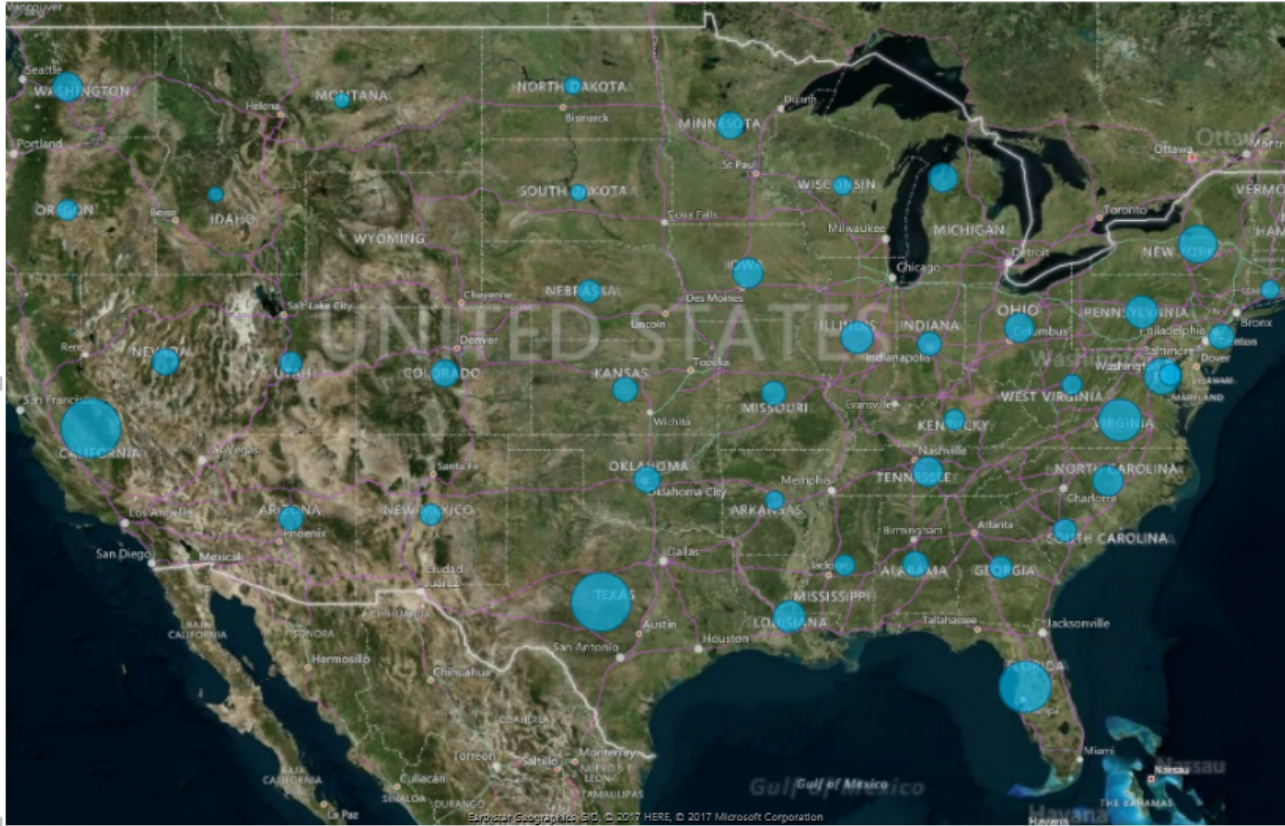
Figure 11: Sales Totals for Each State Shipped

The purpose of the next PowerView visual was to show the country for each supplier along with its contribution to the sales of each category. It is more in-depth than the sales totals for each state shipped since it adds another layer of filtering by adding the CategoryName, linked to the Order Details table by the CategoryID, which adds a pie chart effect to the Power View. Figure 12 shows sales for each supplier divided up by category, where the view can be edited within the software to provide the most customizability possible. The key to the right of the map is automatically constructed when the map option is chosen.
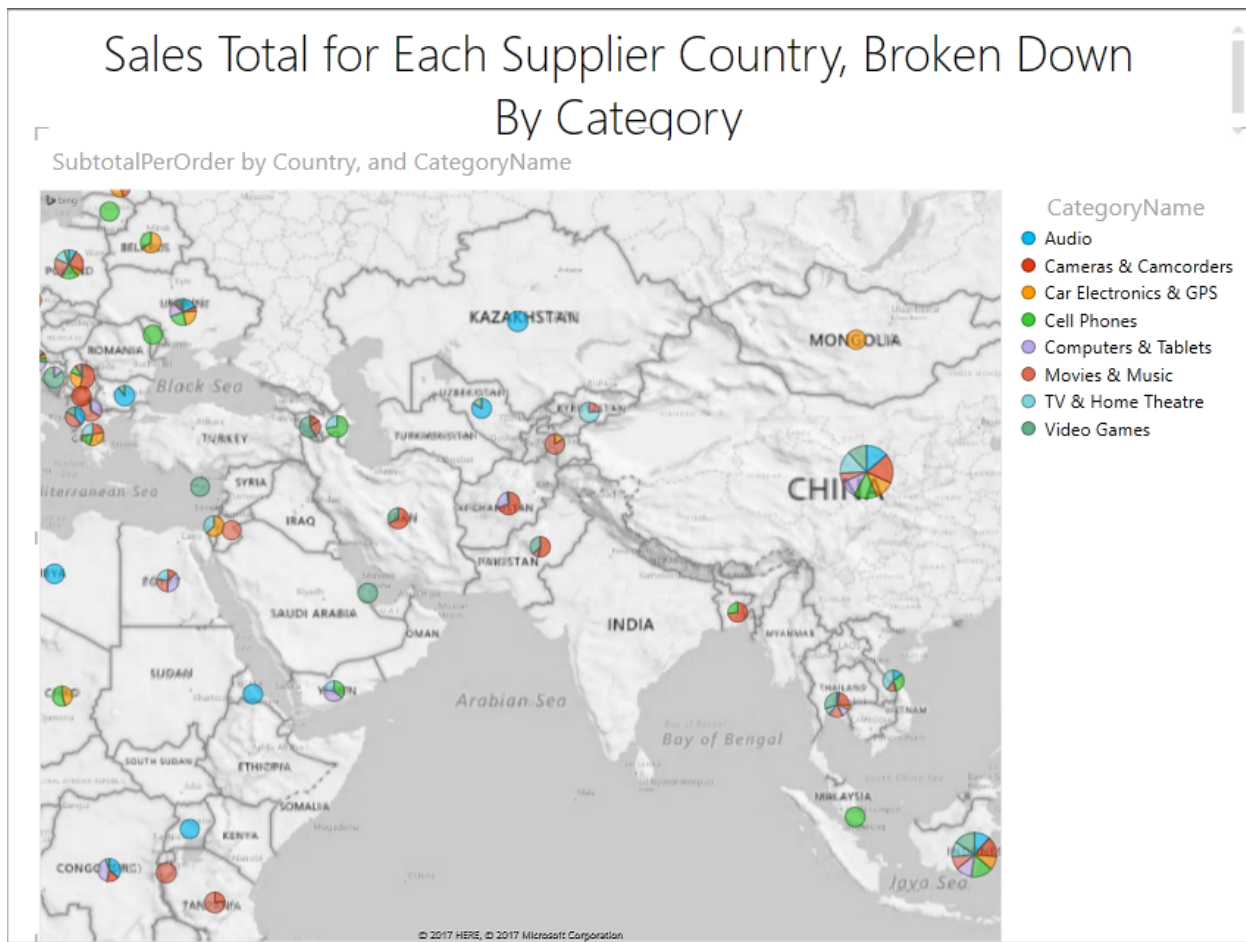
Figure 12: Sales Total for Each Supplier Country by Category

Profit before tax was calculated and displayed visually by implementing both Measures and Power View. A new Measure named ProfitBeforeTax was created using the Calculation Area in the Order Details table that expanded on the original Sum Measure. The Sum Measure calculated the sum of each sale for the sales price, but the ProfitBeforeTax measure used the wholesale price to the company to find the difference. A new calculated field was necessary, "SubtotalWholesale":

=RELATED(Products[UnitPrice]) *(1-'Order Details'[DiscountAmount])*'Order

and is only different than SubtotalPerOrder where UnitPrice is used instead of SalePrice.

Conclusions

PowerPivot and DAX have recently started to get the spotlight from Excel users, and many that were found from reading through the literature review have not had the full awareness of its potential. BI is a hot topic that will stay around for years to come. Businesses are always looking for ways to save both time and money, and the techniques implemented in this suggested class have potential to generate a decent level of understanding toward the application of BI. This difference can be to boost performance or even to help a company that is going under and has no other options.

An educator can use the tools mentioned in this paper to format an Introductory class in BI. A student should be able to learn much in a semester in a course that incorporates the ideas and applications discussed in this paper. There is no question that PowerPivot and DAX are here to stay. Having this type of knowledge and skills in an introductory data analytic or decision-making class will set many students in the right direction.

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Insider Risk: Finding Sensitive Files in the Enterprise using a PC's Master File Table

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Abstract

Individuals whom have legitimate access to network resources, trade secrets, or otherwise sensitive data as part of their daily functions are categorized as an Insider Risk. Insider Risk has been pushed into the public eye in recent years with the Edward Snowden leaks of 2013. Snowden had a business need to access the data he retrieved but the controls around how that data was used were insufficient to protect it. It is important to note is that an Insider Risk does not have to have malicious intent. Human error can cause a data beach just as easily as a hacker can. The problem this paper address is one where users have the proper access to the resources they need while at the same time enabling an organization to monitor where that data resides during its useful lifecycle (for example, if that data is copied to a USB drive or to a cloud storage platform). This paper documents a tool that can be used to inventory known sensitive files throughout an enterprise using a PCs Master File Table. The first step in preventing an Insider Risk from causing a breach is to have an accurate assessment of where the data is, then appropriate actions can be deployed if needed.

Introduction

Insider Risk (or an insider) is a broad and complex problem. In traditional cybersecurity, the hackers are attacking corporate resources through traditional vectors; phishing emails, web site vulnerabilities, USB phishing attacks, misconfiguration in software, or basic malware. Although we might not know who the attacker is, we have a firm understanding of where they are coming from and what they might be after. An Insider Risk is different. An Insider Risk can take many forms (figure 1).

Figure 1. Various manifestations of an Insider Risk

According to Verizon's Data Breach Report (Verizon, 2017), over the 42,000 incidents that were reported, 25% of them were found to have origins with an insider. In other words, someone that was given access to resources misused them causing a breach. Continuing with this trend, 2,500 of the total insider compromises are attributed to 'Miscellaneous Errors' (i.e. Human Error). To exacerbate the insider problem, Verizon reports that Insider Risk breaches often take orders of magnitude longer to discover than traditional, hacker based breaches. Often going undetected for months and many instances, years. The problem becomes one of how do organizations protect their resources from the very people that are supposed to have legitimate access to those assets. One methodology is to attempt to understand the motives behind why an insider causes harm to their employer or steals assets from them.

Goodenough and Decker (2008) investigate the applicability of cognitive neuroscience (the biological methods that influence thought and understanding) to the Insider Risk problem in their paper "Why do Good People Steal Intellectual Property". This domain strives to understand a link between a person's physiological nature of their brain and how a person reacts and thinks in various situations. The authors use an analogy of a song to illustrate how this applies to intellectual property theft. Playing that song or singing it does not omit the opportunity for another person to do the same thing. This is drastically different from physical theft where if a chair is stolen then no one else can use that chair. It is this key differentiation in the type of property stolen where the 'why' insiders steal. With the theft of the song, as is true with Intellectual Property (IP) theft, overuse of the IP does not cause the IP to go away. Admittedly, the IP valuation may decline because of overuse, but the IP can still be used. With the theft of the chair, the chair is gone and goes away. While the utility behind attempting to understand the motives of insiders is debatable, the problem that insiders pose to organization is still very tangible.

Tackling the idea of mitigating the threat posed by insiders by monitoring the databases where the IP is stored is a concept presented by Bertino and Ghinita (2011). In their work, Bertino and Ghinita propose a monitoring system for database management systems (DBMS) that overlays the database and uses anomalous activity detection to determine if a user's activities are malicious or not. They noted that it is ideal to monitor as closely to the IP as possible to get the best results for the anomaly detection engine. That is the reason for the tight coupling with a DBMS. Their results were promising and they were able to detect some data exfiltration cases that traditional firewalls might have missed or ignored. It is noted that many data exfiltration activities will piggyback upon normal network communication channels; many choosing to simply encrypt the data and forward it out to the Internet via HTTP port 443. Bertino and Ghinita proposed a simple architecture where all traffic to and from the DBMS routes through a secure gateway where analysis is performed. Their approach has a couple of challenges. The idea of a secure gateway introduces the potential for a single point of failure as well as a chokepoint for the DBMS. Secondly, and more crucial to insider risk, is that IP can reside in other locations than a DBMS. Within many organizations, IP is located on Microsoft SharePoint sites, file servers, and even stored on technicians workstations. This large and diverse surface makes detection difficult and a single point system only mitigating some of the IP protection needs. The work documented in this paper will not mitigate or prevent data leaving an organization. However, it will help to forensically identify where the data has been staged as well as provide for a data map of where the IP has been.

Anatomy of the Master File Table

The Master File Table (MFT) is a file that is contained on every NTFS file system. This file is named $MFT and is located in the root of the file system but hidden from users unless forensics tools are used (figure 1).
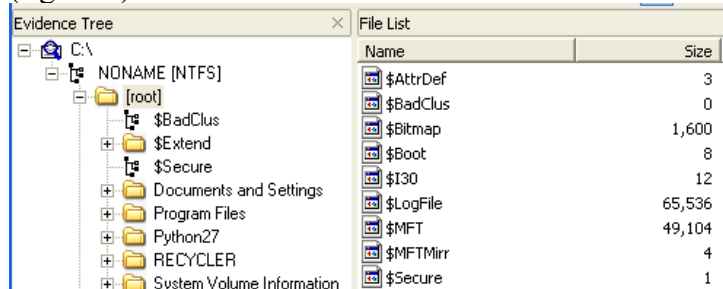
Figure 1. Master file table located in the root of the drive using AccessData's FTK Imager.

The MFT is a table of contents of sorts for all files and folders within a given file system. There is, at a minimum, one entry in the MFT for each file (Carvey, 2014). These entries include metadata about the file including: 1) file name, 2) file size, 3) file location on the disk, 4) data/time stamp information, 5) permissions, and 6) file content (when the file is smaller than ~900 bytes). As files and folders are created, entries in the MFT are also created. However, when files are deleted, they are marked for deletion (i.e. reuse) but not removed. When new files are added, depending upon the size of the MFT, they are either added to old (deleted) entries or to new entries. The reason for this functionality is the MFT is a high volume file that is accessed frequently. To increase the access times of the MFT, Microsoft has designed the MFT to reside in contiguous space on hard drives for increased performance. Because of this, the MFT is preallocated space larger than is needed. It is very common for an MFT to contain an abundance of deleted information – which is good for forensics.

The data structure of the MFT that contains file information is the $FILE_NAME attribute. Within this attribute is the metadata about a particular file. Table 1 is a listing of the $FILE_NAME attributes.

Offset	Length (bytes)	Description
0x00	8	Reference of parent directory
0x08	8	File creation time
0x10	8	File modification time
0x18	8	MFT modification time
0x20	8	File access time
0x28	8	Physical file size
0x30	8	Logical file size
0x38	4	Attributes (flags)
0x3C	4	Extended attributes
0x40	1	Length of file name
0x41	1	File namespace
0x42	Variable	File name

Table 1. $FILE_NAME attribute data structure (Polstra, 2016).

Using this information, we can start to directly process the MFT for interesting file names and start to build a map of where these files are currently located, or have been located in the past.

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Before the MFT file can be processed by our script, it must be converted into another format using the attribute definitions from Table 1 and others defined by (Carrier, 2005). Figure 2 is an example of an MFT file using the forensics analysis tool FTK Imager. Notice the excessive noise in the file as it is not in a human readable format. Notice in figure 2 the sample file name "DEATHS1.DOC1". This is an example of the file name attribute (0x42). It is a short file name in 8.3 format that is commonly used for backward compatibility when applications cannot process long file names with spaces in them. The long file name is also stored in the MFT and can be seen as "Death Star Floor 1.docx". It would be difficult to search this type of file and provide meaningful output without pre-processing activities.

```
2f77c00 46 49 4C 45 30 00 03 00-C6 5A 7F 3D 00 00 00 00  FILE0····ÆZ·=····
2f77c10 06 00 02 00 38 00 01 00-10 02 00 00 00 04 00 00  ····8···········
2f77c20 00 00 00 00 00 00 00 00-07 00 00 00 DF BD 00 00  ············ß¾··
2f77c30 02 00 00 00 00 00 00 00-10 00 00 00 60 00 00 00  ············`···
2f77c40 00 00 00 00 00 00 00 00-48 00 00 00 18 00 00 00  ········H·······
2f77c50 AF E4 DC EC 7C 5D D3 01-01 88 AB FC 7C 5D D3 01  ¯äÜì|]Ó···«ü|]Ó·
2f77c60 82 0D B5 FC 7C 5D D3 01-A1 26 A9 FC 7C 5D D3 01  ··µü|]Ó·¡&©ü|]Ó·
2f77c70 20 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ···············
2f77c80 00 00 00 00 B8 02 00 00-00 00 00 00 00 00 00 00  ····¸···········
2f77c90 A0 D1 42 10 00 00 00 00-30 00 00 00 78 00 00 00  ÑB·····0···x···
2f77ca0 00 00 00 00 00 00 05 00-5A 00 00 00 18 00 01 00  ········Z·······
2f77cb0 8B 01 00 00 00 00 02 00-AF E4 DC EC 7C 5D D3 01  ········¯äÜì|]Ó·
2f77cc0 01 88 AB FC 7C 5D D3 01-61 E9 AD FC 7C 5D D3 01  ··«ü|]Ó·aé·ü|]Ó·
2f77cd0 A1 26 A9 FC 7C 5D D3 01-00 40 00 00 00 00 00 00  ¡&©ü|]Ó··@······
2f77ce0 49 31 00 00 00 00 00 00-20 00 00 00 00 00 00 00  I1······ ·······
2f77cf0 0C 02 44 00 45 00 41 00-54 00 48 00 53 00 7E 00  ··D·E·A·T·H·S·~·
2f77d00 31 00 2E 00 44 00 4F 00-43 00 6C 00 6F 00 6F 00  1·.·D·O·C·l·o·o·
2f77d10 30 00 00 00 88 00 00 00-00 00 00 00 00 00 04 00  0···············
2f77d20 70 00 00 00 18 00 01 00-8B 01 00 00 00 00 02 00  p···············
2f77d30 AF E4 DC EC 7C 5D D3 01-01 88 AB FC 7C 5D D3 01  ¯äÜì|]Ó···«ü|]Ó·
2f77d40 61 E9 AD FC 7C 5D D3 01-A1 26 A9 FC 7C 5D D3 01  aé·ü|]Ó·¡&©ü|]Ó·
2f77d50 00 40 00 00 00 00 00 00-49 31 00 00 00 00 00 00  ·@······I1······
2f77d60 20 00 00 00 00 00 00 00-17 01 44 00 65 00 61 00   ·········D·e·a·
2f77d70 74 00 68 00 20 00 53 00-74 00 61 00 72 00 20 00  t·h· ·S·t·a·r· ·
2f77d80 46 00 6C 00 6F 00 6F 00-72 00 20 00 31 00 2E 00  F·l·o·o·r· ·1·.·
2f77d90 64 00 6F 00 63 00 78 00-40 00 00 00 28 00 00 00  d·o·c·x·@···(···
```

Figure 2. Raw example of a record in an $MFT viewed using a forensics analysis tool – FTK Imager.

Converting the MFT into a format which can be searched is done utilizing a third party script, analyzeMFT (dkovar, 2018). This python script takes a $MFT as an input and returns the MFT in a .csv format. The .csv format is easier to import into other python scripts and allows for simple searching of interesting files. Figure 3 is an excerpt from a processed $MFT that is in .csv format. After the MFT files have been collected and processed into .csv files, searching them for interesting information can commence.

```
"48607","Good","Active","File","6","395","2","/Users/student/Desktop/Death Star Floor
1.docx","2017-11-14 19:15:25.510366","2017-11-14 19:15:52.030413","2017-11-14
19:15:52.014812","2017-11-14 19:15:52.092812","2017-11-14 19:15:25.510366","2017-11-14
19:15:52.030413","2017-11-14 19:15:52.014812","2017-11-14
19:15:52.046013","d7a58421-bec8-e711-aee8-000c29295cae","80000000-4800-0000-0100-000000000300",
"00000000-0000-0000-0300-000000000000","40000000-0000-0000-0040-000000000000","Death Star
Floor 1.docx","2017-11-14 19:15:25.510366","2017-11-14 19:15:52.030413","2017-11-14
19:15:52.014812","2017-11-14
19:15:52.046013","","","","","","","","","","","True","False","True","True","False","False","Fa
lse","False","False","False","False","False","False","False","False","","N","N","N"
```

Figure 3. Example of a comma separated MFT record that has been extracted from $MFT and convert-
ed into a .csv file.

Searching for Protected Data

Searching through a .csv file using python is a relatively trivial task. The difficult work for an organi-
zation is the development and maintenance of a list of known files that contain IP that is being moni-
tored. As the MFT file does not contain other, more detailed information about files, searching for file
names (rather than user names or file contents) is limited. It is noted that files that are smaller than 900
bytes are stored entirely within the MFT data structure. However, no files of IP were found of that
size, so that option is dismissed as a validation method for the tool. Figure 4 is the python script that
searches file names and Figure 5 is sample output and the keywords to be searched.

```python
import sys
import csv

with open(sys.argv[1], 'r') as terms:
    lines = terms.read().splitlines()

print("\n+--- Here are our search words ---+\n")
for each in lines:
    print(each)
print("\n+--- MFT from Computer ", sys.argv[2], "---+")
print ("\nSearch Term -- Record Num -- File Name")

with open(sys.argv[2], 'r') as f:
    readMFT = csv.reader(f, quotechar='"', delimiter=',', quoting=csv.QUOTE_ALL,
        skipinitialspace=True)
    for row in readMFT:
        row = [element.lower() for element in row]
        for term in lines:
            if [x for x in row if term in x]:
                print(term,  row[0], row[7])
```

Figure 4. Python 3 script that searches the parsed $MFT file.

```
C:\Users\lehrf\Documents\python\mft>python searchMFT.py keywords.txt parsedMFT.txt

+--- Here are our search words ---+

luke skywalker
star floor

+--- MFT from Computer  parsedMFT.txt ---+

Search Term -- Record Num -- File Name
star floor 48607 /users/student/desktop/death star floor 1.docx
star floor 48611 /users/student/documents/plans/~$ath star floor 2.docx
star floor 48619 /users/student/appdata/roaming/microsoft/office/recent/death star floor 2.lnk
star floor 48623 /users/student/documents/plans/death star floor 2.docx
```

Figure 5. Output from the IP search python script. Notice the search words and the outputted MFT en-
tries.

The IP script can easily be modified to output the results to a file for further analysis. Increasing the utility of this script would be automating the processing of $MFT files and searching for known files that contain IP. When a new file location is identified, a notice can be triggered and delivered to an operator.

Applying the IP Script in the Enterprise

This tool was tested on a global network under diverse client conditions. Some of the challenges and successes of the tool will be discussed in this section in general terms to protect the subject's environment.

Challenges: This first challenge is not directly related to searching the MFT, but rather the collection of search terms. In large scale enterprises it is often difficulty to identify file names that need to be monitored. In this project, identifying file names was accomplished by locating data owners that had responsibility over various types of IP documents. From here, a list was generated that could be used to search over collected $MFTs.

Collecting $MFTs from endpoints can be another complication of this process. $MFT files are protected, hidden files that are located on the Windows root directory. Traditional methods of file copying will not be able to access and copy the $MFT. This causes the wide scale collection of $MFT files to be difficult. To accomplish this, specialized tools are required. Forensics tools are able to access these files, as well as advanced endpoint malware tools. This project utilized a specialized proprietary endpoint tool for the mass collection of the $MFT files. Free forensics tools like FTK Imager (FTK Imager, 2018) are also useful for collecting the $MFT. However, it is often more complex to capture global $MFT files using FTK Imager. Another method that could be used to capture the $MFT file is a PowerShell script. An incident response script has been published on github (https://github.com/n3l5/irFARTpull) that has the capability to copy $MFT files and has the ability to be automated (n135, 2018).

Successes: Searching for IP files on a large scale network is a complicated task. Having a mechanism where a logical map can be created that contains the location of IP files is helpful in identifying an insider risk. The first step was to create a baseline of where all the files currently reside. This allows the creation of a map of where files live or have previously been, and more importantly, when new locations appear.

Utilizing the initial baseline it is possible to quickly identify new machines that have IP downloaded to them. Creating alerts on the newly identified machines enables incident responders to investigate. Depending upon the alert timing, this advanced warning gives security teams a proactive edge into locating where IP is and how it moves within the corporate infrastructure. Creating an alert structure could be facilitated by an organizations security information and event management system (SIEM). The IP script can send logs to the SIEM where an IP dashboard would present any new locations found. Thus enabling security teams to proactively monitor any changes in IP. Figure 6 is an example of what a baseline would look like if IP locations were overlaid onto a map.

Figure 6. Example visualization based upon the found locations of IP on machines (Splunk Answers, 2018).

Conclusion and Future Work

The IP script was successful in what it was created to do – locate IP files across an enterprise. However, it was determined to be too narrow in scope as it required an exact file name match (or wild carding). The following areas of future work would have increased the capability of the IP script and potentially making it a more versatile tool in combating an insider.

A potential blind spot with searching $MFTs is the need for an exact match for the files names, or at a minimum, a partial match using wildcards. An upgrade to the current script would involve the use of fuzzy logic to aid in the pattern matching of the file names. A promising R package that utilizes the Damerau-Levenshtein distance algorithm, among others, to allow for fuzzy logic searching of the $MFT (Van der Loo, 2014). The Damerau-Levenshtein distance is an algorithm that calculates the minimum number of permutation to transform one word into another. This fuzzy logic would add to the capabilities of the script and account for minor changes in a files name. This type of expansion would aid in combating anti-forensics measures that an insider might use to mask their efforts.

Another area of expansion is the application of data science algorithms to analyze trends in the data. Using asset management within an organization, it would be possible to physically track the location of IP. This might provide for an interesting analysis of the spread of IP within a particular group. Additionally, it would be beneficial to map the physical location of IP within an organization. Knowing who has access to IP and their physical location are two distinct components of an insider risk program. The ability to combine both would greatly add to the capabilities to detect an insider within an organization.

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Net Neutrality: The Changing Landscape

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Abstract

On December 14, 2017 the FCC voted to repeal the net neutrality rules adopted by the FCC on February 26, 2015. The repeal goes into effect 60 days after it is published in the Federal Register. When the 539 page repeal order was released on January 4, 2018 it was not known when it would be published in the Federal Register. The repeal is being challenged on many fronts. Thirty US Senators are backing a plan to block the repeal through congressional action. A coalition of 22 state attorneys general filed a lawsuit to block the repeal in the US Court of Appeals for the District of Columbia. Legislators in many states have introduced bills that would either create state net neutrality laws or use other approaches to preserve the spirit of the 2015 requirements. Gov. Andrew Cuomo issued an executive order in January that preserves open internet protections for New Yorkers. However, the new FCC ruling prohibits state and local government from adopting their own rules. Even Burger King has entered the fray with a pseudo-educational prank advertisement. This paper will attempt to make sense of a very changing landscape.

Introduction

How should broadband Internet service be classified? Is it a public utility or an information service? That question is at the heart of the recent Federal Communications Commission's recent decisions.

On February 26, 2015 the FCC, in a vote of 3-2, classified it as a public utility. The order issued that day banned blocking, throttling (impairing or degrading traffic on the basis of content or service), and paid prioritization. The transparency rule from a 2010 order remained in place. That rule requires fixed and mobile broadband providers to disclose their network management practices and performance characteristics. The FCC at the time claimed that this order was grounded in the Telecommunications Act and Title II of the Communications Act. The 2015 order was challenged in court. In June, 2016 the US Court of Appeals for the District of Columbia Circuit upheld the order and its declaration of broadband as a utility.

It is naïve to think that politics do not plan at least a partial role in the net neutrality debates. Hence it should be noted that in 2015 there were 3 Democrats and 2 Republicans serving on the FCC, with Tom Wheeler, a Democrat, as chairman. After the new administration took office in 2017, the FCC had 3 Republicans and 2 Democrats with Ajit Pai, a Republican, as chairman.

On May 18, 2017 the FCC's Republicans voted to propose a new review of the rules, a review which would include a cost-benefit analysis. Chairman Pai argued that the 2015 rules slowed the telecom industry's investment in building out broadband access and introducing innovative new products. [1] This opened a 90 day period during which comments from stakeholders and the general public were

gathered. Approximately 23 million comments were submitted. However, groups on both sides of the issue began to notice that many of the comments were fake. As many as 8 million of the comments may have been fake, and another million came from real people whose identities were stolen. Nearly a half-million were filed from Russian email addresses, according to one of the Democratic commissioners. [2]   New York State Attorney General Eric Schneiderman and 28 U.S. Senators sought to get the FCC to delay making its decision, but the FCC stuck to the original December 14 date for its decision. A group of ten Congressional Democrats asked the U.S. Government Accountability Office (GAO) to investigate the pervasiveness of fraudulent comments. The GAO accepted the request, considering that the work was within the scope of its authority. The estimate was that it would take about 5 months for the investigation to begin.

The crucial vote took place on December 14, 2017, and "Restoring Internet Freedom" was passed by a vote of 3-2. The text was released on January 4, 2018 and published in the Federal Register on February 22, 2018. Restoring Internet Freedom was to go into effect 60 days after being published in the Federal Register, i.e. on April 23, 2018 (except for some amendatory instructions). However, since the transparency rules were being changed somewhat, the changes are contingent on the US Office of Management and Budget's approval of the modified collection requirement. As of April 26 the approval had not yet been given and hence the 2015 rules were still in effect. The new order restores classification of broadband internet access service as an information service and reinstates the private mobile service classification of mobile broadband internet access service. ISPs must disclose information about their network management practices and performance characteristics (maintaining the standing transparency rule which has been in effect since 2010). Other conduct rules imposed by the 2015 order (blocking, throttling, paid prioritization) were eliminated, claiming that those rules have greater costs than benefits. However, ISPs must disclose any blocking, throttling or paid prioritization. The order preempts any state or local measures that would effectively impose rules or requirements that the FCC repealed in this order or declined to impose. [3]

Not surprisingly, strong reactions followed almost immediately. First, consider possible congressional action. The ultimate solution may require congressional action, but it is not likely that this will happen soon. All members of the Democratic Senate caucus and one Republican support a procedural effort (made possible by the Congressional Review Act) to block the December 14 decision. The OneMore-Vote action day on February 27 was designed to help get the one more vote needed in the Senate, but this would still have to pass the House and be signed by the President. Rep. Marsha Blackburn (R-Tennessee) introduced a bill (Open Internet Preservation Act) to ban blocking and throttling but not paid prioritization. The Internet Association, a political lobbying group which represents Google's parent, Facebook, Amazon, Microsoft, and Netflix among others, wrote a strong letter to Senators McConnell and Schumer saying that it backed Senate efforts to reverse the December 14 vote. The letter also recognized the need for a bipartisan effort to establish permanent net neutrality rules, rules which restore the protections of the 2015 Order.

Legal challenges started quickly. An initial petition was filed by a coalition of 22 states and the District of Columbia. Now that Restoring Internet Freedom has been published in the Federal Register the coalition has re-filed the petition to formally commence the lawsuit against the FCC's repeal of the 2015 order. The coalition is led by New York State Attorney General Eric Schneiderman. The petition has been filed in the U.S. Court of Appeals for the D.C. Circuit, the same court which heard the lawsuit after the 2015 order. [4] The Benton Foundation filed suit against the December 14 decision. The suit

was filed on February 27, the OneMoreVote action day. The goal of the Benton Foundation is to bring open, affordable, high-capacity broadband to all in the United States. [5] Six companies, part of the Coalition for Internet Openness, filed a petition in the U.S. Court of Appeals for the D.C. District on March 5, 2018. Suits have also been filed by Free Press and Public knowledge, two public interest groups.

Despite the provision disallowing state or local measures which would impose rules or requirements repealed in Restoring Internet Freedom, states have been active in various ways. On January 22, 2018 Montana Gov. Steve Bullock issued an executive order which forbids any ISP with state government contracts from blocking or charging more for faster web deliveries. The order applies to new and re-newed contracts signed after July 1, 2018. AT&T and Verizon, among others, hold government con-tracts in the state.   On January 24, 2018 Gov. Andrew Cuomo of New York issued an executive order that prohibits ISPs from entering into contract with the state government unless they agree to policies that mirror the FCC's former net neutrality rules. Other executive orders have been issued by the gov-ernors of New Jersey, Hawaii, and Vermont. The executive order issued by Gov. Phil Scott of Ver-mont states that state agencies may only use service providers that do not throttle, block, or prioritize network content.

Washington State became the first state to pass rules that ban network discrimination. Washington House Bill 2282, signed into law by Gov. Jay Inslee on March 5, 2018 bars ISPs in the state from blocking content, applications, or services or slowing down traffic on the basis of content or whether paid to favor certain content. The law goes into effect on June 6, 2018.   Oregon's legislature passed a bill (by strong bipartisan margins) that bars state agencies from doing business with broadband provid-ers that do not abide by the principles of net neutrality. Gov. Kate Brown signed the bill on April 9, 2018. It goes into effect on January 1, 2019. The law was written more narrowly than the Washington State law in an attempt to survive lawsuits from ISPs. The California State Senate passed bill 460 which upholds net neutrality. The bill now goes to the State Assembly.

Legislators in many other states are considering similar action. However, no such bill will come from the state of Connecticut. A similar bill was proposed and came before the state's Energy and Technol-ogy Committee. The committee has 2 senators from each party; when House members are included the Democrats have a majority. Sen. Paul Formica used a seldom used procedure to require that the four Senators vote first on the bill before it could be considered by the representatives in the House. The vote by the four senators was a tie, which, according to the rules, killed the bill. Sen. Formica feels that this is a federal issues and that they are saving the state from the hassle of fighting an inevitable law-suit. [6] Colorado is also not likely to have such a bill. On April 23, a Republican-led State Senate panel rejected a proposed bill.

Even Burger King jumped in to the debate. On January 24, 2018 Burger King published a new com-mercial on YouTube (shared across Burger King's Facebook, Twitter, and Instagram pages) which was a fictional spoof of the December 14 decision. Customers were being charged for Whoppers in accord-ance with how fast they wanted them to be prepared. Slow MBPS (i.e. making burgers per second!) cost $4.99, but hyper-fast MBPS cost $25.99. The commercial showed customers becoming very up-set, wondering why someone got the Whopper faster! The Burger King brand was trying to make a point that the Internet should be the same for everyone.

It should be recognized that the net neutrality debate involves some big players: service providers such as Comcast, Verizon, and AT&T, and content providers such as Goggle and Amazon. AT&T, which had supported the December 14 decision, took out a full page ad in the New York Times and the Washington Post on January 24. The ad called for a net neutrality law that would govern ISPs and web companies such as Facebook and Twitter. AT&T CEO Randall Stephenson called for Congress to pass an "Internet Bill of Rights", including provisions that would require ISPs to not discriminate in the way they treat online traffic.

On March 8, 2018 the U.S. Judicial Panel on Multidistrict litigation randomly selected San Francisco's 9th Circuit Court to hear the consolidated challenges to the FCC's December ruling. [7] Note that this is not the same court that heard the case in 2016.

Many questions remain as states continue to act and the lawsuits pile up. Will ISPs choose not to engage in blocking, throttling, and paid prioritization (as some claim) even though they could? Has anyone calculated how the December 14 order might change who benefits from the advertising dollars? There ae more questions than answers, and the landscape changes weekly.

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Using Live Projects in the Classroom

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Abstract

Several years ago, we developed a paper for the ASCUE conference about using live projects in the classroom. The Purdue Polytechnic and our department Computer and Information Technology (CIT) have always encouraged the use of team projects throughout our curriculum. As mentioned in the original paper as instructors we are always trying to improve the classroom experience, making it more interesting and meaningful to the student. Typically, the team project used is from the textbook or a project the instructor has worked on in industry and has modified to fit in the context of the class. We have a junior/senior level course CNIT 390 Supervised Practicum designed to combine university study with work experience. We used this course in 2013 and again last fall to give students a chance to work on a live project. The original project in 2013 was for a company that wanted a potential application and planned to view the results before deciding if they wanted to switch or maintain the current system. In 2017, the city of Columbus approached Purdue about developing a new smartphone app that monitored increased train traffic that was disrupting traffic on a main thoroughfare for the EMT, police and general public. They wanted a system developed to go live as soon as possible. In this paper, we will discuss the differences in the two projects and how that affected our efforts, results along with lessons learned from the two efforts.

Introduction

Purdue University has gone through many changes in the past few years, one of which directly affects the learning experience of our students. The development of the Purdue Polytechnic Institute, which Computer and Information Technology is part of, has led to increased emphasis on project based learning and, in particular, on working with industry partners. In the last several years, we have delivered one of our courses, CNIT 390 Supervised Practicum, an existing class that is used for that purpose. This paper will review how the class was organized and delivered and the results of the student developed projects. Finally, since the results of the projects are very different, we will review what we have learned from this experience and what it means in future endeavors involving "live" projects.

Purdue Polytechnic

Purdue University and the Purdue Polytechnic have seen many changes over the last five years. Many of these changes have involved how students should be prepared for jobs when they graduate from Purdue. Purdue President Mitch Daniels introduced a plan named Purdue Moves, with an agenda focused on areas including affordability and accessibility, world-changing research, STEM leadership and transformative education. The goal was to place Purdue as an elite academic institution not only nationally but also worldwide. Purdue Polytechnic Institute is part of the Purdue Moves under STEM leadership and the centerpiece for transforming the technology component. The Purdue Polytechnic Institute (PPI), previously the College of Technology, is one of 10 colleges at Purdue University offering undergraduate and graduate degrees including Computer and Information Technology (CIT). PPI is aimed at transforming the college through renewed undergraduate programs, a state of the art approach to how learning occurs, applied research, and a renewed focus on workforce development.

Among the more important points, PPI values student autonomy with their learning and believes that learning is a personal act of discovery with faculty playing the role of supporting rather than driving the students' learning. PPI also values open-ended inquiries that have inherit risks and are one of the keys to learning and creativity. The PPI values intrinsically motivated students and the just in time approach (learning when needed to solve a problem) as opposed to just in case (in case it might come up on a test). Finally, the PPI believes that, although individual mastery is important, students need to learn to collaborate, as it improves individual learning. The approach taken in one of the courses offered in the Computer and Information Technology (CIT) curriculum, CNIT 390 Supervised Practicum, falls directly in line with the values and beliefs articulated by Purdue Polytechnic Institute. The following sections will review the use and reflections from two recent offerings of the course.

CNIT 390 Course

CNIT 390 Supervised Practicum is an instructor-directed course designed to combine university study with work experience directly related to the student's major. The class is a 3-credit hour course with credit awarded upon the completion of a department-approved project. The course is designed for undergraduate CIT students who desire to integrate both the theory and practice of information technology. The goal is that students will apply what they have learned in previous courses by implementing projects for real users, generally organizations within the community. The course is not new; it has been in the curriculum for years predating Purdue Moves and Purdue Polytechnic initiatives. CNIT 390 is not a required course in the curriculum, but a CIT elective. Because of that and the high amount of effort needed to find acceptable projects and clients, this course is not offered on a regular basis.

CNIT 390, although not created to be part of the Purdue Polytechnic, fits the PPI goals and concept very well. As we have already mentioned, PPI believes that learning is a personal act of discovery with faculty playing the role of supporting rather than driving the students' learning, values open-ended inquiries that have risks, intrinsically motivated students and the students' need to learn to collaborate in an effort to improve individual learning. The basic format of the class involved very limited instructor lecture, no textbooks, in both cases student managed projects with instructors acting as guides to the students, and students required to gain the knowledge of developing the applications outside of the normal classroom. The class has been offered twice at the Columbus campus, in 2013 and 2017. In the

following sections, we will review the course development, delivery of the course, client, and client project and evaluate the course looking at issues that occurred and lessons learned for each course and implications for future offerings of CNIT 390.

2013 Section of CNIT 390

Insul-Coustic Quoting System Project

The instructor solicited clients for a class project. The client selected for the project was Insul-Coustic, a manufacturing company out of Fort Wayne, Indiana. The client was looking for a potential upgrade to an existing homegrown Excel based system to allow the staff to quote projects and manage existing projects. The client made clear it that he would evaluate the end product and then decide if they would implement it.

Format, Schedule and Delivery of the Course

The class was offered in a format with class time reserved for two days a week over a traditional 16-week semester. Days were reserved in case lecture was needed and to make sure students had a common time when they could meet as a team and with the client. The class met in traditional format with lectures and discussion for the first two weeks to introduce the class, project, review the basic systems development approach to be taken in the class, and complete a skills assessment to determine team member strengths. Throughout the rest of the semester, the students were required to create analysis, design and implementation deliverables and meet with the client and instructor with a goal to have the project completed by week 14 (deadline set by the instructor) of the semester with the last two weeks used for project review and lessons learned (and a little extra time in case the project required more time).

Role of the Student, Client and Instructor

The parties involved included the client, students and the instructor. The client was Insul-Coustic. This class involved finding a client (unlike the next section of the class). In soliciting clients, a criterion was to find a company that would be willing to spend time with the students in their role of client on an IT project. For Insul-Coustic, one of the owners agreed to work with the students. He made space in his schedule to work as a client on a regular basis.

The role of the instructor was to be responsible for evaluating the students for the purpose of determining a grade and in terms of the project more of a guidance role. In order to do this, the instructor's role was more a person in charge of application development instead of a project manager. The student's role was setup as the IT group. The goal was to cover all of the functions that would be required to run through the Systems Development Life Cycle.

Evaluate Student Performance

Planning to evaluate student performance created a challenge. The goal was to make sure everyone was evaluated individually. To do this there was a combination of activities that involved not only the

instructor but also the students and clients in the evaluation process. Following are items that were chosen to evaluate students on:

   b. Writing assignments focusing on project reflection
   c. Project update memos
   d. Class assignments such as having each student fill out project time sheets weekly
   e. Client evaluations
   f. Peer evaluations
   g. CONOPS document
   h. Completed application with the documentation

Results of the Development of the Insul-Coustic Quoting System Project

The original scope of the project was large and with the limited time and capabilities. The end product specifications were narrowed to develop a system to handle the quoting process. The class started with two teams performing the initial analysis and then combined to complete the development.

The approach the students decided to take was similar to the Agile or a System Prototyping where the goal was to work in short cycles to get something to the user to test, use and give feedback. Based on the project, user availability and length of the class they chose to work in two-week cycles. The students and client agreed on the scope and determined that if there was additional time at the end they could add features to the project. Based on the user requirements, the students chose to develop a web-based application written in PHP, JavaScript and HTML and using MySQL for the database. The system was completed and user tested within the timeframe of the semester although not on week 14 but closer to final week of the semester. Again, the client was looking at possible upgrades. At the end of the semester, the client chose not to implement the system. The main issue that the client had, which became apparent as the end of development, was that if implemented there was no support for the platform chosen (PHP, JavaScript and MySQL).

Reflections on the Experience

From an instructor point of view, it was a new experience. The instructor role was much more the guide instead of leading the class. This was an adjustment. The class had a more heightened level of excitement, involvement and stress working with a live project as compared to working on "canned" projects. There seemed to be an added ownership as they were creating something that was going to be used in industry and they were not only trying to work for a grade in class but satisfy a client's requirements for a live system. Having said that, some students seemed to disappear into the group and not really participate except for the minimum required. Students noticeably took it upon themselves to search the internet for online tutorials, documentation, etc. on how to accomplish certain tasks that were critical to the project. The students understood this was an unstructured assignment and realized they were not going to be spoon-fed. One area that was difficult in the class was trying to evaluate student performance and to give them a grade. As mentioned, there were multiple assignments throughout the semester but it was difficult to get a feel for individual accomplishments in some cases.

The client filled out a questionnaire after the class on the experience. He stated that the students were interested in the project, inquisitive about the project details, and eager to perform tasks. The cost was minimal and gave Insul-Coustic a chance to evaluate a new concept without investing many resources

or much time. Students overall were dependable, skilled and worked well with each other. From a standpoint of things that could be improved, the main thing he mentioned was giving students more opportunities to work with "real" clients to have a better feel for questions to ask. Overall, the client was very pleased and expressed an interest in being involved again and possibly continuing this project into a later phase.

Students were surveyed about their experience on the project. Students tended to be pleased with their role on the project. They believed they were prepared to work on the project. Students overall felt they were utilized the right amount of time, although there were some who felt they were over utilized and they commented some students were underutilized. The live project led to a lot of real world experience that would have been hard to capture in a normal assignment, this was the most often-made comment from the students. The project gave students experience at working on various aspects of IT instead of, like in most classes where it is programming or systems analysis. Students were pleased with the setup of a student as project manager and the instructor as a guide. There were a few negative comments or suggestions about the project. On the Insul-Coustic project, it would have been nice if the students could have visited the company. For members who were not contributing, the lack of structure could be frustrating. Some students were working on parts of the project that made them feel secluded from the rest of the project. One student was disappointed the product was not used by the company (they were told that the project was a way for the client to evaluate a new concept).

2017 Section of CNIT 390

Train Application Project

In 2017 the city of Columbus Indiana approached Purdue about developing a new smartphone app that would monitor increased train traffic that is disrupting traffic on a main thoroughfare for the EMT, police and general public. The initial goal was to develop a smartphone application that all involved parties could use to get notifications about approaching train traffic. They wanted a system developed to go live as soon as possible. Figure 1 shows the locations of the SecurityPros cameras and a sample status of the key railroad crossings.

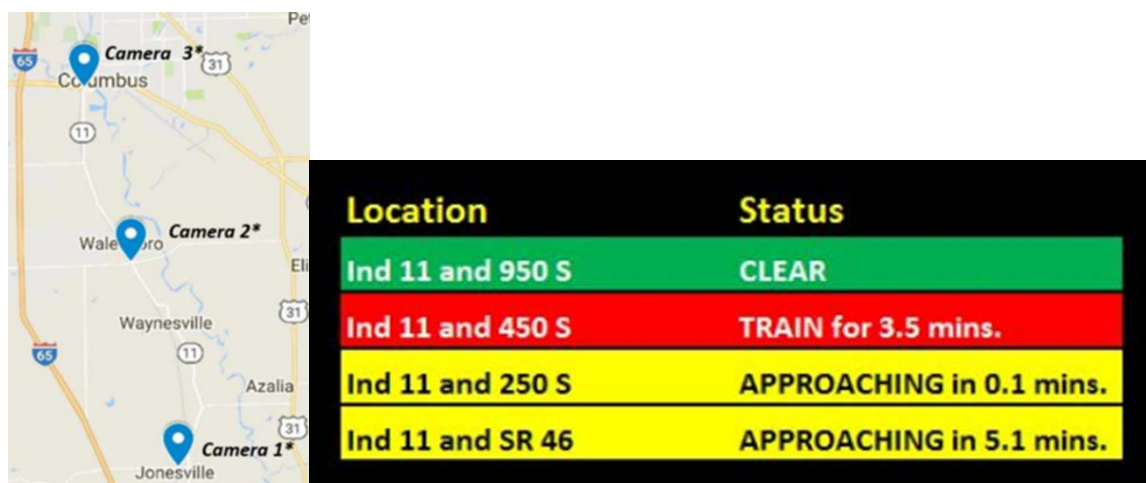| Location	Status
Ind 11 and 950 S	CLEAR
Ind 11 and 450 S	TRAIN for 3.5 mins.
Ind 11 and 250 S	APPROACHING in 0.1 mins.
Ind 11 and SR 46	APPROACHING in 5.1 mins.

Fig. 1. The map and a sample status of the key railroad crossings

In August of 2017, shortly before the class was to begin, the scope of the project was changed for the students to develop a web app, i.e., a website with a mobile version accessible via the smartphone's browser.

Format, Schedule and Delivery of the Course

The class met twice a week, in the conventional 16-week semester format. Lectures alternated with lab sessions devoted to the team project work. The course explored a wide variety of Web application development topics including the major components of the HTML5 — HTML, CSS, and JavaScript — along with traditional and mobile Web design, forms, and advanced topics, such as geolocation and the Google Maps API. Students were expected to use Adobe Dreamweaver, Adobe Photoshop, and Google Web Designer and produce accurately functioning Web apps meeting the given requirements. Most meetings with the client representative were scheduled to take place during the regular class time.

Role of the Student, Client and Instructor

The instructor's role involved teaching front-end development in HTML5, evaluating the students' performance, and providing task formulation and general guidance on the team project. The semester project was an 'unstructured problem solving' experience, so the student team had to manage the project schedule. One of the four students enrolled took on the role of the project manager and contact person, another one concentrated on the front-end web app design and testing, the third student developed the back-end solution, and the other student dealt with the camera and server specification development. The latter task proved harder than the reader might expect, requiring coordination with the system administrators on campus. As a result, the dedicated server donated by the client arrived November 29, 2017, very late in the semester. Nevertheless, it was configured by the end of the semester, as the prior preparation work was done by the student responsible for the back-end development on his own private server.

Evaluate Student Performance

Six homework assignments were given early on in the semester, ultimately contributing ~21% of the final grade. All of them were project-oriented and aimed at getting the project off the ground as quickly as possible. The students were also given the midterm and final exams. The largest single component of the final grade (~35%) was the team project grade that encompassed the project's functionality, documentation, and presentation. Student participation was taken into account as well. The instructor initially intended to take into consideration client evaluations, too; however, that plan was abandoned because the project was not completed by the end of the semester as originally estimated.

Results of the Development of the Columbus Train Tracker Project

Given that the client liked the mock-up website design, a section of the CNIT 355 Software Development for Mobile Computers was added to the Spring 2018 semester schedule, and three out of four original student project participants took this course as well, along with one other CIT student. The project scope was extended to include development of an Android app that would access the Columbus Train Tracker website directly, bypassing the need to use a smartphone browser. By the end of the second semester, the team achievements were as follows.

1. An Android application prototype was developed and presented to the client.
2. The website was made accessible via Purdue VPN and tested to make sure that it received messages from SecurityPros cameras located near the railroad tracks and handled the messages appropriately.
3. The web server, database, and Java application were integrated.

Reflections on the Experience

From the instructor's standpoint, the amount of work needed to learn back-end development in the situation when it was not taught in either of the two courses was greatly underestimated, but the student involved in it went above and beyond all expectations to get the job done. The front-end website and Android app development went just fine. The client was satisfied with the mock-up website and Android app prototype demos.

Four out of five student participants kindly agreed to fill out a questionnaire about the project experience. Regarding their respective roles on the project, one of the respondents reported being very pleased, another one pleased, a third one displeased, and the fourth one very displeased.

The very displeased student was the one responsible for configuring the web server using the Express/Node framework, the Java application used for reading from and interpreting emails from the cameras, the design and implementation of the database server to house all data, the server setup and administration (as well networking), and the integration of all these components with one another. This heroic student was definitely overworked, yet reported that he was under-utilized. He also considers himself overqualified in terms of his technical ability, and that rings true. The displeased student developed the prototype of the Android train-tracking app. He recognized that he was over-utilized, yet reported being underqualified, ostensibly in error or out of modesty. The students primarily criticized the lack of access to the stakeholders, along with the setbacks stemming from the late delivery of the cameras, server, rack, the networking issues, and numerous false positives from the cameras needing more calibration.

The pleased and very pleased students were the ones responsible for the hardware specifications and front-end website development. One of them opined that it was interesting to work "on a project that has application in the real world and can benefit the community."

Evaluating the Courses

To evaluate the course you need to look at it from several viewpoints. From an instructor standpoint, it was a change from traditional classes and involved a different role as mentioned previously, more of a consulting, guiding role than that of a provider of a lecture-driven course. Both instructors felt the students picked up valuable knowledge and real-life experience that is hard to duplicate in the typical class. Most of the CIT classes focus on one area: system analysis, programming, networking or databases. These classes pulled all of these areas together and achieved even more by forcing students to get in and be true problem solvers in order to develop the applications and not have the instructor or book to rely on. In fact, in several cases the students surpassed the instructors' knowledge in areas needed to complete the project. In some cases, this was uncomfortable for the instructor but only natural on projects with far reaching scopes like these.

Examining the course from a student perspective, was it successful? Overall, probably yes, but certainly not of equal value for all students. In a traditional classroom that would be true as well. One student put it aptly; this is not like the programming class where our first assignment is the "Hello World" program. One student specifically mentioned he thought that was the big advantage of this class not just focusing on one area of information technology because everyone has areas of strength and this allowed students in most cases to find their niche. The enthusiasm of the students was evident to not only instructors but to the clients as well who noted that in their comments.

One real issue in both sections offered was that there were several students, who worked much more on the project than the other students. In the first section from 2013, it was two students and in the second section from 2017, it was one student. In both cases, it was the students doing the majority of the coding in the implementation stage. All of the students involved were more than willing to take on the work, even mentioned that they enjoyed the challenge, but it did get to a point specifically in the latest offering of the class that faculty and students met because it was having a detrimental effect on the students' other courses that semester. In both cases, it was not that the other students were unwilling to code, but it was difficult to get the other students up to speed where they could be productive. The tight schedules made it difficult for the students doing the coding to take the time to get others up to speed.

In future offerings it would be helpful to figure out a way to reduce overloading students on the project. Overloading can be especially detrimental to a student if it occurs at the end of the semester, when the student is finishing other courses as well. This was even more stressful to the students because they were trying to satisfy the instructor, but also a client who wanted to use the finished product. For other students, there were periods when they were under-utilized, especially in the case of the 2013 class with eight students in it.

It was extremely helpful to have the clients we had. The time and resources they devoted to the project were generous. The biggest area of difference in the two courses were the clients' goals and expectations for the developed systems.

In the 2013 project, the client expectations were lower and goals of the client relieved some of the pressure of developing the system. As mentioned previously the client's goal was to look at an alternative to their current system. In the analysis phase it was determined there was not enough time in a one-semester class to accomplish the initial goals and the scope of the project was scaled back with complete agreement from the client. When the project was completed at the end of the semester the client tested the system and chose to keep their existing system.

The 2017 section of the course had completely different goals and expectations. Unlike the first course where clients were sought out, the City of Columbus, Indiana, came to Purdue with a problem that they needed resolved. From initial meetings it was clear that expectations were high from the city representatives and from Purdue. For Purdue this was a chance to showcase what Purdue Polytechnic was about and advertise Purdue Polytechnic in Columbus and our program specifically. Initial meetings with CIT faculty, Purdue administration and Columbus in the spring of 2017 raised expectations. From those initial meetings it was determined that the users first wanted a website and then would want apps for Android and iOS devices created. The scope had increased so that it could not be accomplished in a one-semester class with four students enrolled.

Showing the importance and desire to accommodate the clients, Purdue added a second class that most of the students enrolled in the spring 2018, CNIT 355 Software Development for Mobile Computers. Even with this class, the project could not be completed by the end of the second semester and other alternatives are being reviewed such as possibly hiring one or two of the students to finish the project.

Meanwhile, the word of the project leaked and it was publicized in the local newspaper, Indianapolis television station and on the main campus at West Lafayette. All of this was great publicity but also increased the pressure on the project participants. At the present time, the website has been successfully tested. A dedicated server is installed in the client-donated server rack housed in the Networking Lab, and the server's capability to receive and handle messages from the cameras that perform train detection was demonstrated. Website accessibility was established and maintained through Purdue VPN (Virtual Private Network). An Android application prototype was developed and presented to the client. However, the website and the Android app have not been made available to the public yet. There are complications that are still being resolved including insufficient reliability of train detection by the cameras on the tracks (too many false alarms) and internal networking issues (letting the public access the website without having to go through the VPN). At this point, the project is still ongoing, as the City of Columbus expressed the intent to hire a student who would maintain the train app server.

Conclusions

The second offering of the CNIT 390 Supervised Practicum in 2017 was able to expose potential issues with offering live projects. The biggest issue is that expectations need to be managed and contingencies need to be in place. This includes expectations of all involved especially the clients. The scope of both projects exceeded the timeframe allotted – a school semester. In the first case, because of the flexibility of the client, the scope of the project was decreased and the project was finished in the semester. In the second instance, the scope was not reduced, but the timeframe was increased to allow for the development of the smartphone application. Normally, it would not be possible to add a class because this meant changing the sequencing of CIT classes and, with only two full-time instructors, this could make it more difficult to offer the classes that students need to graduate. However, because of the publicity, this was an option.

As instructors, we emphasize that these are students working on the projects as we attempt to lower expectations, but when clients see prototypes (even non-working ones), their expectations rise. Consequently, it is critically important to have a contingency plan that the clients are aware of and agree to.

The second issue that arose in both offerings of the class was the unequal workload that existed within the project, with some students overloaded. In both cases, the overloaded students were doing the majority of the programming. There is no clear answer to this dilemma. The possible options include pair programming and/or having extra students shadow the programmers (as a backup) to the extent possible.

Finally, the size of the class must be managed in order to find a way to utilize all of the students involved. The larger project teams used in the first semester caused more students to be underutilized. However, the use of competing teams alleviated that problem somewhat. In addition to that, having smaller backup projects that students could work on when they were not needed on the main project helped as well.

At this point, the projects appear to be a success, even though the second project is ongoing. This format was a learning experience for not only the students but also the instructors. It has also proven to be a positive experience for the clients and one in which CIT can continue. It requires careful selection of clients and project scope, but delivers a good learning experience for the students.

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Using Chess Programming in Computer Education

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Abstract

Chess programming is an old and venerable branch of game development. In the modern computing environment, it encompasses the development of chess engines, chess user interfaces (UIs), chess tournament broadcast tools, chess databases, endgame tablebases (EGTBs) and opening books. In this paper, the author shares his multi-year experience of utilizing most of these components of chess programming in teaching undergraduate courses in computer science (CS) and computer and information technology (CIT). The courses at different levels were taught at Edinboro University of Pennsylvania and, most recently, at Purdue Polytechnic Columbus, formerly called Purdue College of Technology Columbus. They involved teaching programming in C, C++ and Java, as well as system administration. We will discuss the courses' structure and learning outcomes, the choices of tools and equipment, how the courses progressed, individual assignments and team projects, the lessons learned, the specifics of getting the students engaged, and the author's plans for the future work aimed at improvement of programming and computer networking skills of Purdue Polytechnic students via their involvement in different aspects of chess programming.

Introduction

Chess is a widely popular and well-respected turn-based centuries-old game played on an 8x8 board with white and black pieces (pawns, knights, bishops, rooks, queens, and kings) that move according to the rules that can be quickly learned even by young kids. The art of the game is not easy to master, though, so many software products have been developed to implement chess as a video game on numerous platforms and assist the beginner, amateur, and professional chess players alike. Some of these software products are free and open source, letting the developers learn by examining the existing solutions. Chess programming involves the development of the following products.

1. Chess engines capable of playing the game and analyzing its positions,

2. Chess user interfaces (UIs) that facilitate communication between the user and the engine(s) and/or databases,

3. Chess tournament broadcast tools that allow viewers to follow games online,

4. Chess databases, such as Shane's Chess Information Database (Scid),

5. Endgame tablebases (EGTBs), and

6. Opening books for chess engines to use early in the game and users to explore and learn.

In this paper, the author shares his multi-year experience of utilizing most of the aforementioned components of chess programming in teaching undergraduate courses in computer science (CS) and computer and information technology (CIT). The courses were taught at Edinboro University of Pennsylvania and, most recently, at Purdue Polytechnic Columbus, formerly called Purdue College of Technology Columbus. Purdue Polytechnic Institute (PPI) of Purdue University has a statewide system that offers programs throughout the state of Indiana. One of the main goals of the system is to make technology programs available throughout the state of Indiana. One of such program majors supported in Columbus, Indiana, is computer and information technology (CIT). At each statewide site, Purdue Polytechnic collaborates with a local college that provides non-major classes such as English, Mathematics, etc. The partner of Purdue Polytechnic Columbus is Indiana University Purdue University Columbus (IUPUC). Purdue Polytechnic has its own admissions, programs and recruitment activities in the community.

In the next sections of the paper, we will discuss the courses' structure and learning outcomes, the choices of tools and equipment, how the courses progressed, individual assignments and team projects, the lessons learned, and the specifics of getting the students engaged. The courses involved teaching programming in C, C++ and Java, as well as system administration. They will be grouped into sections according to their level, from 100 to 400. Finally, the author will outline his plans for the future work aimed at improvement of programming and computer networking skills of Purdue Polytechnic students through involving them in different aspects of chess programming.

Chess in a 100-Level Programming Course

CNIT 105 Introduction to C Programming was a 3-credit-hour course offered in Spring 2017 to non-CIT majors – the undergraduate students of robotics engineering technology (RET) and mechanical engineering technology (MET) at Purdue Polytechnic Columbus. Fifteen students enrolled. The students were required to use Code::Blocks 16.01 with the MinGW-w64 v. 6.2.0 compiler to produce accurately functioning 64-bit C applications. The first learning objective of the course being to be able to compile and run a program using the C language, chess software came in handy for the first of the two lab exams, each of which cost 100 points, or ~15% of the final grade.

To show the power of the tools that the students were mastering, the objective of Lab Exam 1 was chosen for them to demonstrate ability to use a modern IDE to compile, debug, run, and configure a multi-file C program. That program was Cfish (2017), the fruit of translation of Stockfish, the strongest free, open-source chess engine in the world, from C++ into C by Ronald de Man to speed up the compile. The students configured Cfish under Arena (2017), a free chess GUI. For 5 points of extra credit, the students were asked to set the Arena timer to 5 minutes and play an optional quick game of chess against Cfish in the lab. The students who did not know how to play chess were allowed to ask the instructor for help and/or follow hints from Cfish. Twelve students received the extra credit, even though only a couple of them had requested the instructor's assistance to make valid moves. This lab exam did not involve programming; it was given during Week 4 of the semester. Figure 1 shows the instructor's screenshot of Arena running Cfish that was used as part of the lab exam assignment.

Figure 1. Cfish playing under Arena: A screenshot from the lab exam assignment.

Chess in a 200-Level Programming Course

The author's first use of chess programming in the academia took place in Spring 2012, when he taught CSCI 230 Principles of Programming II, an undergraduate course at Edinboro University of Pennsylvania. This was the second course in a three-course sequence that taught computer science majors programming in C++. Sixteen students enrolled. Some of those students were members of the Edinboro Chess Club, for which the instructor served as the faculty advisor. In addition to two midterm exams and a final exam, the students were given 12 lab assignments that determined 15% of the final grade, 6 homework assignments (18%), and 4 programs to write (30% of the final grade).

The primary course objective was for the students to be able to "employ the principles of software engineering to design high-quality, structured programs," so I made a decision to base the programming assignments on the code from two famous free, open-source chess engines: Stockfish (2012) by Tord Romstad, Marco Costalba, and Joona Kiiski and Kaissa 1.00 by G.M. Adelson-Velsky, V.L. Arlazarov, and M.V. Donskoy. The code archive of the latter program was received by email from Mr. Anthon Dubetz of DISCo (the now defunct Donskoy Interactive Software Company), along with the written permission to use it.

The first programming assignment directed students to develop a C++ program that would compute all chess proto-moves and output them as a C++ statement that declared and initialized a multi-dimensional array. The students were informed that the resulting statement would be included in the next program, so it had to obey the C++ syntax for multi-dimensional arrays.

For the second programming assignment, the students were provided a starter project derived from Stockfish 2.2.2 and Kaissa 1.00. Their task was to complete LegalMoveGen, a C++ program that would use the pre-computed multi-dimensional array of proto-moves to produce an array-based list of all legal chess moves for a user-specified position and output the list using the provided **move_to_uci()** function.

The third programming assignment was to complete LegalMoveAndFlagsGen, a C++ program that would:
      1. Set all move flags correctly for each legal chess move generated and
      2. Output the detailed list of legal moves using the provided **move_to_uci()** function and a new function **print_flags()** that would report how the move flags were set for each legal move.

Finally, the fourth programming assignment asked the students to modify LegalMoveAndFlagsGen in order to complete OneMoveWonder, a UCI chess engine that would make random legal moves when installed in the Arena interface. This last assignment proved too difficult for the students to complete.

Figure 2 shows the multi-file structure and part of the output of LegalMoveAndFlagsGen for a test position provided in the popular FEN format.

Figure 2. Structure and partial output of LegalMoveAndFlagsGen (Program 3).

Chess in a 200-Level Networking Course

When system administrators have to deal with free, open-source software, one of the common tasks that they are likely to face in their line of work is to compile an executable from the source code and install or otherwise configure the program. Another important thing for the future system administrators to learn is how computers communicate with remote servers via the ports dedicated to FTP and

SFTP connections. CNIT 242 System Administration is a required course in computer networking for CIT undergraduate students at Purdue Polytechnic Columbus. It is taught every spring semester using the resources of Kuber Maharjan Networking Lab housed in the Advanced Manufacturing Center of Excellence. Most recently, in Spring 2018, 12 students initially enrolled in the course, and one of them subsequently withdrew from it. In the spring semesters of 2014, 2015, 2016, 2017 and 2018, the instructor assigned a team project involving a broadcast of a double round-robin tournament called Purdue free open-source chess engine contest (FOSCEC) on the Web. Each time, an effort was made to compile as many of the engines from sources as possible. "Factory" compiles provided by the engine authors were used for the engines that did not compile from the sources, or if the in-house compiles did not run correctly. The tournament games and results are available online at (FOSCEC 2014).

The first three seasons of FOSCEC were played using Deep Fritz 14 (2014), a commercial GUI acquired for the course by the Columbus site. Figure 3 shows the results of the last of those three seasons. The engines are not listed in the table according to their ranking in the tournament, because the table had to be edited manually to account for several engine crashes that Deep Fritz 14 did not automatically count as losses.

season3 Columbus, IN 2016

#	Engine	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Score	Rank
1	Stockfish 210216 64 BMI2	■	½1	1½	½1	½1	½1	11	11	11	11	11	11	11	½1	11	11	27.0 / 30	1
2	Gull 3.0.1 x64	½0	■	½1	11	½½	½½	11	11	1½	11	1½	½1	½1	11	11	11	24.0 / 30	2
3	Texel 1.06a40 64-bit	0½	½0	■	½1	½1	½1	½½	1½	½1	1½	1½	½1	1½	1½	11	11	21.0 / 30	3
4	Firenzina 2.4.3 xTreme x64	½0	00	½0	■	01	½½	0½	½1	11	1½	11	11	11	11	½1	11	20.0 / 30	5
5	Protector 1.9.0	½0	½½	½0	10	■	½½	11	½½	1½	1½	11	1½	½1	1½	11	11	20.5 / 30	4
6	Sting SF 6.1 64bit	½0	½½	½0	½½	½½	■	½1	01	½1	11	½½	11	10	11	11	1½	19.5 / 30	6
7	Cheng 4.39	00	00	½½	1½	00	½0	■	1½	1½	½½	1½	1½	11	11	11	1½	17.5 / 30	7
8	Arasan 18.3	00	00	0½	½0	½½	10	0½	■	1½	11	½0	½1	1½	11	1½	11	16.0 / 30	8
9	Senpai 1.0	00	0½	½0	00	0½	½0	0½	0½	■	0½	10	½0	½½	11	11	11	12.0 / 30	9
10	Vajolet2 2.1	00	00	0½	0½	0½	00	½½	00	1½	■	1½	½1	½1	½0	0½	½1	11.0 / 30	10
11	Bobcat 7.1	00	0½	0½	00	00	½½	0½	½1	01	0½	■	½1	½½	01	½½	½0	10.5 / 30	11-12
12	Crafty 25.0 JA UCI	00	½0	½0	00	0½	00	0½	½0	½1	½0	½0	■	10	½½	½½	1½	9.5 / 30	13
13	Octochess revision 5190	00	½0	0½	00	½0	01	00	0½	½½	½0	½½	01	■	½1	10	½1	10.5 / 30	11-12
14	EXchess_v7.88b_x64	½0	00	0½	00	0½	00	00	00	00	½1	10	½½	½0	■	01	11	8.5 / 30	14
15	Toga II 3.0	00	00	00	½0	00	00	00	0½	00	1½	½½	½½	01	10	■	1½	8.0 / 30	15
16	Scorpio_2.7.7_64_pop_ja	00	00	00	00	00	0½	0½	00	00	½0	½1	0½	½0	00	0½	■	4.5 / 30	16

Generated with Deep Fritz 14

Figure 3. Screenshot of the table of the results of Purdue FOSCEC Season 3 (Spring 2016).

In an attempt to reduce crashes and improve broadcast quality, Season 4 was played using Arena 3.5.1, a free chess GUI routinely used to test the engine compiles, in a combination with another freebie, Tom's Live Chess Viewer (TLCV 2017). Figure 4 features the results of Purdue FOSCEC Season 4. Unfortunately, due to the quirks in the Arena configuration, three engines — Stockfish, Texel and Arasan — were misconfigured to use only one thread instead of the usual 16 on an 8-core Windows workstation with hyper-threading on. In another deficiency of the Season 4 setup, TLCV does not have the ability to broadcast to mobile devices, such as smartphones or tablets.

www.foscec.org/Season4 ×
← → C ⟳ ⓘ www.foscec.org/Season4Classic/PurdueFOSCECSeason4.html

PurdueFOSCECSeason4

Rank	Engine	Score	As	Mc	Cf	St	Gu	Iv	Bo	Fi	Pr	Ig	Se	Cr	Ch	Bo	Te	Op	Va	Ar	To	Oc	S–B
01	AsmFishW_2017-04-09_bmi2	33.0/38	··	==	==	=1	==	11	1=	11	11	11	=1	11	11	11	1=	11	11	11	11	11	567.25
02	McBrain_2017_v21a_x64_bmi2	30.0/38	==	··	==	=1	1=	1=	==	==	11	1=	=1	11	1=	11	11	=1	11	1=	11	11	517.75
03	Cfish_2017-04-18_YC_x64_bmi2	29.5/38	==	==	··	=1	=1	1=	=1	1=	11	=1	1=	1=	11	11	=1	11	=1	1=	=1	=1	525.25
04	Stockfish_2017-04-17_x64_bmi2	27.5/38	=0	=0	=0	··	==	==	==	11	==	=1	=1	=1	11	11	11	11	=1	11	11	11	439.75
05	Gull.3.1_JVx64	26.5/38	==	0=	=0	==	··	==	==	1=	01	=1	11	1=	=1	1=	11	11	1=	11	=1	11	434.50
06	Ivanhoe1945a_x64_AVX2_Intel_2015-07-28	26.5/38	00	0=	0=	==	==	··	10	==	1=	11	11	11	=1	=1	==	11	11	11	11	11	413.75
07	Booot6_popcnt	23.5/38	0=	==	=0	==	==	01	··	11	1=	1=	10	10	11	==	1=	==	1=	0=	11	11	401.25
08	Firenzina_2-4-3_xTreme_x64_AVX2_Intel_2015-07-28	20.5/38	00	==	0=	00	0=	==	00	··	=0	=1	=1	=1	11	==	01	1=	=1	1=	11	11	308.75
09	Protector_Win64	20.0/38	00	00	00	==	10	0=	0=	=1	··	==	11	=1	==	1=	1=	==	1=	==	1=	11	306.75
10	Igorrit_0086v9_x64-Sentinel	16.0/38	00	0=	=0	=0	=0	00	0=	=0	==	··	==	01	00	11	=0	11	11	=1	01	01	248.75
11	Senpai1.0_sse42	16.0/38	=0	=0	=0	=0	00	00	01	=0	00	==	··	11	==	00	==	10	=1	=1	1=	11	241.50
12	Crafty-win64	16.0/38	00	00	0=	-0	0=	00	01	-0	-0	10	00	··	-1	1-	==	--	-1	1-	11	1-	235.25
13	Cheng4_x64	15.5/38	00	0=	0=	00	=0	=0	00	00	==	11	==	=0	··	==	==	1=	1=	01	==	11	228.25
14	Bobcat_v8.0_core2	15.5/38	00	00	00	00	0=	=0	==	==	0=	00	11	0=	==	··	10	1=	==	11	==	11	221.00
15	Texel64	14.5/38	0=	00	00	00	00	==	0=	10	0=	=1	==	==	==	01	··	==	01	==	0=	11	220.75
16	OpenCritter64	13.0/38	00	=0	=0	00	00	00	==	0=	==	00	01	==	0=	0=	==	··	01	10	11	1=	194.00
17	Vajolet2.2.3	12.0/38	00	00	00	=0	0=	00	0=	=0	0=	00	=0	=0	0=	==	10	10	··	11	==	11	164.75
18	Arasanx-64-popcnt	10.5/38	00	0=	=0	00	00	00	1=	0=	==	=0	=0	0=	10	00	==	01	00	··	0=	1=	173.25
19	Toga_II_3-0	10.0/38	00	00	0=	00	=0	00	00	00	0=	10	0=	00	==	==	1=	00	==	1=	··	01	146.50
20	Octochess-windows-sse4-r5190	4.0/38	00	00	=0	00	00	00	00	00	00	10	00	0=	00	00	00	0=	00	0=	10	··	60.50

380 games played / Tournament is finished

Tournament start: 2017.04.20, 15:13:11
Latest update: 2017.07.04, 08:31:29
Site/ Country: AMCE126-2, United States
Level: Blitz 120/30
Hardware: Intel(R) Core(TM) i7-5960X CPU @ 3.00GHz with 31.9 GB Memory
Operating system: Windows 10 Enterprise Professional (Build 9200) 64 bit
PGN-File: PurdueFOSCECSeason4.pgn
Table created with: Arena 3.5.1

Figure 4. Screenshot of the table of the results of Purdue FOSCEC Season 4.

To alleviate the problems experienced before, the instructor decided to use Norman Schmidt's free, open-source CCCC (2018) to broadcast Purdue FOSCEC Season 5. By this point in the Spring 2018 semester, a test tournament of two engines was run at a short time control and broadcast to the FOS-CEC website. Figure 5 displays a screenshot that features the second game of the completed test tournament. We are planning to use CCCC to broadcast a double round-robin tournament of 20 free, open-source chess engines at the classic time control of 120 minutes + 30 seconds added per move for the whole game. This time control was common in early seasons of TCEC (2018), the tournament often regarded as the Unofficial World Computer Chess Championship. (Unlike FOSCEC, TCEC allows participation of commercial engines, private engines, and free engines that are not open-source, alongside

the free, open-source ones.) For each engine, the number of threads should be set to 16. The hash size is set to 4096M for all engines that can handle it (Booot supports up to 2048M), and the ponder option is set to OFF.

The eleven students were divided into three teams. A team of four students was responsible for compiling as many engines from sources as possible and testing the compiles under the Arena GUI. Sixteen engines were compiled and tested successfully, and working "factory" compiles were located for the other four. Two teams of three students each were responsible for the front end (an 8-core Windows workstation) and the back end (an Apache web server running on a virtual Ubuntu server), respectively.
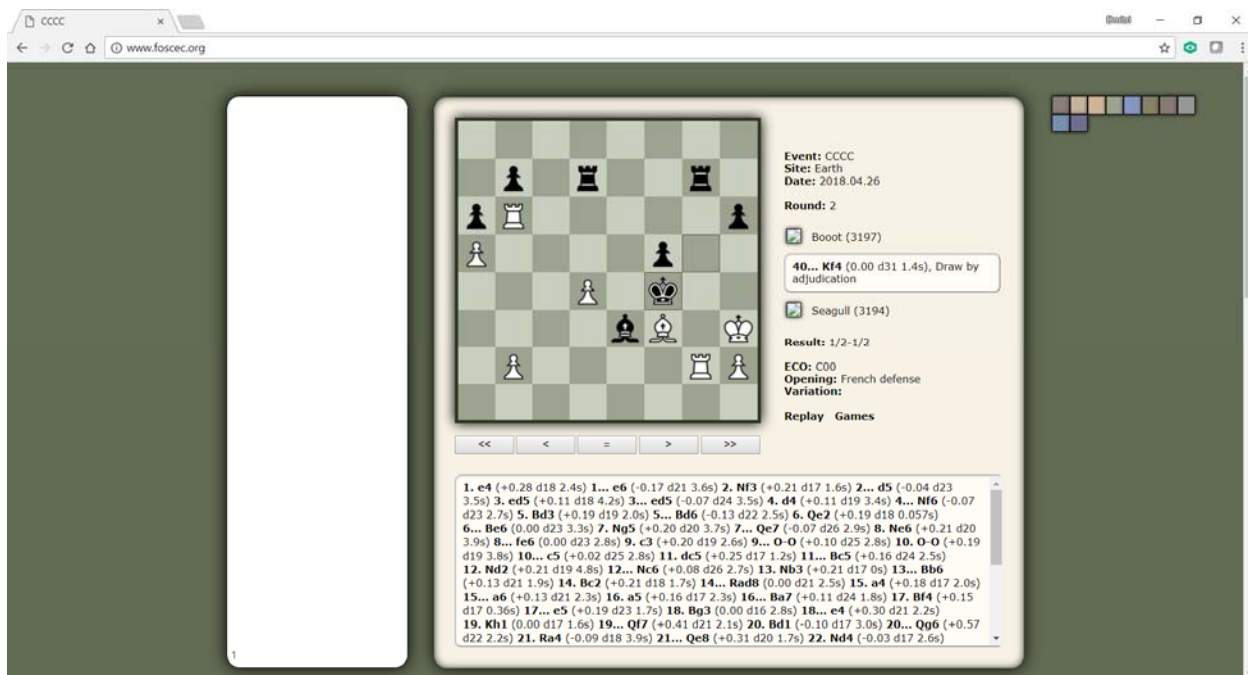

Figure 5. Screenshot of the CCCC-based Purdue FOSCEC Season 5 website.

Chess in a 300-Level Programming Course

CNIT 325 Object-Oriented Application Development is an undergraduate CIT course at Purdue Polytechnic Columbus that focuses on using Java in the development of modern business applications. Topics include object-oriented design, encapsulation, object interfaces, inheritance, aggregation, abstract classes, polymorphism, data structures, and exception handling.

In the Fall 2017 semester, a team of four students successfully completed a project to modify a public domain ComradesGUI chess interface and accomplish the following.

1. Add two timers to the GUI. Once the game is started from a given position, the timer of the side to move will be ticking. Once a move is made, the first timer will be paused and the other side's timer will be activated.

2. Provide means to the user to set the timers initially.

3. Add a Play button that would start a game, provided that at least one chess engine is loaded. The following modes of play are supported: Human vs. Engine1, Engine1 vs. Engine1, Engine 1 vs. Engine2.

4. Once the game begins, GUI will issue UCI commands to the loaded engines to tell them to think and make their moves.

5. Implement game end detection.

6. Make sure that the games can be saved in the PGN format.

The resulting new version was released at the Firenzina website (2017). Figure 6 features a screenshot of two chess engines playing a game under ComradesGUI Proto Type V3. Prior to this release, ComradesGUI worked in the infinite analysis mode only.
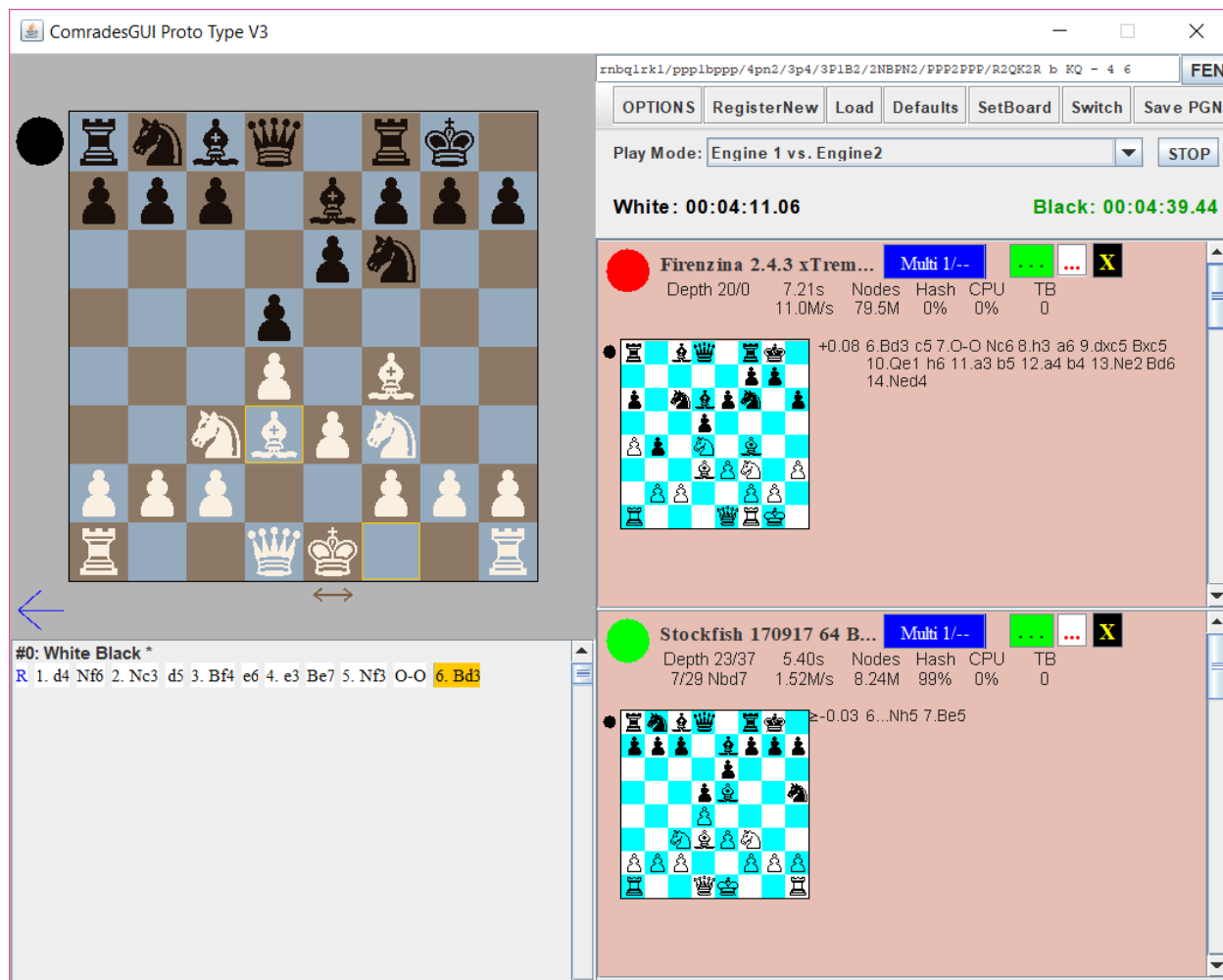

Figure 6. Screenshot of two chess engines playing a game under ComradesGUI Proto Type V3.

Chess in a 400-Level Programming Course

As we reported previously (Gusev & Swanson, 2017), a free open-source chess engine called Firenzina was ported for Android by an undergraduate CIT student who took CNIT 425 Software Development for Mobile Computers II in Spring 2014. Figure 7 features a screenshot of Firenzina playing a game of chess against Stockfish on an Android smartphone under the auspices of Chess for All, a free app.

In the most recent Rapidroid rating by Chesstroid (2018), Firenzina 2.4.3 xTreme for Android was ranked in the Top 10 as of January of 2018, as shown in Figure 8. Firenzina 2.4.1 xTreme for Android was released as #4 according to the very first Rapidroid rating released September 14, 2014, as demonstrated in Figure 9.

Our main challenge in the 400-level courses remains low enrollment. This makes it difficult to give a team project to a team of a sufficient size to be up to the challenge.

Figure 7. A screenshot from the Chess for All app showing gameplay by Firenzina, a chess engine ported to Android for a Spring 2014 CNIT 425 project. Source: Abshire and Gusev (2015).

```
BAYES RATINGS AFTER 23299 GAMES PLAYED BY 132 PROGRAMS
Rnk Name                       O/S T TC  Elo   +    -  Gam Sco Oppo Dra
001 Stockfish 8.0.AP           A32 4 bf 3357  34   32 400 83% 3106 32%
002 Komodo 11.2.2              A32 4 bf 3340  33   32 400 81% 3107 33%
003 Andscacs 0.921             A32 4 bf 3210  29   29 400 63% 3120 41%
004 Ginkgo 2.0                 A32 4  b 3146  28   28 400 54% 3127 43%
005 Chiron 4                   A32 4 bf 3124  29   29 400 56% 3083 38%
006 Texel 1.08a4               A32 4 bf 3084  29   29 396 51% 3079 34%
007 Gull 3 AP                  A32 4 bf 3074  29   29 398 48% 3087 38%
008 Firenzina 2.4.3 xTreme     A32 4 bf 3064  28   28 398 43% 3118 49%
009 Critter 1.6a               A32 4 bf 3062  28   28 406 43% 3116 44%
010 BlackMamba 2.0             A32 4 bf 3061  28   28 400 52% 3054 43%
```

Figure 8. The Top 10 of the January 2018 Rapidroid rating by Chesstroid.

```
Ra Name                    Elo    +    -  Ga Sco Oppo Dra
 1 Komodo 8                3199  125 114 20 73% 3069 45%
 2 Stockfish 5             3186  125 116 20 70% 3071 40%
 3 Critter 1.6a            3118  114 112 20 55% 3085 50%
 4 Firenzina 2.4.1 xTreme  3071  110 112 20 45% 3094 60%
 5 BlackMamba 2.0          3061  129 124 18 58% 3003 39%
 6 Komodo32 3 AB           3022  130 130 18 53% 2986 39%
 7 Senpai 1.0              2952  133 128 16 63% 2884 50%
 8 Gaviota v1.0-d          2930  135 145 18 39% 3006 11%
 9 RobboLito 0.085e4l      2924  125 135 18 31% 3033 39%
10 Texel 1.04              2845  147 139 16 59% 2788 19%
```

Figure 9. The Top 10 of the September 2014 Rapidroid rating by Chesstroid.

Conclusions and Future Plans

The author's long experience shows that chess programming can be used successfully in at all levels of undergraduate computer education, if students are sufficiently motivated.

The instructor intends to continue to use chess programming in the CIT courses to improve programming and computer networking skills of Purdue Polytechnic students. Among possible future programming projects, a re-write of the historically important Kaissa 1.00 chess engine to comply with the modern UCI chess protocol (2018) and a modification of ComradesGUI to use the newer JavaFX GUI library instead of Swing can be named. The research of implementations of chess tournament broadcasts is expected to continue as well.

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When Faculty Behave Like Students

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Abstract:

What happens when faculty become the student in a blended/hybrid experience? Faculty experiencing a blended/hybrid course while developing a blended/hybrid course recounts to Knowles' 2nd principle of andragogy, experience. In a review of the literature, there is a demonstrated need for faculty perceptions as students in their professional development and how this experience affects their practice. This project addresses the experience as the teacher for faculty, and the attitudes from faculty towards the possibilities for better blended/hybrid course development that is student-centered. Studying faculty attitudes and changes faculty make because of the experience will change the focus of professional development.

Presenter Bio:

Jean Bennett has presented several times at ASCUE. Her current position as the Assistant Director of CeTEAL, she researches, designs and delivers professional development programs for faculty. Her current areas of interest include the effect of professional development on student learning outcomes.

Factors Affecting the Use of Computers in Teaching and Learning of Electro-technology in Secondary Technical and Vocational Education and Training (TVET) Institutions

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Abstract:

The study seeks to investigate the factors that affect the use of computers in teaching and learning of electro-technology in Cameroon secondary technical and vocational training institutions. Even though literature have highlighted the important role computer plays as an instructional material in teaching-learning particularly in classroom of perceived difficult subjects such as electro-technology, previous empirical studies have underscored the important role computer plays in facilitating teaching-learning in the classroom situation. It is therefore embarrassing to know that most TVET institutions in Cameroon have not yet integrated the use of computer in teaching-learning of subjects like electro-technology, even though the Government of Cameroon and its development partners have invested huge amounts of money and resources in providing schools in Cameroon with computer hardware and software. Descriptive survey method was used to obtain both qualitative and quantitative data on the factors that affect the use of computers in teaching-learning of electro-technology in Menchum division. Stratified random sampling was used to select 182 students studying electro-technology and 40 electro-technology teachers from Menchum division

Presenter Bio:

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Engaging Professional Development Pathways

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Abstract:

Recently, the demand for professional development (PD) across many campuses has become necessary. The need to stay current with innovative technology continues to increase while many PD budgets decrease. Traditional PD offerings such as "lunch and learn" sessions are useful face-to-face ways to offer training sessions. However, adjunct professors and other faculty/staff on different geographical campuses find it difficult to attend training opportunities on a centralized campus. The need to address the geographical barriers coupled with opportunities for faculty and staff to stay "virtually" connected to campus initiatives during the summer months made hosting a webinar series a solution. Alternative pathways to offering PD were addressed at Campbell University in Summer 2017 through the "Summer Webinar Series". The Summer Webinar Series provided faculty and support staff with the option to gain exposure to technology tools and brainstorm ways to improve course design through technology integration prior to the fall semester. The participation of the first webinar series was high with 94 Campbell University faculty and staff members registering to attend one or more webinars during the summer.

Presenters Bios:

Charlotte Russell Cox is the Instructional Technology Specialist at Campbell University. She holds a BS degree in Education/Political Science from UNC-Greensboro and a MS in Instructional Technology from NC A&T SU. Currently, Charlotte is a doctoral candidate at NC State University.

Allan Winter is the Academic Computing Coordinator and Adjunct Professor of Applied Music (French Horn) at Campbell University. His experience includes instruction in secondary and higher education. His bachelor's degree in Education is from East Carolina University. Allan holds a Master of Science Degree in Education with an emphasis in Music and Computer Assisted Instruction from the University of Illinois at Urbana-Champaign, where he was a graduate assistant at the Computerized Education Research Laboratory.

A Descriptive Case Study of Adult Learners' Completion in the Coaching Digital Learning Massive Open Online Course

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Abstract:

The massive open online course (MOOC) phenomenon allows diverse learners to enroll and participate in a course to learn specific content. However, numerous MOOC participants fail to finish the course in which they enroll (Rivard, 2013). A gap in the literature is motivation for completing a MOOC (self-efficacy and self-determination). The North Carolina State University (NCSU) Friday Institute (FI) is an entity of the NCSU College of Education. The FI MOOC is a free professional development initiative known as MOOC-Ed. MOOC-Ed is designed for K-12 and higher education leaders from around the world. The Coaching Digital Learning MOOC-Ed teaches educators how to facilitate technology integration. My research is a qualitative case study to describe the drivers, barriers, and strategies to complete the Coaching Digital Learning MOOC-Ed professional development. The case study also uncovered descriptions about how MOOC-Ed completers changed their professional practice after the course. Three types of data collection methods (questionnaires, interviews, and documents) were used to address four research questions. Two groups of the Coaching Digital Learning MOOC-Ed were my target sample: Spring 2016 and 2017 course completers.

Presenter's Bio

Charlotte Russell Cox is the Instructional Technology Specialist at Campbell University. She holds a BS degree in Education/Political Science from UNC-Greensboro and a MS in Instructional Technology from NC A&T SU. Currently, Charlotte is a doctoral candidate at NC State University.

Rethink Hyperlinks!

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Abstract:

Hyperlinks and GSuite have transformed the learning landscape. Students and teachers are able to collaborate on a level never seen in history. In this session, teachers will learn a crash course on ways they should be using hyperlinks in their classroom now! Hyperlinks can differentiate, engage, and provide an opportunity for collaboration. Presentation will feature a World War II Digital Encyclopedia created by students with hyperlinks. I will illustrate the successful ways I've used branching with hyperlinks in my classroom and how you can implement hyperlinks into your lessons today!

Presenter Bio:

Candice is a middle school social studies teacher and a Google for Education Certified Trainer that serves the Southeast area in training and consulting. Candice specializes in helping teachers and schools implement G Suite in their current curriculum.

The HESS Consortium: Building a stronger voice in higher education technology for private institutions

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Abstract

In 2014, CIOs for six small private colleges came together to discuss how to collaborate and save money in the area of enterprise systems, primarily ERP systems. Today, the Higher Education Systems and Services Consortium (HESS) has over 100 private, non-profit college and university members across the U.S. representing 262,350 FTE students and nearly 70,000 employees.

This interactive session will discuss the concept for the HESS Consortium, its goals and its accomplishments with ERP, LMS and cloud software providers as well as partnerships with other national and state associations and the E&I buying cooperative. We will also discuss recent contracts with ERP and LMS solution providers and how its HESS partners are making progress in better collaboration between its member institutions and solution providers in the ERP marketplace for higher education.

Attendees will leave with a new understanding of the Consortium, its members and how these schools are working to create a new and stronger voice for small to mid-sized private, non-profit colleges and universities with its major technology partners.

Presenter's Bio:

Keith Fowlkes is Vice President for the Technology Contracts Division of E&I Cooperative Services in Jericho, NY. Keith is a veteran chief information officer in higher education with over 25 years in technology leadership. Keith is also a co-founder and Board member of the HESS Consortium.

Using Simulations to Teach Behavior Management Skills to Teacher Candidates

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Abstract

Developing effective educators is a priority for ensuring that future generations learn successfully. Along with educator quality, there is also a need to reduce attrition within the field of special education. At the core of this issue, for beginning teachers, is the challenge of positively managing students while leaning to teach simultaneously. Beginning teachers cite classroom management as the primary area in which they need support (Portner, 2005) and it is considered one of the most important, but difficult and complex issues teachers face in the classroom (Lee & Powell, 2005). Classroom simulations possibly provide a means of preparing preservice teachers in classroom management skills while allowing them to focus on teaching and learning simultaneously (Dieker, 2008). This presentation will outline a mixed methods study conducted to examine candidate's perceptions of the use of computerized simulation as an effective tool to learn classroom management and discipline. The development, implementation, and assessment of the simulation as well as candidate data on the feasibility of the approach in comparison to other methods of learning classroom management will be presented.

Presenter's Bio:

Dr. Roberta Gentry is an Assistant Professor in the College of Education at Virginia State University. She has been using simulations to assist future teachers with real world applications of concepts learned in teacher preparation programs.

Improving Close Reading Skills: Balancing Technology with Traditional Pedagogy

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Abstract

The Learning Objectives for First Year Composition II at Georgia State/Perimeter College focus on developing the Writing and Research Skills necessary to prepare students for writing requirements across the disciplines and in the workplace. Perhaps even more essential to research writing skills are critical reading skills. Too often, though, students "race to the finish line" when reading the very sources they intend to cite, without considering the context, the argument's scope, or the individual claims made. This often leads students to misquote a source, or misrepresent the arguments and claims made in a source. While advances in writing and research technologies have vastly improved the ease in which we can conduct research, these technologies do not always promote deep reading. In fact, these technologies can at times inhibit deep reading. This presentation explores ways to incorporate the use of technology in the classroom with traditional, "old school" note-taking methods to develop close reading skills and enhance critical thinking.

Presenter's Bio:

Nancy Gilbert has taught First Year Composition and Literature at Georgia State/Perimeter College for 15 years. Her academic interests include Social Linguistics, Media Communications, and Early 20th Century British and Irish Literature.

Transforming College Teaching Using the Active Learning Classroom

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Abstract:

Lecture-based college classes are becoming a thing of the past. Today's students want to actively engage with the material and each other. The University of Lynchburg has created several designated active learning classrooms. Cooperative learning groups, learning contracts, simulations, and role-playing now take the place of PowerPoint slides and lectures. Strategies that utilize Chromecasting, writing on the walls, and utilizing the flexible furniture will be shared. This session will highlight the process and share the strategies that transformed lecture-based formats to fun and engaging active learning classes.

Presenter Bio:

Holly Gould is an Associate Professor in the College of Education, Leadership Studies and Counseling at the University of Lynchburg. Her 28-year career has spanned teaching in elementary and gifted classrooms in Alaska as well as teaching undergraduate, masters, and doctoral students.

Using Templates in Online Course Design

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Abstract for Poster Session

Course templates provide a structural foundation for effective online course design. Effective course design enables accessible, high-quality learning opportunities for students. Course templates are designed to meet accessibility and usability standards, making the course design effective while saving you time in coming up with the design yourself. They are developed based on proven instructional design models and best practices for online learning. Using templates makes course design easier and provides students with a standardized look and feel to each course. Attendees will be provided with take-aways, including recommended resources to using templates in their online courses.

Presenter Bio:

My name is Jessica. I hold a Master's in Instructional Technology, and am currently working on my Ed.S. in Instructional Technology as well. I am also the Instructional Technologist in the Office of Online Learning at Coastal Carolina University.

Replacing the Career Development and Internship Office with a Knowledge Management System to Support Project-Based Internships

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Abstract:

A Knowledge Management System (KMS) can be used as a dynamic alternative to a permanent career development office. Our internship initiative includes program, campus, and community level development phases. Phase I (Ph1) used Blackboard as a technology platform. Phase II will include the utilization of a campus web site portal for students and faculty across academic programs to develop project based internships using the tools developed in Phase I. Phase III will include an interactive software matching platform that community organizations, faculty, and interns can use to arrange and manage project-based internships. This session will present Blackboard's usage to support the Phase I KMS internship initiative on an Ohio University campus. Ph1 includes the intern-partner matching, pre-internship preparation of intern and partner, supervision of project activities, and post internship assessment. Project-based internships, driven by project scope planning structure, provides interns with opportunities to develop workplace competencies and provide a return on internship investment (ROII) for community partners. Ph1 was funded by a 3 year $500,000 Career Ready Internships grant from Great Lakes Higher Education Corporation.

Presenter Bio:

Dr. Hoyt- Professor of Management at Ohio University, supervised 500 internships, facilitated faculty workshops on project-based learning. His work on training transfer includes publications, teaching excellence awards and 2015-18 $500,000 grant from the Great Lakes Career Ready Internship program

Predicting Effective Internships: Developing a Text Analysis Based Algorithm

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Abstract:

Effective internships should be measured based on the skill development demonstrated by student interns and the return on internship investment (ROII) for intern partners. An ongoing challenge is controlling factors associated with the planning and implementation of internships that are more likely to result in an effective internship. This presentation will review a data analytics approach to developing a predictive model to be used identify the most important characteristics of an effective internship. The algorithm uses text analysis methodologies and software to construct a "Best Internship Profile". The presentation reviews how the model strengthens internship planning, implementation, and intern reporting processes and tools required to maximize intern skill development and ROII for partners. The "Best Internship Profile" model used data collected from over 500 internships. Data streams used in the text analysis approach were collected from internship planning documents, learning plans, weekly activity reports, in process work outputs, partner evaluations, and final report documents. Data analysis software used is IBM SPSS Statistics 23 and text analysis software included Provalis Research's Word-Stat7 and QDA miner.

Presenter Bio:

Dr. Hoyt- Professor of Management at Ohio University, supervised 500 internships, facilitated faculty workshops on project-based learning. His work on training transfer includes publications, teaching excellence awards and 2015-18 $500,000 grant from the Great Lakes Career Ready Internship program

Developing a Self-Paced Orientation for Online Students

Sali Kaceli
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Abstract

A key component of the online education initiative for any institution is the proper training and support of the students enrolled in online courses. In this session we will explore components that we incorporate in our self-paced student orientation. In addition to showing a demo of our online orientation, we will also focus on the various tools and mechanisms we have put in place for our online students to succeed in their studies.

Presenter's Bio

Sali has been serving as Director of Educational Technology and Distance Learning at Cairn University since February 2012. Prior to this position, he served as Manager of Academic Computing for 14 years for the University.

Establishing a Distance Learning Framework for the Institution (revisited)

Sali Kaceli
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Abstract

As online education continues to be a critical component of the long-term strategy of the institution, establishing a Distance Learning Framework is key to ensuring quality online education and at the same time meet federal and accreditation requirements.

In this session we will revisit what we presented 3 years ago and will cover additional key components of our successful framework that resulted in 10+ online programs in just a few years. We will also discuss best practices and findings along with the need to establish new policies in accordance with accreditation requirements.

Presenter's Bio

Sali has been serving as Director of Educational Technology and Distance Learning at Cairn University since February 2012. Prior to this position, he served as Manager of Academic Computing for 14 years for the University.

Using VoiceThread®: Promoting Engagement and Communication in the Online Classroom

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Abstract

Encouraging collaboration and meaningful communication in an asynchronous online course can prove challenging. Lacking the face-to-face discussion that is featured in the traditional classroom setting, it is imperative for instructors to create a sense of community to engage online adult learners. One modality for furthering classroom discussion is VoiceThread®. VoiceThread® is an audio-visual tool that allows students to orally present and respond to each other, bringing to life what was previously only possible to communicate by the written word. VoiceThread®, a web-based platform that enables users to collaborate in a cloud space, was successfully used recently in an online asynchronous nursing course. Functioning as an 'interactive discussion board', VoiceThread® promoted conversation and peer collaboration in response to nursing practice concepts presented by the instructor. With no extensive learning curve required, students were able to comment by posting a response using a webcam, audio only message using a microphone, or by phone. Use of VoiceThread® in this asynchronous environment not only promoted a sense of connection between peers, but helped students exemplify a command of the material through verbalization.

Presenter's Bio:

Nicole Lipscomb-King, MSIT, MSTS, is the Instructional Designer for the Georgia Baptist College of Nursing of Mercer University. Nicole provides personalized, curriculum design support to the College of Nursing faculty members serving both undergraduate and graduate programs.

The Coming of Cognitive Computing

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Abstract:

Cognitive computing----embedded artificial intelligence (AI) within computer programs---is rapidly becoming not only possible, but necessary. The rapid rise of analytics, especially Deep Learning analytics, has fostered the development of computers that can act as though they are intelligent, i.e., they can understand requests, connect data points and draw conclusions, much like humans. They can reason, observe and plan. Decades of AI research and analytics tools development have merged into the world of cognitive computing.

Some real world examples:
 • Insurance companies using cognitive computing to learn the underwriting guidelines, read the risk submissions, and effectively help underwriters;
 • Banks using cognitive computing applications to build better and more intimate relationships with customers;
 • Cognitive computing being used to help fantasy football enthusiasts manage their choices and teams more effectively;
 • Education using cognitive systems to create customized learning solutions, individually tailored for each student.

This presentation will outline and explain the developments in cognitive computing, including examples and predictions for future developments in cognitive computing.

Presenter Bio:

Dr. Steve Knode is a retired Air Force officer. He has an extensive background in data analytics, artificial intelligence, virtual reality, decision support systems, and quantitative methods. His current position is as a faculty member developing and teaching graduate courses in data analytics.

Teaching an IT degree program, Informatics, with Concurrent Learning/Teaching Model (CLTM)

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Abstract:

Mercer Informatics program is offered at multiple locations as well as online. Majority of our students are non-traditional students. Last year in the ASCUE conference, we talked about some challenges we faced and presented a solution by adopting Concurrent Learning/Teaching Model (CLTM) to teach in-class students at the same time with the online students. Due to the subject matter of the Informatics, many instructions of the informatics course contents need a lot of hand on interaction experience. CLTM allows and encourages student-instructor and student-student interactions. Students and faculty feedback show that screen sharing and presentation recording function gave them a lot of flexibility. The result of surveys on CLTM was very positive. In today's education, online is not referring online as asynchronous format anymore. It could be hybrid, blended, or concurrent teaching. This year, we are going to present the expended version of this CLTM by teaching two physical locations as well as online students at the same time.

In this talk, we will share our survey data on CLTM model application. In detail, we are also going to give a demo on how to set up the concurrent teaching in two locations and online simultaneously.

Presenter's Bio:

Dr. Liu is Associate Professor of Informatics. Her areas of professional expertise include computer graphics and algorithms, information visualization, real-time Web 3D, real-time platform independent shading, human-computer interaction and Web applications and usability studies.

Using Addigy to Manage Apple Computers

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Abstract:

Addigy is a cloud-based IT Mac management solution. With Addigy you can deploy software and updates, enable FileVault encryption with a master key, configure settings via policies, run powerful reporting and monitoring tools, and much more! In this presentation, we'll show how we're starting to use Addigy at Washington and Lee University to manage our Apple computer labs and client computers. Topics discussed will include: installing the Addigy client, creating and configuring policies, creating and deploying silent install packages for updates and software.

Presenters' Bios:

Tom is a Technology Integration Specialist at Washington and Lee University. He facilitates the use of technology in academic offices, providing end-user support for staff and faculty. In this role, he analyzes workflows and specific job needs for departments and recommends technology solutions.

Generational Attitudes On Adoption of Social Media in Higher Education Settings

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Abstract:

This qualitative study explored generational attitudes on the adoption of social media in higher education. Online interviews, focus groups, and document reviews provided the sources of data for the inquiry. The interview produced eight emergent themes: (a) The Need for Incorporating Social Media, (b) Decline in Social Media Usage with Age, (c) Older Generational Reluctance to Engage through Social Media, (d) Millennials Understand the Usefulness of Social Media, (e) Millennial Privacy Issues, (f) Heavy Use of Social Media, (g) Uncertainty of Social Media Engagement, and (h) Willingness to Engage through Social Media. The study concluded generational attitudes exist among Baby Boomer, Generation X, and Millennial faculty members and Millennial and Generation X students. Recommendations for the research include a study of the same phenomenon at a PWI, a single case study of social media use among faculty, a comparative study of social media use among men and women in higher education, and a mixed methods study of social media.

Presenter's Bio:

Charles Iyon Mitchell, a Durham NC, native, is an Assessment Professional at North Carolina Central University. Mr. Mitchell is pursuing a Doctor of Philosophy from Hampton University, and has earned Masters Degrees from NCCU, and a B.A. in Geography from UNC-Chapel Hill.

Control and Customization: The Opportunity to Tailor the Learning Experience to Improve Outcomes

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Abstract:

The purpose of this study was to investigate the traditional approach to teaching graduate accounting with textbook only in comparison to teaching with the use of digital tools. The aim was to introduce students to the use of digital tools and how it could be used to enhance their twenty-first-century skills in preparation for the workplace.

Presenter's Bio:

IJames Kyle Page is a visiting assistant professor of accounting and academic adviser. Professor Page holds a Doctor of Education degree in Higher Educational Leadership & Innovation from Wilmington University, and a Master of Business Administration degree from Sacred Heart University.

Phriendly Phishing: An Awareness Campaign

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Abstract:

Phishing attacks are on the rise and .edu account credentials are a sought after commodity on the dark web. Compromised account credentials create headaches not only for the user and IT staff , but also the entire organization if a degraded email reputation results in blacklisting. What's a CIO to do? Roanoke College launched an in-house phishing awareness campaign where small groups of users were sent a "phishy" email. If they clicked the link and gave up their account credentials, they were directed to an "Oops" web page with information on how to identify phishing scams. This presentation will describe how the awareness campaign was executed, percentage of users who clicked the link and willingly entered their credentials (you'll be shocked), and the many lessons learned.

Presenter's Bio:

Mark Poore is the Chief Information Officer at Roanoke College and recently celebrated his 20th year in Information Technology. He was appointed CIO in October 2016. Before coming to Roanoke College in 1997, he held several IT positions in software development companies.

Active Communication and Engagement with Online Students

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Abstract:

Effective communication between faculty and students is a key component of the learning experience. Because of the nature of distance learning, many online students feel disassociated from the traditional brick and mortar classroom experience. Blogs, vlogs, instructor videocasts, discussions, and synchronous lectures are key components of increasing student engagement in an ever increasingly technologically advanced learning environment

Presenter's Bio:

Dr. Stephen E. Ruegger is an Associate Professor of Criminal Justice and Public Safety Leadership at Mercer University. He also serves as the program coordinator for the Master of Science in Criminal Justice and Public Safety Leadership.

Reducing Classroom Response Times from 24 hours to 5 minutes: A Case Study of Skyrocketing Tech Support!

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Abstract:

College IT Departments are often judged by how effectively they respond to requests for technical assistance. The quality of this support is under the most scrutiny when faculty and students are dealing with technical issues in their classrooms. Significant equipment downtimes in these environments can have a dramatic impact on learning outcomes, faculty attitudes, and student satisfaction. Salt Lake Community College [SLCC] has had to address this issue head on over the past decade as it grew from a small regional technical school into one of the largest community colleges in the nation. Now with over 60,000 students spread out across 10 campuses, classroom tech support has become a significant challenge for the IT Department.

Using SLCC as a case study, this presentation will outline the critical steps all IT Administrators and Staff can take to dramatically improve the productivity of their classroom tech support, even when facing the challenging realities of limited personnel and shrinking budgets. Solutions include focusing on organizational design, staff training, hardware solutions, leveraging related Departments, networked equipment monitoring, creative budget requests, and garnering Administrative support.

Presenter's Bio:

Kurt Shirkey is the Director of Classroom Technology Support at Salt Lake Community College - one of the largest community colleges in the nation. For 15 years he has designed the instructional technologies for 500+ learning spaces. To relieve stress, he also teaches American Government courses.

Online Course Design & Delivery: A Self-Paced Hands-On Approach to Faculty Professional Development

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Abstract:

Recent migration to a new learning management system provided an opportunity to implement a professional development program designed for faculty that combines both technology and pedagogy. The use of the learning management system (LMS) is encouraged across all course delivery methods. Therefore, a decision was made to design three different modules based on individual faculty needs. The first module (Level 1) focuses on the integration of technology into the traditional classroom to encourage the use of the LMS within face-to-face courses. The second module (Level 2) focuses on the design of a course for hybrid delivery and covers topics relevant to courses delivered in a hybrid format (at least 50% online). The third module (Level 3) focuses on the design and delivery of a fully online course and includes instruction on additional tools used to support synchronous and asynchronous learning activities. Breaking the content down into three different modules makes it more manageable and enables faculty to complete the level required of them for their specific course delivery method.

Presenter's Bio:

Jacqueline Stephen is the Director of the Office of Distance Learning and the Instructional Designer at Penfield College of Mercer University. Jacqueline is also an Instructor in the Human Resources Administration & Development's Program at Penfield College of Mercer University, Georgia

Integrating Technology into Traditional Face to Face Classroom Courses

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Abstract:

This session will focus on ways to integrate online learning tools into face to face classroom courses with students who may be resistant or anxious regarding online learning and technology. Research findings from classroom activities over the past two years will be presented highlighting ways technology has been incorporated and student feedback from the experiences. Recommendations based on these findings will also be presented with the hopes of engaging the audience in a "how might you" conversation about potential applications they could consider for their future traditional face to face classroom courses.

Presenter Bio:

Dr. Lynn Tankersley is an Associate Professor of Criminal Justice in the Department of Leadership Studies in Penfield College of Mercer University. Prior to coming to Mercer, she worked in the field of corrections throughout the State of Texas.

Enhancing the Student Experience in Online Learning

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Abstract

This panel is designed to allow higher-ed faculty to hear from students and professionals in the field of online learning regarding ways to improve the teaching and learning experience online. Panel members will consist of students from all levels of online education: undergraduate, master's, post-master's, and doctoral programs. Online learning professionals on the panel will give their insight from both sides of the spectrum.

Presenters' Bios:

Matthew is an Instructional Technologist at Coastal Carolina University (CCU). He is passionate about online course design and the establishment of online instructor presence. He holds an Ed.S. in Instructional Technology and is a nationally certified QM Peer Reviewer for Higher Education courses.

Jacqueline is an experienced Director of Distance Learning and Instructional Designer with a demonstrated history of working in the higher education industry, nationally and internationally. She is currently pursuing a Doctorate of Education in Instructional Design and Technology.

Space Matters: Integrating Learning Spaces, Technology and Teaching Methodology to Drive Increased Student Engagement and Success in STE(A)M Education

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Abstract:

This presentation highlights how the successful integration of progressive learning spaces with the expanding use of education technology and progressive teaching methodologies are contributing to increased student engagement and success in higher education.

Research findings published by the National Academy of Sciences and other sources are highlighted to demonstrate the positive impact of flexible and collaborative learning strategies on student outcomes in STE(A)M education.

Presenter Bio:

Frank serves educational institutions and ed tech companies in a consultative role that supports all aspects surrounding progressive learning spaces and education technology. He leverages over 30 years of experience from across education administration, teaching and ed tech private sector roles.

Presenters Index