The 5th Annual

POLYTECHNIC SUMMIT 2013

Bridging Boundaries

June 5-7, 2013
Wentworth Institute of Technology
Boston, Massachusetts

Sponsors:

WENTWORTH Institute of Technology

SOUTHERN POLYTECHNIC STATE UNIVERSITY

UNIVERSITY OF WISCONSIN STOUT
WISCONSIN'S POLYTECHNIC UNIVERSITY

AXIS COMMUNICATIONS

POLYTECHNIC SUMMIT 2013

Table of Contents

**Please note: titles and abstracts have not been edited but are printed based on author submissions.*

The International Journal of Polytechnic Studies (IJPS) welcomes submissions for the Fall 2013 Issue.

The IJPS publishes medium-length articles (approximately 5-10 pages) on all things polytechnic—research, theory, teaching, and polytechnic applications of science, technology, industry, and business.

For information about publication and submission guidelines, contact:

Mark Stevens
IJPS Editor
(678) 915-7380
mstevens@spsu.edu

To see past issues of the IJPS:

1) Use INTERNET EXPLORER or GOOGLE CHROME (rather than Firefox).
2) Go to <http://polytechnicjournal.org/>
3) Click The International Journal of Polytechnic Studies.
4) Register (fill out info) and hit "Register" at the bottom of the page.
5) Browse: By Issue.

This year's theme: Bridging Boundaries

Many of the greatest opportunities for innovation in energy, medicine, manufacturing, information technology, and other key sectors stem from interdisciplinary collaboration. Most of the biggest problems facing society, such as climate change, require interdisciplinary solutions. Polytechnic universities built around the development of strong programs in distinct disciplines face the task of responding to a world that increasingly demands individuals with interdisciplinary knowledge and experience. At the same time, polytechnics are being challenged increasingly to collaborate with partners in industry, the nonprofit sector and government, to take on projects that benefit their communities and regions, and to connect internationally in an increasingly global society. The theme of the 2013 summit, *"Bridging Boundaries,"* is an effort to explore how polytechnics are reaching across disciplines, across economic sectors, across town-gown lines, and across international borders to strengthen the quality of education they offer and the impact of faculty and student work. Among this year's panels, workshops, talk, and posters, you'll find lots of presentations that highlight ways of breaking through disciplinary and other "silos" to make polytechnic education stronger.

June 5, 2013

Dear Polytechnic Colleagues,

On behalf of Wentworth Institute of Technology's faculty, staff, and students, I am delighted to welcome you to the 2013 Polytechnic Summit. Wentworth is proud to host the Summit in 2013 and 2014—the first ones to be held in the Northeast!

As the 2013 Summit program goes to press, the schedule includes 100 paper presentations, 27 panels and workshops, and 44 posters. The Summit begins and ends with distinguished speakers. Our opening keynote speaker, Governor Michael Dukakis, will address the nexus of public policy, higher education, and the high-tech economy. The closing keynote speaker is Ken Reardon, nationally known for interdisciplinary, community-based projects in communities including East St. Louis, New Orleans, and Memphis.

This year's off-site event is a behind-the-scenes look at Boston's transportation infrastructure. Dubbed "Big Dig Night," the evening includes a reception and tours of two world-class transportation facilities: the Haymarket vent building and the Highway Operations Center (the nerve center of Boston's street and highway transportation management system).

The Program Committee has scheduled ample time in the program for you to enjoy all of the attractions that Boston has to offer. From Wentworth's campus on Huntington Avenue, all of Boston's attractions are accessible via public transportation, taxi, or private vehicle. Many are accessible on foot.

Throughout your visit, if there is anything we can do to make your Polytechnic Summit experience more worthwhile or enjoyable, please ask any of our staff. Whether you are looking for directions to a particular room on campus or a particular Boston landmark, a great restaurant recommendation, or help with a projector or laptop, all of us at Wentworth are eager to assist.

We are excited to welcome you to the 2013 Polytechnic Summit, to Boston, and to Wentworth. Have a great Summit!

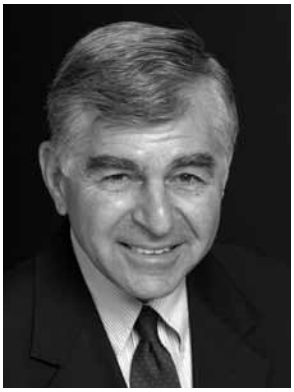
Best Regards,

Zorica Pantić

Zorica Pantić, Ph.D., E.E.
President

OPENING KEYNOTE SPEAKER

Wednesday, June 5, 2013 11:30 a.m. - 1:00 p.m.



Michael S. Dukakis

Michael S. Dukakis is a Distinguished Professor of Political Science at Northeastern University and a visiting professor of public policy during the winter quarter at UCLA. His research has focused on national health care policy reform and the lessons that national policy makers can learn from state reform efforts. He and former U.S. Senator Paul Simon authored a book entitled *How to Get Into Politics-and Why*, which is designed to encourage young people to think seriously about politics and public service as a career. More recently, he and Professor John Portz of Northeastern co-authored a new book on public management entitled *Leader-Managers in the Public Sector- Managing for Results.*

Dukakis served as governor of Massachusetts from 1975 to 1979 and from 1983 to 1991. He was voted the most effective governor in the nation by his colleagues in the National Governors Association in 1986 and received the Democratic Party's nomination for President of the United States in 1988.

A graduate of Swarthmore College and Harvard Law School, Dukakis also served in the United States Army in Korea from 1955 to 1957. A native of Brookline, Massachusetts, Dukakis and his wife, Kitty, continue to reside there. They have three children and eight grandchildren.

CLOSING KEYNOTE SPEAKER

Friday, June 7, 2013 Noon - 1:30 p.m.
"Creating Interdisciplinary Approaches to Wicked Urban Problems"

Kenneth M. Reardon

Professor, University of Memphis

Ken Reardon is a professor in city and regional planning at the University of Memphis. Ken, along with Professor Katherine Lambert Pennington, is currently involved in an advocacy planning effort with the residents of the city's last remaining public housing project and the launch of Memphis' first mobile food store – the Green Machine. Prior to joining the Memphis faculty five years ago as professor and director of the graduate program in City and Regional Planning, Ken was an associate professor and chair of the Department of City and Regional Planning at Cornell University, where he pursued research, teaching, and outreach in the areas of neighborhood planning, community development, and community/university development partnerships. Among Ken's most significant Cornell accomplishments was the completion of the *Peoples' Plan for Overcoming the Hurricane Katrina Blues: A Strategy for Building a More Vibrant, Equitable, and Sustainable 9th Ward,* undertaken in cooperation with ACORN. Before joining the Cornell faculty in 2000, Ken served as an assistant and associate professor of Urban and Regional Planning at the University of Illinois at Urban-Champaign, where he established and directed the East St. Louis Action Research Project for nearly 10 years. Ken earned his B.A. in Sociology from the University of Massachusetts-Amherst in 1976, his Master of Urban Planning degree from Hunter College of the City University of New York in 1982, and his Ph.D. in City and Regional Planning from Cornell University in 1990. He also completed a post-doctoral research fellowship in Public Policy and Minority Communities at the Hubert H. Humphrey Institute at the University of Minnesota in 1996. Ken has received numerous awards for his engaged scholarship activities, among them the American Institute of Certified Planners President's Award, the Lynton Award for Professional Development, the Dale Prize for Excellence in City and Regional Planning, and the Tennessee Medical Association's Public Service Award.

BIG DIG NIGHT

Polytechnic Summit participants will have a unique opportunity to learn about Boston's famed "Big Dig." Begun in 1991 and completed in December 2007 at a total cost estimated at more than $14.8 billion, the project has been characterized as "one of the most technically-challenging infrastructure developments ever undertaken in the U.S." The Big Dig replaced an elevated six-lane highway, the Central Artery, with an extended subterranean highway, culminating in a 14-lane, two-bridge crossing of the Charles River. In addition, the Massachusetts Turnpike was extended from its former end, south of downtown Boston, through a tunnel (Ted Williams Tunnel) under South Boston and Boston Harbor to Logan Airport.

On Thursday evening, June 6, summit participants can tour two facilities related to the Big Dig: the Highway Operations Center and the Vent Building 4. The Vent Building 4 is one of seven structures that form the "lungs" of the Big Dig, as intake and exhaust fans replace bad air with good along the tunnel's three-mile length. The fans, along with pumps, generators, batteries, and other equipment, occupy several subterranean floors of the vent building. An on-site reception and overview of the Big Dig project will precede a tour of those lower floors.

The tour will also include the Highway Operations Center (HOC), which has one of the most advanced "smart highway" systems in the world. The HOC can monitor all of the traffic in the tunnels, ramps, and highways constructed as part of the Big Dig, as well as the majority of other roads and tunnels in Boston. The system uses a range of intelligent transportation systems (ITS) devices including 1,400 loop detectors, 430 cameras, 130 electronic message signboards, 300 lane control signals, and carbon monoxide detectors. HOC staff draw on more than 35,000 data points to compile a detailed picture of traffic conditions, used to manage traffic flow, incidents, ventilation, security, fire detection and emergency response.

Hundreds of thousands of people drive through the Big Dig every day, but very few get to see the amazing behind-the-scenes infrastructure that makes it possible. We thank the Massachusetts Department of Transportation for opening their facilities to us, and hope you'll take advantage of this unique opportunity.

Buses will depart the West Lot at 5:00PM promptly. They will drop off at the Lenox Hotel and Wentworth at approximately 9:00PM.

Program at a Glance

Wednesday, June 5, 2013

8:30am – 5:00pm	Conference Check-in and Information Center in Flanagan Center 103
11:30am –1:00pm	Lunch and Keynote Speaker in Watson Auditorium: Michael Dukakis
1:15pm – 2:15pm	Concurrent Session 1: Panels and Workshops
2:30pm – 3:30pm	Concurrent Session 2: Panels and Workshops
3:45pm – 4:45pm	Concurrent Session 3: Panels and Workshops
5:00pm – 6:30pm	Reception and Poster Session in Watson Auditorium
	Dinner on own

Thursday, June 6, 2013

7:00am – 8:30am	Breakfast - Beatty Cafe
8:30am – 5:00pm	Conference Check-in and Information Center in Flanagan Center 103
8:45am – 10:15am	Concurrent Session 4: Panel, Workshop, and Talks
10:30am – 12:00pm	Concurrent Session 5: Panel and Talks
Noon – 1:00pm	Lunch in Watson Auditorium
1:15pm – 2:45pm	Concurrent Session 6: Talks
3:00pm – 4:30pm	Concurrent Session 7: Panel and Talks
5:00pm	Buses depart West Lot for Special Event
5:30pm – 9:00pm	Special Event: Haymarket Reception and Tour of Big Dig Facilities
9:00pm	Buses return from Special Event to the Lenox Hotel and Wentworth
	Dinner on own

Friday, June 7, 2013

7:00am – 8:30am	Breakfast - Beatty Cafe
8:30am – 11:30am	Conference Check-in and Information Center in Flanagan Center 103
8:45am – 10:15am	Concurrent Session 8: Panel, Workshop, and Talks
10:30am – 11:45am	Concurrent Session 9: Panel, Workshop, and Talks
Noon – 1:30pm	Lunch and Keynote Speaker in Watson Auditorium: Ken Reardon

POLYTECHNIC SUMMIT 2013

Agenda

WEDNESDAY, JUNE 5

Session 1
1:15 - 2:15 p.m.

Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 426	Ira Allen Room 326	Williston Room 001 Manufacturing Center
Workshop 175: *The Inclusive Classroom: The Whys and Hows of Supporting Retention of Underrepresented Students* (C. Haigh, P. Fowler, WIT)	**Panel 152:** *The (Inter) Discipline of Architectural Education* (M. Neveu, C. Hadimi, T. Peters, WIT)	**Panel 45:** *Interdisciplinary Faculty Collaboration: Creating a Bioinformatics Minor* (M. Werner, J. Russo, H. Wu, D. Rilett, A. Ahrabi, L. Grove, D. Dow, P. Valverde, WIT)	**Panel 24:** *Flipping Out on Critical Thinking: Engaging Activities Across Disciplines* (B. Stutzmann, D. Colebeck, SPSU)	**Workshop 76:** *Synthesis of Biodiesel at a Polytechnic School, Part 1* (G. Sirokman, WIT)	**Workshop 66:** *Manufacturing Center Tours and Demonstrations* (P. Rourke, WIT) Also offered in Sessions 2 and 3.

For more information about each panel, workshop, poster or talk, see the Abstracts section of this agenda. (All conference abstracts are listed in order by their reference number that appears in this schedule.)

WEDNESDAY, JUNE 5 (CONTINUED)

Session 2
2:30 - 3:30 p.m.

Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 426	Ira Allen Room 326	Williston Room 001 Manufacturing Center
Workshop 124: *Carving Your Initials into Google: Developing An Online Persona* (G. Andres, Jarrod Slavinskas, Emmanuel College)	**Panel 165:** *Building a Sustainable Town/Gown Engagement Model* (P. Hafford, C. Hotchkiss, E. Miller, S. Pascal, WIT)	**Panel 86:** *The WIT Visioning Process* (J. O'Brien, WIT)	**Panel 27:** *Infusing Leadership Skills Across Disciplines* (B. Stutzmann, D. Colebeck, SPSU)	**Workshop 76:** *Synthesis of Biodiesel at a Polytechnic School, Part 2* (G. Sirokman, WIT)	**Workshop 66:** *Manufacturing Center Tours and Demonstrations* (P. Rourke, WIT) Also offered in Sessions 1 and 3.

Session 3
3:45 - 4:45 p.m.

Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 421	Beatty Room 426	Williston Room 001 Manufacturing Center
None	**Panel 20:** *Blurring Boundaries of the Polytechnic and Applied English Classrooms: Affirming Learning through Intercultural Practice* (J. Orr, I. Omidvar and N. Abid, SPSU)	**Panel 172:** *Building Undergraduate Research, Inter-Departmental Collaboration* (G. Gospodinov, WIT)	**Panel 58:** *School District UW-Stout Partnership for Student Success* (M. Hopkins-Best and J. Weissenburger, UW-Stout)	**Workshop 92:** *The Future of Off-Line Polytechnic Education* (C. Wiseman, L. Carr, C. Gleason, M. Kupferman, G. Sirokman, D. Suresh, WIT)	**Workshop 66:** *Manufacturing Center Tours and Demonstrations* (P. Rourke, WIT) Also offered in Sessions 1 and 2.

For more information about each panel, workshop, poster or talk, see the Abstracts section of this agenda. (All conference abstracts are listed in order by their reference number that appears in this schedule.)

Beatty Room 303	Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 421	Beatty Room 426
Workshop 188 (8:45 - 9:15): *Student Response Systems and Student Engagement* (T. Greene, WIT; C. Maldonado, Tufts University) **Workshop 37 (9:15 - 10:15):** *Helping Students Transition to Grad School* (A. St. Germain, M. Dunlop, WIT)	**Panel 55:** *Strengthening Project-Based Learning Experiences Through Expanded Interdisciplinary Collaboration Between Colleges of Management and Engineering* (R. Klippel, A. Adekola, UW-Stout, MTU)	**Talks:** *Business and Entrepreneurship Education* **Moderator: Douglas Dow (WIT)** **Talk 1:** #41 **Talk 2:** #163 **Talk 3:** #102 **Talk 4:** #176	**Talks:** *STEM Research* **Moderator: Adeel Khalid (SPSU)** **Talk 1:** #170 **Talk 2:** #114 **Talk 3:** #162 **Talk 4:** #173	**Talks:** *Sustainability* **Moderator: James O'Brien (WIT)** **Talk 1:** #32 **Talk 2:** #85 **Talk 3:** #91 **Talk 4:** #166	**Talks:** *The Big Picture: Issues in Polytechnic Education* **Moderator: Chuck Hotchkiss (WIT)** **Talk 1:** #193 **Talk 2:** #177 **Talk 3:** #17

Room 419

Talk 1: #41 *Accelerate, an Innovation and Entrepreneurship Program;* M. Fuchs & F. Driscoll (WIT)
Talk 2: #163 *Rethinking Finite Math: Bridging Boundaries between Mathematics, Economics, Finance, and Business;* G. Bard (UW-Stout)
Talk 3: #102 *Impact of Interdisciplinary Engineering Education on Teaching Innovation to First-Year Students;* S. Jaume (WIT)
Talk 4: #176 *Interdisciplinary Entrepreneurship Education;* R. Trilling (WIT)

Room 420

Talk 1: #170 *Investigations of Omega-complexity of Chaotic Systems;* G. Gospodinov & S. Jackson (WIT)
Talk 2: #114 *Edge-Saturation Effect on Finite Size 0-D Carbon Nano-Ribbons - a Density Functional Theory Study;* L. Cirello (RIC) & L. Chen (MCPHSU)
Talk 3: #162 *Modeling Mesoscale Structure in Polymers for Efficient Anhydrous Proton Transport;* B. Husowitz (WIT)
Talk 4: #173 *Topological Tools for Analysis of Dynamical Systems;* G. Gospodinov, E. Grillo, K. Fong, M. Shakespeare (WIT)

Room 421

Talk 1: #32 *Food, Service and Sustainability;* H. Pritchard (WIT) & L. Camiel (MCPHSU)
Talk 2: #85 *Trends Shaping the Future: A First-Year Course for Civil Engineering Students;* M. Kupferman (WIT)
Talk 3: #91 *Minnesota's Wolf Population and the Effects of Hunting;* B. Burgau (WIT)
Talk 4: #166 *Gravity Fed Water System;* L. Boyd & M. Raison (WIT)

Room 426

Talk 1: #193 *Good Design Is Good Citizenship: From Social Engagement to Scholarly Engagement;* Z. Szafran, R. Halstead-Nussloch & B. Carpenter (SPSU)
Talk 2: #177 *Finding a Balance: Developing the Interdisciplinary Course;* C. Sexton (Cal Poly SLO)
Talk 3: #17 *Inputs and Outcomes: A Comparison of Polytechnics in the United States;* R. Pinizzotto (WIT)

Beatty Room 303	Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 421	Beatty Room 426
Panel 6: *Breakthrough Video Compression Beyond HEVC (High Efficiency Video Coding)* (A. Decegama, WIT)	**Talks:** *Construction Management* **Moderator: Amanda Hattaway (WIT)** **Talk 1:** #42 **Talk 2:** #47 **Talk 3:** #113 **Talk 4:** #63	**Talks:** *Project-Based Learning in Engineering Curricula* **Moderator: Cindy Stevens (WIT)** **Talk 1:** #38 **Talk 2:** #103 **Talk 3:** #72	**Talks:** *Undergraduate Student Research: Biomedical Engineering I* **Moderator: Mir Atiqullah (SPSU)** **Talk 1:** #171 **Talk 2:** #99 **Talk 3:** #106 **Talk 4:** #107	**Talks:** *Faculty Scholarship Across the Disciplines* **Moderator: Patrick Hafford (WIT)** **Talk 1:** #28 **Talk 2:** #116 **Talk 3:** #126 **Talk 4:** #161	**Talks:** *The Polytechnic Classroom: Alternatives* **Moderator: John Haga (WIT)** **Talk 1:** #147 **Talk 2:** #141 **Talk 3:** #65

Room 401

Talk 1: #42 *Cost Growth Areas in Retail Construction;* K. Siddiqi & J. Rounseville (SPSU)
Talk 2: #47 *Integrating Lean Design and Construction into the Academic Medical Center Environment;* J. O' Farrel (Brigham and Women's Hospital)
Talk 3: #113 *Smart Scheduling Alert System for Time Sensitive Construction Projects;* J. McGee &. H. Abaza (SPSU)
Talk 4: #63 *Simulation and Project-Based Learning in a Construction Management Program Capstone Course;* M. Hasso (WIT)

Room 419

Talk 1: #38 *Development of Sophomore Robotics Engineering Design Challenges at WPI;* T. Tabor & C. Putnam (WPI)
Talk 2: #103 *Teaching First-Year Engineering Design Projects;* S. Jaume, G. Ma, J. McCusker, X. Le, D. Suresh, D. Dow & F. Driscoll (WIT)
Talk 3: #72 *Intra-Disciplinary Integration in Civil Engineering Education;* M. Davidson, L. Anderson and J. Duggan (WIT)

Room 420

Talk 1: #171 *Data Assimilation in the Study of the Dynamics of Cancer;* G. Gospodinov & M. Shakespeare (WIT)
Talk 2: #99 *Design of an Efficient Integrated Physical Therapy Machine Providing Simultaneously Biomechanical, Electrical and Heat therapy for Back Injuries;* A. Catan, A. Dalvi, D. Desmond, J. Lopes & S.Badjou (WIT)
Talk 3: #106 *Design of a Concussive Head Impact Detection System for Contact Sports;* M. Joyal, D. Powers, A. Schwarzkopf and S. Badjou (WIT)
Talk 4: #107 *Design of an Electromagnetic Device to Accelerate Wound Healing;* S. Badjou, V. Martinuzzi, J. Lujan-Hernandez and D. Orgill (WIT)

NOTE FOR SESSION 5:

Room 421 and **Room 426** talk information is on the next page.

Beatty Room 303	Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 421	Beatty Room 426
Panel 6: *Breakthrough Video Compression Beyond HEVC (High Efficiency Video Coding)* (A. Decegama, WIT)	**Talks:** *Construction Management* **Moderator: Amanda Hattaway (WIT)** **Talk 1:** #42 **Talk 2:** #47 **Talk 3:** #113 **Talk 4:** #63	**Talks:** *Project-Based Learning in Engineering Curricula* **Moderator: Cindy Stevens (WIT)** **Talk 1:** #38 **Talk 2:** #103 **Talk 3:** #72	**Talks:** *Undergraduate Student Research: Biomedical Engineering I* **Moderator: Mir Atiqullah (SPSU)** **Talk 1:** #171 **Talk 2:** #99 **Talk 3:** #106 **Talk 4:** #107	**Talks:** *Faculty Scholarship Across the Disciplines* **Moderator: Patrick Hafford (WIT)** **Talk 1:** #28 **Talk 2:** #116 **Talk 3:** #126 **Talk 4:** #161	**Talks:** *The Polytechnic Classroom: Alternatives* **Moderator: John Haga (WIT)** **Talk 1:** #147 **Talk 2:** #141 **Talk 3:** #65

Room 421

Talk 1: #28 *What's up? The vertical direction;* R. Di Cecca (WIT)
Talk 2: #116 *Separating the Signal from the Noise in Statistical Analyses;* F. Hopcroft (WIT)
Talk 3: #126 *Redefining Gender and Identity in Virtual Space;* G. Mohaghan (WIT)
Talk 4: #161 *A Machine Learning Approach to Designing Guidelines for Toxicity;* B. Husowitz (WIT)

Room 426

Talk 1: #147 *Space, Modality, and Technology: A 3-Dimensional Framework for Converged;* Z. Szafran & S. Conn (SPSU)
Talk 2: #141 *Flipping the University Engineering Classroom;* E. Danahy (Tufts)
Talk 3: #65 *Engaging Millennials by Flipping the Classroom;* N. Ridge (WIT)

NOTE FOR SESSION 5:

Room 401, Room 419 and **Room 420** talk information is on the previous page.

Beatty Room 303	Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 421	Beatty Room 426
Talks: *Online Instruction and Its Alternatives*	**Talks:** *Humanities in Polytech. Education: Art and Poetry*	**Talks:** *Project-Based Learning: Energy*	**Talks:** *Undergraduate Student Research: Biomed. Engineering II*	**Talks:** *Transportation and Systems Engineering*	**Talks:** *Interdisciplinary Learning*
Moderator: Magdy Ellabidy (WIT)	**Moderator: Chuck Hotchkiss (WIT)**	**Moderator: Robert Lind (WIT)**	**Moderator: Durga Suresh (WIT)**	**Moderator: Hussein Abaza (SPSU)**	**Moderator: Sylvain Jaume (WIT)**
Talk 1: #13 **Talk 2:** #23 **Talk 3:** #11	**Talk 1:** #18 **Talk 2:** #112 **Talk 3:** #186 **Talk 4:** #62	**Talk 1:** #93 **Talk 2:** #84 **Talk 3:** #94 **Talk 4:** #132	**Talk 1:** #104 **Talk 2:** #156 **Talk 3:** #178 **Talk 4:** #105	**Talk 1:** #73 **Talk 2:** #179 **Talk 3:** #123 **Talk 4:** #118	**Talk 1:** #154 **Talk 2:** #64 **Talk 3:** #71 **Talk 4:** #194

Room 303

Talk 1: #13 *Comparison of Teaching Systems Analysis and Design course to Graduate Online Students vs. Undergraduate On-campus Students;* A. Khalid (SPSU)

Talk 2: #23 *Lessons Learned: Teaching an Online Graduate Level Course in Business Operations at WIT;* C. Stevens and J. Blaisdell (WIT)

Talk 3: #11 *Using Learning Communities to Change Student Attitudes toward Technical Majors;* A. Gokhale and K. Machina (ISU)

Room 401

Talk 1: #18 *ReMetCa: a tool to create a digital repertory on Medieval Spanish poetry;* Elena Gonzalez-Blanco (Universidad Nacional de Educación a Distancia)

Talk 2: #112 *Humanities Education at Polytechnics: A Case for Poetry;* D. Downey (WIT)

Talk 3: #186 *Bridging Boundaries: Digital Engagement and the Museum;* M. Nunes (SPSU)

Talk 4: #62 *Interdisciplinary Design Mash-Up Project: A Light Fixture for Art Museum;* P. Greenberg (WIT)

Room 419

Talk 1: #93 *Wireless Energy Transmission by Scalar Electromagnetic Waves;* M. Goulamaly, K. Bounar & S. Badjou (WIT)

Talk 2: #84 *Thermal-Electric Generator;* H. Granados, N. Rrapushi & D. Sophis (WIT)

Talk 3: #94 *The Solar Thermoelectric Generator;* S. Amaral, R. Andrews, A. Garcia, M. Jurkowski & M. Zenouzi (WIT)

Talk 4: #132 *Residential Induction Water Heater;* N. Jariwala, M. Goulamaly, M. Piontkowski, A. Catan & M. Zenouzi (WIT)

NOTE FOR SESSION 6:

Room 420, Room 421 and **Room 426** talk information is on the next page.

Beatty Room 303	Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 421	Beatty Room 426
Talks: *Online Instruction and Its Alternatives*	**Talks:** *Humanities in Polytech. Education: Art and Poetry*	**Talks:** *Project-Based Learning: Energy*	**Talks:** *Undergraduate Student Research: Biomed. Engineering II*	**Talks:** *Transportation and Systems Engineering*	**Talks:** *Interdisciplinary Learning*
Moderator: Magdy Ellabidy (WIT)	**Moderator: Chuck Hotchkiss (WIT)**	**Moderator: Robert Lind (WIT)**	**Moderator: Durga Suresh (WIT)**	**Moderator: Hussein Abaza (SPSU)**	**Moderator: Sylvain Jaume (WIT)**
Talk 1: #13 **Talk 2:** #23 **Talk 3:** #11	**Talk 1:** #18 **Talk 2:** #112 **Talk 3:** #186 **Talk 4:** #62	**Talk 1:** #93 **Talk 2:** #84 **Talk 3:** #94 **Talk 4:** #132	**Talk 1:** #104 **Talk 2:** #156 **Talk 3:** #178 **Talk 4:** #105	**Talk 1:** #73 **Talk 2:** #179 **Talk 3:** #123 **Talk 4:** #118	**Talk 1:** #154 **Talk 2:** #64 **Talk 3:** #71 **Talk 4:** #194

Room 420

Talk 1: #104 *Inspiration Detection Algorithm for Electromyogram;* A. Petrilli & D. Dow (WIT)
Talk 2: #156 *Modeling the Nephron with Differential Equations;* E. Grillo & L. Stokinger (WIT)
Talk 3: #178 *Improving Accuracy for Cardiac Electrical Axis Determination from ECG;* R. Beatrice, C. Lampe, B. Katehis and S. Krishnan (WIT)
Talk 4: #105 *Detection of Respiration in Central Venous Pressure Using State Machine;* A. Garcia and D. Dow (WIT)

Room 421

Talk 1: #73 *An Interdisciplinary Team Plans the next Big Dig for Boston;* J. Lambrechts (WIT)
Talk 2: #179 *A System to improve Elevator Efficiency;* T. Creighton, P. Hannon, C. Mitchell, M. Webb & S. Badjou (WIT)
Talk 3: #123 *Statistical Analysis of Travel in Urban Boston;* S. Irwin & Z. Buzaid (WIT)
Talk 4: #118 *Improving the Systems Engineering Requirements Analysis Process: A Few Tools and Techniques;* A. Khalid (WIT)

Room 426

Talk 1: #154 *A Minor in Web Design and Development for Non-computing Majors;* R. Vullo and C. Beaton (RIT)
Talk 2: #64 *Interdisciplinary Collaboration in New Major Design;* L. Maclean, P. Hafford, & S. Kennedy (WIT)
Talk 3: #71 *Integrated Project Design, An Architecture/Construction Management Project Based Learning Opportunity;* C. Cimino & T. Taddeo (WIT)
Talk 4: #194 *A Mathematician's Perspective on Teaching Linear Algebra and Differential Equations to Biomedical Engineering Students;* J. Haga (WIT)

NOTE FOR SESSION 6:

Room 303, Room 401 and **Room 419** talk information is on the previous page.

Beatty Room 303	Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 421	Beatty Room 426
Talks: *Outreach by Polytechnics* **Moderator: Magdy Ellabidy (WIT)** **Talk 1:** #103 **Talk 2:** #90 **Talk 3:** #40	**Panel 25:** *The Arts Online for Non-Arts Majors: Ideas and Challenges* (B. Stutzmann, D. Colebeck, SPSU)	**Talks:** *Project-Based Learning: Modeling and Design* **Moderator: Robert Lind (WIT)** **Talk 1:** #79 **Talk 2:** #130 **Talk 3:** #88 **Talk 4:** #97	**Talks:** *Undergraduate Student Research* **Moderator: Amanda Hattaway (WIT)** **Talk 1:** #187 **Talk 2:** #95 **Talk 3:** #169 **Talk 4:** #15	**Talks:** *Cars, Trucks, Trains, and Planes* **Moderator: James O'Brien (WIT)** **Talk 1:** #133 **Talk 2:** #89 **Talk 3:** #128 **Talk 4:** #119	**Talks:** *Information Technology and Applications* **Moderator: John Haga (WIT)** **Talk 1:** #115 **Talk 2:** #75 **Talk 3:** #26

Room 303

Talk 1: #103 *Serving a statewide mission via distance education: 17 Years at Southern Polytechnic;* D. Stone (SPSU)
Talk 2: #90 *Organizational Models for Informal Education and Outreach;* M. Stephenson & D. Dow (WIT)
Talk 3: #40 *High School Outreach: A Story of Biodiesel;* G. Sirokman (WIT)

Room 419

Talk 1: #79 *Mathematically Modeling a Bungee Jump; R. Rushing;* K. Frazier & M. Monteiro (WIT)
Talk 2: #130 *The Importance of Group Collaboration to Further a Discipline;* M. Arsenault, A. Polidoro & S. Zettler (WIT)
Talk 3: #88 *Project Visualization Application;* S. Gulam, N. Hansen and K. Chen (WIT)
Talk 4: #97 *Design of a Chirp-Based Ground Penetrating Radar for Efficient Imaging of Underground Structures;* W. Fletcher, C. Lampe, A. O'Rourke, R. Wilson, K. Bounar & S. Badjou (WIT)

Room 420

Talk 1: #187 *Student's Role in Breaking Boundaries: Student Projects;* J. Lee and P. Valverde (WIT)
Talk 2: #95 *Effects of Cell Phone Radiation on the Cardiovascular and Autonomic Nervous Systems;* S. Iacobone, E. Trabing and S. Badjou (WIT)
Talk 3: #169 *Healthcare and Poverty in the United States;* E. Hart, D. Paquette & N. Shea (WIT)
Talk 4: #15 *Integrating Trends in Healthcare and Science Into the Classroom: Translational Medicine in an Interior Design Studio;* L. Suslowicz (WIT)

Room 421

Talk 1: #133 *Aerodynamic Drag on Semi-Trailer: An Undergraduate Research Project;* M. Atiqullah (SPSU)
Talk 2: #89 *Design of a Cam-less Cylinder Head for an Internal Combustion Engine;* B. Roberts and J. Campbell (WIT)
Talk 3: #128 *Effect of Additives on Engine Performance and Air Pollution;* H. El-Sadi, M. Jackson, F. Hopcroft, R. Roberts and R. Melo (WIT)
Talk 4: #119 *Teaching Aircraft Design Course Using Real and Virtual Wind Tunnel;* A. Khalid (SPSU)

Room 426

Talk 1: #115 Textbooks: Ebooks vs. Print A. Khalid (SPSU)
Talk 2: #75 *Students' Perceptions of the Effectiveness of the Use of Virtual Strength of Materials Laboratory;* W. Barham, J. Werner, J. Preston, Y. Feng and N. Atkins (SPSU)
Talk 3: #26 *Developing a Mobile Technical Assistance Delivery System: An eCommerce Approach;* C. Smith (UW-Stout)

Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 421	Beatty Room 426	Wentworth Room 003
Panel 59: *Empowering the Humanities: Digital Humanities at Wentworth* (R. Bernier, C. Gleason, L. Falvey, J. Gordon, WIT)	**Talks:** *Project-Based Learning: Improving Everyday Life* **Moderator: Douglas Dow (WIT)** **Talk 1:** #98 **Talk 2:** #111 **Talk 3:** #180 **Talk 4:** #158	**Talks:** *Mathematics Education* **Moderator: Durga Suresh (WIT)** **Talk 1:** #29 **Talk 2:** #139 **Talk 3:** #46 **Talk 4:** #155	**Talks:** *Service Learning* **Moderator: Amos St. Germain (WIT)** **Talk 1:** #121 **Talk 2:** #30 **Talk 3:** #48 **Talk 4:** #9	**Talks:** *Approaches to Teaching: Design & Fabrication* **Moderator: Adeel Khalid (SPSU)** **Talk 1:** #174 **Talk 2:** #57 **Talk 3:** #164	**Workshop 21:** *Modern Digital Logic* (T. Johnson, WIT)

Room 419

Talk 1: #98 *Efficient Navigation System for the Blind;* E. Felger, C. Hennessy, S. Iacobone, V. Martinuzzi, E. Trabing, K. Bounar and S. Badjou (WIT/API)
Talk 2: #111 *Making Life Easier, One Pair of Pants at a Time;* T. Breese, A. Gowaski, R. Jellison and S. Molloy (WIT)
Talk 3: #180 *Design of a Cold Weather Car Heater;* E. Apple, B. Creegan, T. Frasca, B. Van Etta and S. Badjou (WIT)
Talk 4: #158 *A Thermodynamics Approach to Explaining Organizational Behavior;* R. Pinizzotto (WIT)

Room 420

Talk 1: #29 *Improving Retention in Engineering Calculus;* A. Penta (WIT)
Talk 2: #139 *NSF STEP Grant to Improve Performance in Early Mathematics Courses;* O. Feldman (WIT)
Talk 3: #46 *Mathematics Education in Extreme Social and Cultural Environments: Prison Education;* G. Gospodinov (WIT)
Talk 4: #155 *A First Year Math Course for Applied Math Majors at Wentworth Institute of Technology;* A. Hattaway (WIT)

Room 421

Talk 1: #121 *Impact of Community Engagement by Engineering Students on Various Attributes of Learning;* T. Hellickson and C. Swan (Tufts)
Talk 2: #30 *A Method for the Determination of Risk in a Polytechnic Service Learning Project;* F. Hopcroft (WIT)
Talk 3: #48 *STEM Community Outreach via Service Learning: A New Initiative to Bring Science Education Out of the Classroom;* L. Grove (WIT)
Talk 4: #9 *Desire and Empathy: Observations and Reflections on a Service Learning/Alzheimer's Project;* E. Slater (WIT)

Room 426

Talk 1: #174 *Engaging Students with New Technologies: Utilizing a Fabrication Laboratory in the Industrial Design Classroom;* Astwood (UW-Stout)
Talk 2: #57 *Teaching Collaboration Through Communication Skills to Interior Designers and Construct Management Students;* S. Stewart, E. Sumner and R. Pike (WIT)
Talk 3: #164 *Synergistic Power of Multisensory Learning for Teaching Environmental Technology Systems and Materials;* R. Tango (SPSU)

Beatty Room 401	Beatty Room 419	Beatty Room 420	Beatty Room 421	Beatty Room 426	Wentworth Room 307
Talks: *Humanities in Polytechnic Education II: The Past and the Future* **Moderator: Christopher Smith (UW-Stout)** **Talk 1: #16** **Talk 2: #34** **Talk 3: #44** **Talk 4: #54**	**Talks:** *Issues in Project-Based Learning* **Moderator: Mark John Isola (WIT)** **Talk 1: #50** **Talk 2: #67** **Talk 3: #69**	**Talks:** *Mathematics and Other STEM Fields* **Moderator: Anita Penta (WIT)** **Talk 1: #43** **Talk 2: #36** **Talk 3: #33** **Talk 4: #140**	**Panel 181:** *Research Learning Community* (M. Atiqullah, A. Khalid, B. Stutzmann, D. Colebeck, R. Singh, W. Zhou, SPSU)	**Talks:** *Engaging Students in STEM: Domestic and International Perspectives* **Moderator: Sylvain Jaume (WIT)** **Talk 1: #5** **Talk 2: #35**	**Workshop 22:** *Advanced Programmable Logic* (T. Johnson, WIT)

Room 401

Talk 1: #16 *The Philosophy of Science - A Humanities Course for the STEM Student;* J. O'Brien (WIT)
Talk 2: #34 *Exploding the Silo, an Interdisciplinary Collaboration: History, Ethics, Professional Practice and Boston's Molasses Flood;* L. Ascher & J. Duggan (WIT)
Talk 3: #44 *Four for the Future;* J. Ripley (WIT)
Talk 4: #54 *Why Do Polytechnic Students Never See the Science in Science Fiction: Or How Do We Build the Bridge to Understanding the Value of the Humanities in a Technical Universe – One Humanist's Experience;* M. Stern (WIT)

Room 419

Talk 1: #50 *Project-based Learning for Lower Level Courses;* J. Song (WIT)
Talk 2: #67 *Faculty Guided Projects: The Transition from Theory to Practice;* A. Duva & X. Le (WIT)
Talk 3: #69 *Development of a Project Based Course with a Life Long Learning Component;* J. Santacroce (WIT)

Room 420

Talk 1: #43 *The Lessons of Finite Math for a Chemistry Professor;* G. Sirokman (WIT)
Talk 2: #36 *Collaboration across Departments: Differential Equations and Engineering Heat Transfer;* R. Lind & E. Smith Zbarsky (WIT)
Talk 3: #33 *How Can We Use MATLAB to Teach Vectors?* J. McCusker & F. Caserta (WIT)
Talk 4: #140 *Vectored Battle: Physics Lab as a Game;* J. O'Brien and G. Sirokman (WIT)

Room 426

Talk 1: #5 *Short-Term Study Abroad for Groups of Students – Customized Programs as a Means for International Education;* L. Koch (Darmstadt)
Talk 2: #35 *The Value & Pitfalls of a Non-Profit to the Implementation of International Service Learning Programs;* F. Hopcroft (WIT)

Poster Session and Reception

Wednesday, June 5

5:00 - 6:30 p.m. in Watson Auditorium

Below are all the posters that have been accepted for the conference.

For more information about each poster, see the Abstracts section.
(All conference abstracts are listed in order by their reference number that appears in this schedule.)

Number	Author(s) and Organization	Poster Title
49	Mario Cocchi, Gennaro Bonfiglio, Michael O'Brien and Ernest Shedden (WIT)	S.E.A.T. (Sensing External Activity over Time)
51	Todd Johnson (WIT)	Using the Blackboard Self and Peer Assessment Course Tool in a Course
52	Jenny Tran, Michael Young, Joseph Marinaccio and Joseph Santacroce (WIT)	Electronically Assisted Remote Height Measurement
53	Ekaterina Zagriadskaia, Ali Ahrabi, Alena Chekmasova and Paloma Valverde (WIT)	Does Laboratory Technology Facilitate Students' Learning In Biology Courses?
61	William Williams, Logen Johnson, Jeffrey Lopes, Devin Richard, Mansour Zenouzi and Douglas Dow (WIT)	Cooling Vest System
68	David Ketchen, Patrick Laverty, Vincent Coppola, Douglas Dow and Joseph Santacroce (WIT)	Ultraviolet (UV) Water Purification System
70	Craig Curtis, Megan Joiner, Chris Hashem, Benjamin Nadeau and Thomas Fuller (WIT)	Intelligent Active Aerodynamic Systems
72	Michael Davidson, Leonard Anderson and John Duggan (WIT)	Intra-Disciplinary Integration in Civil Engineering Education: An Approach to Integrate the Various Civil Engineering Disciplines with the Use of an Experiential Studio
75	Wasim Barham, James Werner, Jon Preston, Yu Feng and Nathan Atkins (SPSU)	Students' Perceptions of the Effectiveness of the use of Virtual Strength of Materials Laboratory
77	Shaun Gallano, Joesph Kniffin, Bryan Bucchianeri, Ryan Forest and Adam Kwok (WIT)	Greenhouse Effects
80	Phillip Mealy, Patrick Butler, William Horton, Jordan Bartlett and Leonard Pratt (WIT)	Foot Temperature Sensor

81	Pierre Meyitang, Adwait Dalvi, Erik Amaral, Douglas E. Dow, James McCusker and Joseph Santacroce (WIT)	INTELLIGENT FLOOR SYSTEM (IFS)
87	James O'Brien and Erica Rao (WIT)	Comparison of Multi Disk Exponential Gas Distribution vs. Single Disk in Spiral Galaxies
96	Andrew Beale, Jackie Ellett, Eric Boiselle, Elizabeth Wu and Daniel Wieder (WIT)	Digital Cigar Humidification
101	Chan Ham (SPSU)	Interdisciplinary Projects utilizing an Industrial Robot for Mechatronics Students
114	Louis Cirello (RIC) and Li Chen (MCPHSU)	Edge-Saturation Effect on Finite Size 0-D Carbon Nano-Ribbons --- a Density Functional Theory Study
117	Max Paronich and Tung Tran (WIT)	Stress and Strain
120	Pierre Arthur Elysee (WIT)	Drowning Alert Device
122	Tim Hellickson and Chris Swan (Tufts)	Mixed Methodology: Engineering Students Participating in Learning Through Service, an Achievement Goal Questionnaire
123	Samuel Irwin and Zachary Buzaid (WIT)	Statistical Analysis of Travel in Urban Boston
127	Devin Howe, Susana Vasquez Trujillo, Kirsten Wilde and Laurie Grove (WIT)	Interweaving Scholarly Research and Project-Based Learning in the Classroom: An Introductory Course in Biochemistry and Bioinformatics
129	Nicole McColgan, Liam Holohan, Jacob Croft and Douglas Dow (WIT)	Primary School STEM Project: Design and Construction of Model House with Electric Function
137	Dylan Bagshaw and Shankar Krishnan (WIT)	Total Knee Replacement Implants
138	Kylan Nowell, Kevin Palmer and Douglas Dow (WIT)	Middle-School STEM Project: Using Minecraft Game Environment to Introduce Logic and Programming Basics
142	Benjamin Ford, Cameron Walkulak, Pamela Mudge and Douglas Dow (WIT)	Primary School STEM Project: Cornstarch Monster and Sound
145	Mary E. Rodgers, Maria F. Gonzalez and Douglas E. Dow (WIT)	Primary-School STEM Project: Artificial Lung
146	Bashair S. Alhajhouj, Hebah M. Alyousif and Douglas E. Dow (WIT)	Primary-School STEM Project: Conductive Solutions to Transfer Electric Current and Drive Actuator
148	Michael Carando, Nick Anderson, Tim Juitt and Douglas Dow (WIT)	Object Placement Detector for Home-Based Arm Rehabilitation System
149	Quinn Levine (WIT)	Annex Connector
150	Ryan Moyen, Edmond Hebert and Ashley Yu (WIT)	A.R.C.H.E.R. - Autonomous Remote Controlled Hazardous Environment Robot
156	Liam Stokinger and Elena Grillo (WIT)	Modeling the Nephron with Differential Equations
157	Christopher Bennett (WIT)	Synthetic Biology: Student Driven Advancement at Local Polytechnic College
166	Laura Boyd and Matthew Raison (WIT)	Gravity Feed Water System

167	Kelsea L. Miller, Makeda K. Stephenson and Paloma Valverde (WIT)	Implementation of Undergraduate Research Projects using Planarian Regeneration and Planarian Databases at the Wentworth Institute of Technology
168	Geoffrey Reimann, William Bishop and Lindsay Grumbach (MassBay Community College)	Design and Construction of a “Remote Underwater Surveillance System (RUSS)”
169	Eric Hart, Daniel Paquette and Nora Shea (WIT)	Healthcare and Poverty in the United States
174	Jennifer Astwood (UW-Stout)	Engaging Students with New Technologies ”Utilizing a Fabrication Laboratory in the Industrial Design Classroom.
182	Andrew Tyler, Chelsey Small, Kayla Wright and Douglas Dow (WIT)	Floor Sensor Module for a System to Detect Episodes of Falling
184	Jocelyn Morelli, Edward Bockley, Heather Davis, Ashley Wolfrum, Ilie Talpasanu and Douglas Dow (WIT)	Rehabilitative Feedback for Laminitis Prevention
189	Sam Houtchens (WIT)	LokT - Lock/Unlock Doors Without Keys
190	Samantha Barrett (WIT)	Value of Immersive International Experience: A Co-op in Costa Rica
191	Robert Moran (WIT)	Clinical Utility of Ventilatory Quantities: Guidelines for the Non-Specialist Clinician
192	Robert Moran (WIT) and Nancy Gunther-Orsatti (Siemens Company)	Clinical Utility of Critical Analytes: Interpretive Guidelines for the Non-Specialist Clinicians

5

Short term study abroad for groups of students - customized programs as a means for international education

Lucia Koch, Darmstadt University of Applied Sciences

Our university has been offering customized programs for partner universities from the US for a number of years. The programs are run jointly for U.S. faculty and students and their German counterparts. A large variety of subjects such as energy management, energy efficiency, information science, social media, technology and innovation, plastics engineering, injection molding and global policy have so far been covered. About 10 such faculty-led study abroad groups from various U.S. universities have been visiting us in the last five years. Some of them have since returned for the second or even third time with a group. Usually the programs deal with a particular topic from a variety of angles: theoretical instruction by German and/or U.S. faculty is combined with small student projects and presentations, lab work with company visits, cultural highlights with social events. The aim is to not only to contribute to the core subject itself but to provide a well balanced opportunity for international education. Learning from and with peers from another country and in another institution can be of great personal benefit and very inspiring for further experiences abroad. During the talk I would present the framework of these visits, the topics addressed a model agenda, the funding possibilities and the paperwork behind such projects. I would hope to encourage more U.S. faculty to attempt such a program with their students and to include it as a regular part of their “ordinary” course schedule in the future.

6

Breakthrough Video Compression Beyond HEVC (High Efficiency Video Coding)

Angel Decegama, Wentworth Institute of Techology

This proposal presents a technological breakthrough that can reduce the size of any video file compressed by any existing video codec (including the highly proclaimed, recent H265 codec) by a factor of 10 or more down to at least 10 percent of such compressed, size without loss of the perceived video quality of the original video. This capability has significant implications for affordable worldwide video communications of high quality without massive investments in infrastructure. The markets that can greatly benefit in low costs and high quality from such a breakthrough include online education, telemedicine, videoconferencing, entertainment, security, government, smart-phone applications and many more. This technology has received a patent from the U.S. Patent Office and, besides a detailed description and presentation of the mathematical algorithms, a full demonstration over wired and wireless Internet connections will be given in the conference.

9

Desire and Empathy: Observations and Reflections on a Service Learning/Alzheimer's Project

Elaine Slater, Wentworth Institute of Technology

Engaging engineering students in a Humanities class can be a challenge. Nevertheless, most of us who teach in this discipline do so with a conviction of its importance to all human beings and try passionately to convey that idea to our students with all that our education and experience have trained us to do. The heat of that passion increases exponentially when attempting to persuade those most resistant. Even then, resistance softens all too slowly. But those students who have been a part of a service-learning project involving Alzheimer's patients that I designed and implemented six years ago reveal another story. When I took them from the classrooms and of out their studios and placed them into a situation that demanded sharp, pragmatic intelligence mixed with empathy, compassion, and intimate communication they stunningly responded with all of the above. And I have consistently witnessed that response no matter the semester, situation, or differing student groups. It is about this response, as a catalyst for a holistic educational experience for all of us who have participated, that I wish to present to this conference. I believe this program has validity as a critical piece of any technical curriculum in which the goal is to produce a graduate, who has both a command of strong technical proficiency and a finely honed understanding of human need at its most vulnerable. The presentation is in three parts. The first is an explanation of our project, its premise and structure. This includes its history from inception to today and examines the variances between three memory impaired facilities in which my students and I have worked in over the past six years. My hope is that this presentation will illustrate why I believe that what was gained by students could not have been accomplished in any classroom, despite the best efforts toward study and discourse. It is meant to convey a sense of growth and achievement that began as an exploratory attempt at understanding a very difficult and growing problem amongst the aging and blossomed into a successful and revelatory program. Witnessing students' profound and positive impact on people who approach each day with a certain measure of anxiety and fear has fundamentally changed my way of teaching, both in and out of the classroom. In the second part, a few of my students will then give reflections of their experiences, which are gleaned from their individual journals and recent collaborative exchanges. They will speak about what they learned and what they have contributed to this community. Finally, the summation will encompass what I further envision for Wentworth students and their community partners as they expand their education and offer further insight to the larger community.

11

Using Learning Communities to Change Student Attitudes toward Technical Majors

Anu Gokhale and Kenton Machina, Illinois State University

Research suggests that the perceptions of students, educators, and other stakeholders play a large role in discouraging women and minorities from pursuing technical majors and participating in technical occupations. This NSF-funded project focuses on computing-related majors and utilizes online learning communities and after-class seminars to help freshmen students challenge stereotype, constraining definitions of "femininity" and "ethnicity" and overcome these barriers. The population for this study includes first-year students enrolled in a general education mathematics course required of most majors in humanities, social sciences, and business. Findings show that the online communities and seminars do not alienate the majority white males and are effective in creating greater interest in learning about technology and changing students' attitudes toward computing-related majors and careers in this field.

13

Comparison of teaching Systems Analysis and Design course to graduate online students verses undergraduate on-campus students

Adeel Khalid, Southern Polytechnic State University

In this study, the advantages and drawbacks of teaching Systems Engineering courses to on-line graduate students are explored. The benefits and deficiencies are compared with those of teaching similar course contents to on-campus undergraduate students. For the purpose of this study, the comparison is done based on the System Analysis and Design course taught at both undergraduate and graduate levels. The same textbook is used at both levels and similar material is covered. At the graduate level, students are expected to do more advanced level projects. At the Polytechnic Institute, graduate students typically have several years of industry experience working as systems engineers or in other similar categories. It is expected that graduate students will bring a richer experiential knowledge to the classroom because of their experiences. On the other hand, undergraduate students typically have either no systems engineering background or have unrelated industry experience. So the expectations from the undergraduate students are much lower in terms of bringing examples from real world experiences. However it is observed that, because of the online nature of the course, graduate students are often hesitant to share their experiences in discussion based synchronous online classes. Undergraduate students, in a face-to-face environment are observed to be more open to discussions and immediate feedback to the instructor. Graduate students are not shy but their hesitation to actively participate in online classes can be attributed to their un-familiarity with the technology or the hindrances caused by the current state of technology. In this paper, the drawbacks and advantages of both online and on-campus courses are discussed. A few ideas are included that will help bridge the gap between the effectiveness of teaching online and on-campus courses.

15

Integrating Trends in Healthcare and Science Into the Classroom: A Focus on Translational Medicine in an Interior Design Studio

Lynette Suslowicz, Wentworth Institute of Technology

As a professor, it is important to increase students' awareness of current trends, especially in sectors such as health care, which promise longevity and constant innovation. One such new trend is translational medicine. This paper will review this new trend and the ways in which it was integrated into the curriculum at Wentworth via collaboration with Perkins + Will, one of the top health care firms in the country. Translational medicine is a movement at the forefront of medical campus planning and raises important issues for health care design. For the purposes of this paper, translational medicine is defined as the enabling of multidisciplinary collaboration in a patient-centric environment designed to speed the discovery of new knowledge and technologies. Translational medicine goes beyond co-locating research labs next to clinical or inpatient areas, it enables the minds of researchers and clinicians to converge and innovate together in the everyday work environment. This paper will explore the role that design can play in the application of translational medicine and how students can be effectively introduced to new trends through studio work and design reviews with industry experts. Presently, Wentworth is engaged in a collaboration with Perkins + Will, to educate students in healthcare design and to examine both failures and successes in the design of translational medicine facilities. Wentworth has been granted permission from Perkins + Will and their client to use their most recent health care project in Boston as the basis for one of the fall Interior Design senior studio sections. Throughout the semester, Perkins + Will has committed to contributing their time through guest lectures and to attend multiple design critiques. The intended results of this partnership is to encourage students to adopt an alternate design perspective by understanding the need for patient-centered care and what that means within the context of translational medicine. The students will uncover the essence of spaces by discovering the moments in a plan for innovation to occur; and learn to translate research into a vision through design and technology. Students of this generation are quick to adapt their ideas of

today's technology and will hopefully use that adaptation to better design for the obsolescence of that technology during the design process. Translational medicine seeks to integrate research, development, and care to the end of maximizing patient health. In order for design to play an effective role in furthering such a movement, we must find ways to introduce students to new trends in fields such as health care as early as possible. Collaborating with design firms and providing professional interactions for students is one way for them to become aware of emerging trends and to begin developing the solutions of the future.

16

The Philosophy of Science - A Humanities Course for the STEM Student

James O'Brien, Wentworth Institute of Technology

At STEM focussed schools and STEM Institutions, the general humanities and liberal arts sector of a students education can be under-represented for many reasons. Besides general rigor of a students program of study, some STEM- focused students tend to lose connection to the broader general education requirements of their host institution. This course, the philosophy of science, is a course that allows students to reconnect with the humanities in a way that all of them can relate and appreciate. The course is a general elective drawing on topics already familiar to a STEM student, but placing them in a new light to expose critical thinking and writing. The course takes students on a historical journey of the scientific process through readings, discussions and philosophical explorations to answer in essence one simple question..."Why do we as humans think the way we do?" Evidence of student involvement, syllabi, readings and other offerings from the course will be discussed, as well as plenty of time for interaction with the audience.

17

Inputs and Outcomes: A Comparison of Polytechnics in the United States

Russell Pinizzotto, Wentworth Institute of Technology

It is possible to compare both the inputs and outcomes of polytechnic colleges and universities in the United States using data that are reported to national sites such as the Integrated Postsecondary Education Data System (IPEDS) and/or data that are assembled and disseminated via readily available public websites such as colleges. collegetoolkit.com. Analyses of the data uncover some interesting characteristics of this segment of higher education. For example, comparing average scores of the mathematics and critical reading sections of the SAT shows that they are strongly correlated with an r-squared of 0.95, an extraordinarily large value. On average, the mathematics scores are 30 points greater than the critical reading scores. The polytechnics fall into groupings that can be used to identify peer and aspirational institutions, a task that otherwise might be difficult to achieve. For outcomes measures, the IPEDS data includes first-to -second year retention rates and six-year graduation rates. Websites such as salary.com can be used to obtain average starting salaries. It is found that the retention rate and graduation rate correlate with incoming SAT score (math plus critical reading) with an r-squared of 0.72 in each case. Starting salary correlates with SAT scores more weakly with an r-squared of 0.53. One possible way to measure institutional performance is to compare an outcome to the value predicted by the input. This approach has the advantage of comparing a polytechnic only to similar institutions. Analyses of other types of institutions, such as liberal arts colleges, Ivy League colleges and large state universities show similar correlations. The differences between these types of institutions and polytechnics will be discussed.

18

ReMetCa: a tool to create a digital repertory on Medieval Spanish poetry

Elena Gonzalez-Blanco, Universidad Nacional de EducaciÃ³n a Distancia

The aim of this talk is to present digital humanities project devoted to create a computer-based metrical repertory on Medieval Castilian poetry (ReMetCa). It will gather poetic testimonies from the very beginnings of Spanish lyrics at the end of 12th century, until the rich and varied poetic manifestations from the Cancioneros of the 15th

and 16th centuries. Although metrical studies on Spanish Medieval poetry are developing fast in the last years, researchers have not created a digital tool yet, which enables to undertake complex analysis on this corpus, as it has already been done in other lyrical traditions in Romance languages, such as the Galician-Portuguese, Catalan, Italian or Provencal lyrics, among others, where the first digital repertories arose. ReMetCa is conceived as an essential tool to complete this digital poetic puzzle, which will enable users to develop powerful searches in many fields at the same time, thanks to the possibilities offered by new technologies. It will be very useful for metrical, poetic and comparative studies, as well as a benchmark to be linked to other international digital repertories.,This project is based on the integration of traditional metrical and poetic knowledge (rhythm and rhyme patterns) with digital humanities technology: the tagging systems of TEI-XML and the creation of databases (based on MySQL and X-Path) which open the possibility to undertake simultaneous searches and queries using a simple searchable user-friendly screen.

20

Blurring Boundaries of the Polytechnic and Applied English Classrooms: Affirming Learning through Intercultural Practice

Jeffery Orr, Southern Polytechnic State University; Iraj Omidvar, Southern Polytechnic State University; Nadia Abid, Higher Institute of Applied Studies in Humanities of Sbeitla

Two faculty members in a regional American polytechnic state university and a faculty member at a higher institute of applied studies in humanities in Tunisia collaborated over the spring semester in order to facilitate intercultural practice among their students, to explore the potential of online and specifically social media for such facilitation, and to examine a number of pedagogic and theoretical issues. One course in the U.S. university was holistic communication for non-native speakers of English, a course that in spring was enrolled solely by visiting students from mainland China. This course aimed to increase English-language as well as U.S.-cultural competence through analysis of online news artifacts (textual, aural, and visual) as well as through writing of various formal and informal assignments and interaction with other university students. Another course was social media and intercultural practice, an upper-level experimental course where U.S. students examined theories of culture and of intercultural communication through interaction with students from China in person and students from Tunisia through social media in an academically and theoretically grounded reflective space. The course in Tunisia was an undergraduate reading- and writing-intensive course for upper-level English-major students in a town in central Tunisia. The Tunisian course had a writing in the disciplines frame with activities and assignments emphasizing business communication. As with the holistic communication course in the United States, the goal of the collaboration for the Tunisian students was to use social media to practice language and cultural competence through direct interaction in English with students in the United States. Among other activities, students in the American and Tunisian courses would pose, respond to, and reflect on carefully thought-out questions, conceptualize multimedia slice-of-life narratives to be posted on a group blog, create and post the narratives, receive critique, and revise. For the faculty, among the goals of this collaboration were enacting the principles of critical pedagogy and encouraging students to see their classroom learning as grounded in, relevant to, and answerable to their larger concerns in the world. As social media shifts and blurs the boundaries between the private and the public, this course attempted to understand and harness the potentials of this shift for critical pedagogy. Finally, to explore the possibilities for academic intercultural contact that would not re-inscribe centuries old Orientalist assumptions about Western cultural superiority, collaborators attempted to create a learning environment in which students could interrogate how the many ways in which their identities are constructed -- gender, class, national and political affiliations, religion, etc. -- influence their ability to engage in critical analysis of self and others.

21

Modern Digital Logic

Timothy Johnson, Wentworth Institute of Technology

Still teaching digital logic using 7400 series chips? You do realize the world has moved on and its 2013...This workshop is for YOU! Learn how to teach twice as much twice as fast in the blink of an eye. So simple even college sophomores with SAT scores below 500 are able to master the techniques of hardware design. No more wiring errors, no more fluky chips, no more bent pins, no more trouble shooting boards, no more having to wire the design up for the students. It's the solution industry has adopted. The theory is the same, the devices are modern (post-2000 release). Using Altera's Quartus II software on the DE2 development platform students are building in a two-hour lab an ALU not as a final project but by midterm. No difficult coding--actually the students don't code at all. And neither do you have to learn VHDL or Verilog. If you insist on learning code, you'll learn a simple two-click path and the machine writes the code for you! Student doesn't know Boolean? The machine does it for them. The future of hardware is software. The future is here. A workshop that will change your life.

22

Advanced Programmable Logic

Timothy Johnson and Edmond Hebert, Wentworth Institute of Technology

In one two-hour lab attendees will design, build, and implement their own microcontroller then test the microcontroller by writing and downloading code to it. This workshop assumes the attendee is familiar with the software and hardware used in Modern Digital Logic workshop and microcontrollers. The workshop will provide Altera's Quartus II software for the DE2 development platform and Eclipse for Nios II to implement sample C code.

23

Lessons Learned: Teaching an Online Graduate Level Course in Business Operations at Wentworth Institute of Technology

Cindy Stevens and Jack Blaisdell, Wentworth Institute of Technology

Teaching an online graduate level course in Business Operations for Construction Management involves more than posting content online, setting up due dates, and grading work. The use of online distance learning for an online graduate level course in Business Operations has many challenges. As the graduate department at Wentworth Institute of Technology increases online course delivery many lessons can be learned. This session, based on the presenters' experience of teaching this course online for the past three years, explores the successes and pitfalls of teaching an online graduate level course in Business Operations. Best practices in delivering online courses are also discussed.

24

Flipping Out on Critical Thinking: Engaging Activities Across Disciplines

Beth Stutzmann and Donna Colebeck, Southern Polytechnic State University

Critical thinking skills are vital to bridging boundaries across disciplines. The ability to make connections and decisions, using critical thinking, produce better students and increase their potential as future employees. These important skills can be developed to attain a higher order when professors plan accordingly; designing engaging lessons that require student participation through selected activities; including flipped classroom pedagogy. Keeping a focus on critical thinking, this workshop will demonstrate strategies for "flipping" the traditional lecture class, encouraging student participation, and fostering a participatory learning environment. Presenters will model interactive activities during the presentation as well as share a "Best Practices Toolkit," which includes a step-by-step sequence for creating engaging lectures and incorporating student activities. These activities incorporate the levels of Bloom's Taxonomy and appeal to a variety of learning styles. The toolkit will

also include a collection of the most helpful and relevant student engagement activities applicable in a range of disciplines, including the humanities, arts and sciences. At the conclusion of the presentation, the presenters will facilitate a discussion with audience members, allowing them to ask questions and share their best practices with the group.

25

The Arts Online for Non-Arts Majors: Ideas and Challenges

Beth Stutzmann and Donna Colebeck, Southern Polytechnic State University

Music, art and drama appreciation courses are mandatory in some polytechnic curriculums across the country. However, the polytechnic students are typically not excited about taking courses they do not deem relevant to their major. Arts professors at Southern Polytechnic State University in Marietta, Georgia have designed and created online arts courses (hybrid and fully online) to meet the needs and wants of non-arts, polytechnic majors. This presentation will demonstrate online music, art, and drama classes; how we've flipped the hybrid/face-to-face session to include engaging in-class activities which focus on critical thinking skills that are transferable to major courses; and the challenging issues that arts professors endure when creating an online class for non-majors.

26

Developing a Mobile Technical Assistance Delivery System: an eCommerce Approach

Christopher Smith, University of Wisconsin-Stout

Mobile technology (smartphone) based "knowledge pull" technical assistance delivery systems need to be developed and deployed to take advantage of the proliferation of mobile technologies, meet business and industry desire for speedy access to university resources and to address technical assistance needs using our polytechnic institution's limited staff resources. Current "knowledge push" and "consultation" approaches to technical support rely on anticipation of customer needs. This approach is appealing to administrators as it allows their project managers to control the flow of assistance products to suit perceived company needs. A "pull" approach, however, is more consumer (and learner) centric, requiring "just-in-time" and "made-to-order" delivery of services/solutions. In the fast paced and growing world market for technical assistance from higher education institutions, tech savvy and immediacy-driven learners are seeking made-to-order solutions and just-in-time learning objects. Their demand pressure makes it very difficult for providers that rely on predicting needs (the push approach) to respond to learner needs. Unfortunately, most polytechnic institutions continue to favour and build technical assistance offerings using the push approach. Project managers and directors may even believe that, by basing program development on market studies, they are providing learner-centered learning offerings. Even as the higher education industry trends toward "pull" offerings, accrediting bodies and academic leaders continue to insist on delivery systems that perpetuate the "push" approach in the (possibly misplaced) interest of "standardization" or "quality." A "pull" approach that incorporates smartphone technologies and eCommerce-driven information gathering, demand-driven development processes, and market-driven assessment systems will be presented.

27

Infusing Leadership Skills Across Disciplines

Beth Stutzmann and Donna Colebeck, Southern Polytechnic State University

Leadership skills are important for everyone and these skills can be taught. How are institutions of higher learning incorporating leadership into courses when few classes are offered to address and "teach" leadership? In this presentation, polytechnic humanities professors discuss the concept of leadership; individual and group leaders; leadership skills; ways in which leadership and life skills are taught in their courses; identify extracurricular on-campus organizations and programs that target these skills; and address how preparing students with leadership skills and experiences create desired employee leaders in the work force.

28

Whats up? The vertical direction.

Raffaele Di Cecca, Wentworth Institute of Technology

Given the dynamical state of a system, how do we determine the local vertical direction? This may be an obvious question to a physicist, but very seldom it is discussed in physics textbooks. This line of thinking is very important to our students since many times in physics things are taken for granted, when in reality there is much more critical thinking to be explored. Newtonian mechanics gives us a precise description of the motion of a particle in an inertial frame of reference. What happens when we transition from an inertial to a non-inertial frame of reference? To preserve Newtonian formulation, we introduce the concept of fictitious or pseudo forces such as centrifugal and Coriolis forces. What role do these forces play in mechanics? The Earth is not an inertial frame of reference due to its rotation about the terrestrial axis, its rotation around the sun, and its rotation with the entire solar system about the center of our galaxy: the Milky Way, but for many practical problems, we can assume it to be one. In the midst of all this, how do we find the vertical direction? This presentation will try to clarify misconceptions surrounding fictitious forces and answer the questions: (a) How is the vertical direction defined? (b) How do we find it?

29

Improving Retention in Engineering Calculus

Anita Penta, Wentworth Institute of Technology

In the Fall of 2011, Wentworth Institute of Technology designed new engineering programs that required students to start with Calculus. As a result, we needed to create a new robust Engineering Calculus sequence that would give our students both the technical skills they need as well as foster their creativity and their ability to investigate problems, both individually and in groups. To accomplish this, we have paired the traditional Engineering Calculus syllabus with inquiry-based assignments, peer-assisted learning, and “gateway” examinations. Additionally, for students who fell behind, we offered the opportunity to restart the course at mid-semester and continue with a hybrid online model through the winter break, with the goal of having them continue on schedule with their next course. During the second year of implementation, we adjusted some of our methods based upon student and faculty responses. Simultaneously, our first cohort of students moved through Calculus III and Differential Equations. Their performance in the subsequent classes is being examined in an attempt to assess the efficacy of our pedagogy.

30

A Method for the Determination of Risk in Polytechnic Service Learning Projects

Francis Hopcroft, Wentworth Institute of Technology

A key area in which institutions can exercise significant efforts towards effective polytechnic learning is through the establishment, financial support, and educational support of service learning projects; especially international service learning projects. The development of these programs is too often stymied or delayed, however, by concerns over “liability.” Institutions tend to be exceptionally conservative in this regard and tend to also see the concepts of risk and liability as interchangeable. It is the premise of this paper that risk and liability are most certainly related, but that they are not interchangeable concepts. Liability comes from the failure to properly manage foreseeable risk and it is this risk that institutions fear; not the liability itself. There is no liability without a risk first being present, but there may well be risk without liability being present or resulting from that risk. The management of liability, then, requires appropriate management of risk and that requires a clear understanding of the risks involved. This talk presents a method for evaluating risk on an objective basis, rather than a subjective basis, so that rational decisions can be made for institute participation in foreign or domestic service learning projects.

32

Food, Service and Sustainability

Henderson Pritchard, Wentworth Institute of Technology;
Lana Dvorkin Camiel, Massachusetts College of Pharmacy and Health Sciences

This project will discuss lessons learned when teaching a course in sustainability and food to an interdisciplinary student audience. The course (Environmental Forum) focused on teaching the concepts of sustainability through food. Food is one of the necessities of life and yet as the world approaches 8 billion people in 2050, we project that the model of food and production and consumption will not continue to be sustainable. As well, the current system of food production has been found to not be unequally affordable and available to all peoples. The course focused on current food production, consumption, health issues, politics, climate change and food related health issues. In order to improve the learning objectives associated with the concepts of food, health and sustainability, students were required to volunteer to work on community outreach projects which would enable them to see, firsthand, how food production can be non-sustainable, the disproportionate, in some communities, The project will synthesize student's reflections on their experiences and summarize lessons learned about the impact of service on the learning outcomes of the Food and Sustainability course.

33

How Can We Use MATLAB to Teach Vectors?

James McCusker and Frank Caserta, Wentworth Institute of Technology

Vectors are a basic concept for both electrical and mechanical engineering. MATLAB is the software of choice for electrical and mechanical engineering numerical computations and matrix manipulations. We explored the best proctices for teaching vectors using a MATLAB simulation. A brief history of MATLAB is included, particularly since MATLAB is very easy to use for computations, but the object oriented graphics were grafted onto the system and so are complicted. The simulation was show to students at Wentworth. The students liked the idea of animating graphics, but felt that various "bells and whistles" should be added. We made small changes to the look of the graphics. This is a "work in progress."

34

Exploding the Silo, an Interdisciplinary Collaboration: History, Ethics, Professional Practice and Boston's Molasses Flood.

Lois Ascher and Jack Duggan, Wentworth Institute of Technology

Until historian Stephen Puleo's book Dark Tide was published, the Great Boston Molasses Flood of 1919 was considered a surreal event in Boston history. Few if any considered the historical, technical or ethical dimensions of that disaster, or perhaps even more importantly, its relevance to today's world. In my humanities course, Boston Voyages, I look regularly at the Molasses Flood through the pages of Dark Tide. As a humanities professor teaching a course on Boston, my approach has always been historical. We consider the cultural issues at the time of the tank's construction in 1915, including the role played by the North End Italian immigrant neighborhood in the site selection for the tank. We touch on the concerns surrounding the tank's construction and subsequent collapse four years later, inundating Commercial Street with 2.3 million gallons of molasses moving at 35 miles an hour, destroying buildings and killing 21 people, two of whom were 10-year-old children. Missing from my approach, however, were the lessons and applications of this tragedy to professional practice today. Regulations are now in place, set to prevent a repeat of the site, zoning and construction problems responsible for this catastrophe. A sole interest in profit is now tempered by concern for engineering ethics and environmental justice. Despite today's safeguards, engineering design failures, sometimes with disastrous results, still occur. Consider the Challenger Shuttle, Bhopal and Boston's Big Dig ceiling panel failure. Just like the Molasses Flood, these design failures were caused by decisions, influenced by external factors that compromised safety. These "external

factors" never go away; they are products of the times and change with each generation. Thus it is particularly important to investigate these issues with polytechnic students who, as engineers and designers of the future, will be charged with decisions that will impact our society and culture. This past spring, 2013, Professor Jack Duggan and I combined his Municipal Planning and my Boston Voyages classes to investigate the historic/cultural along with zoning and ethics issues raised by this catastrophe. We did so through the integrated approach of text, classroom lecture, class visit to the flood site and an appearance by the author of Dark Tide, Stephen Puleo. We employed the historical material as a filter to view contemporary zoning and construction disasters, in an effort to better understand the ethical dimensions of our own world. In our talk Professor Duggan and I will present the successes and challenges of that collaboration between humanities and engineering at a polytechnic institution of learning.

35

The Value and Pitfalls of a Non-Profit to the Implemantation of International Service Learning Programs

Francis Hopcroft, Wentworth Institute of Technology

International service-learning programs and projects engender certain risks that are not associated with domestic service learning programs and projects. These risks tend to make institutions far more jittery about supporting international projects than domestic projects because of an unwarranted, but very real, perception that those risks are difficult, if not impossible, to manage or control. One way to help mitigate real or perceived liability risks is to establish a separate nonprofit corporation specifically to handle international programs and projects and in so doing to insulate the institution from those risks. This talk will discuss the creation of a non-profit corporation and the benefits and pitfalls associated with using such an entity to manage international service-learning programs and projects.

36

Collaboration across Departments: Differential Equations and Engineering Heat Transfer

Robert Lind and Emma Smith Zbarsky, Wentworth Institute of Technology

One way to reach across academic boundaries and strengthen the quality of technical education is to form course-collaborations on joint class projects. In fall 2012, students of different levels from two academic departments at Wentworth collaborated in analyzing the old-fashioned method of making ice cream. Students from courses MATH620 Applied Differential Equations (2nd year) and MECH595 Engineering Heat Transfer(4th year) conducted an ice-cream making lab to record temperatures and consume the output. Cross-departmental teams where then formed to mathematically model and solve the transfer of heat from the ice-cream mixture to the ice bath. We found the project provided the math students with a challenging application of differential equations and the mechanical students an opportunity to teach heat transfer to their partners. Students, we observed, not only become more engaged from the social interaction and technical challenge, but they learned how much they know and gained confidence in their problem solving abilities.

37

Helping Students Transition to Grad School

Amos St. Germain and Michael Dunlop, Wentworth Institute of Technology

This presentation deals with the questions students ask as they contemplate going to graduates school. This presentation has been given numerous times by St. Germain and Dunlop.

38

Development of Sophomore Robotics Engineering Design Challenges at WPI

Trenton Tabor and Craig Putnam, Worcester Polytechnic Institute

At Worcester Polytechnic Institute (WPI) we've created the first Bachelor of Science degree in Robotics Engineering in the U.S. Forming the core of this new degree is a four course sequence over the sophomore and junior years. This paper will discuss the educational goals and assesment for final projects in the two sophomore level Unified Robotics Courses. The final project for each of these courses is an intensive design challenge, bringing together all of the technical skills students have learned so far. In addition to a demonstration of their robotic platform, the students must give a design presentation and submit a design report. This work describes the learning-outcomes-focused design of the challenge in both of these courses and discusses artifacts generated by students for presentations and final reports.

40

High School Outreach: A Story of Biodiesel

Gergely Sirokman, Wentworth Institute of Technology

Getting students interested in STEM programs early is vital for the future of these fields. A perfect opportunity for bridging the gap between high school students' interests and the technology needed to investigate their questions is to work with them on science fair projects. Working with high school students on a college campus gives the students an opportunity to experience rigorous scientific experimentation on equipment generally unavailable to high school instructors. This kind of collaboration benefits both the students, and increases the visibility and diversity of the Institute. It also bridges the gap between secondary education and institutes of higher learning. Two high school students from Boston Latin School approached WIT with a request for help with their biodiesel based science fair project. Their project involved measuring the energy content of biodiesel fuels synthesized from different feedstocks. The equipment required for accurate measurements of this sort was available in the Department of Sciences, and they collaborated with Professor Sirokman in using said equipment to acquire data. The students' project was entered in the Boston Regional Science Fair, part of the Massachusetts State Science Fair competition, and aside from several honors, also won second place. The project is thus qualified to move on to the Massachusetts State Science Fair. To improve the project, further investigation and experimentation will be conducted., The challenges of bringing high school students into an academic setting, as well as the potential rewards will be discussed. The nature and results of the students' experiments will be presented.

41

Accelerate, an Innovation and Entrepreneurship Program

Monique Fuchs and Frederick Driscoll, Wentworth Institute of Technology

Innovation and entrepreneurship is a mindset not only applicable to those launching their own companies, but relevant for anyone seeking to challenge the status quo and to reinvent, improve, and advance in any organization. College courses and programs primarily introduce subject matter and have traditionally been used as building blocks for the next course in a program's sequence but often they do not add the additional robust and interdisciplinary educational layer that graduates need to make future societal and global impact as well as build successful careers both personally and professionally. In May 2012, Wentworth introduced an innovation and entrepreneurship initiative, Accelerate, for students to turn their ideas into reality. It is open to all students enrolled at the Institute. Today's presentation describes everything that has occurred since Accelerate's inception and how well Wentworth is perceived in the Boston/Cambridge innovation community in such a short period of time.

42

Cost Growth Areas in Retail Construction

Khalid Siddiqi Siddiqi and Joeseph Rounseville, Southern Polytechnic State University

The objective of this study was to identify the construction specification institute divisions that breed the highest amount of cost growth in the retail construction industry. A comprehensive study was conducted to identify the divisions. Actual data on contract amounts and final close out amounts from completed projects during last five years was collected and analyzed. The scope of this study excluded site work and 2012 RS means city cost data for city cost correction factors was applied. One major conclusion from this study was that thermal, moisture protection division had the highest cost growth during the past five years. The intended audience for this study was general contractors interested in bidding for new supermarkets that have retail shops.

43

The Lessons of Finite Math for a Chemistry Professor

Gergely Sirokman, Wentworth Institute of Technology

Crossing the boundaries between disciplines can on occasion lead to unexpected rewards. The author had the opportunity to teach a Finite Math course, covering topics including matrix algebra and Markov chains. An unexpected side effect was the application of these math topics to chemistry problems, helping students better engage with the material presented in a chemistry course. A fundamental problem in chemistry is that of teaching students to balance equations. This is a problem that can be trivially solved with the application of matrix algebra. Although many introductory chemistry students have not previously been exposed to matrix algebra, systems of linear equations can lead to easy solutions of certain equation balancing problems. Chemical equilibrium presents students with a fairly complicated concept. Probably due to the influence of physics, students tend to expect equilibrium to meanequal amounts," as in physics equilibrium is a matter of equal forces. In chemistry, this concept can be even more complicated to understand. Markov chains give a very easy handle on the kinetic aspects of equilibrium, and allow students to grasp the concept of "equal amounts" from the perspective of chemical change. This talk will show that crossing boundaries, and teaching outside ones"comfort zone" can occasionally lead to great new ideas in ones' usual field of choice.

44

Four for the Future

Jonathan Ripley, Wentworth Institute of Technology

Recent and future graduates of polytechnic colleges and universities may confront (and be directly involved in developing) a world different from the present in many respects. This presentation will examine four particular memes (ideas that spread widely or replicate) about the future extending the human lifespan, implanting microchips into human brains, bioengineering future humans, and developing robo sapiens or self-aware robots and their ethical implications. It is not the focus of the presentation to argue vehemently for or against any of these future developments, but to establish that the debate needs to be conducted, and that the debate needs to be continuous, incorporating new aspects and technologies as they arrive. The presentation will make specific reference to PHIL450, Ethics and the teaching of concepts about the future in an undergraduate ethics course.

45

Interdepartmental Faculty Collaboration is Essential to Develop Rigorous, Career-Oriented and Student-Centered Courses for an Interdisciplinary Minor in Bioinformatics at the Wentworth Institute of Technology

Michael Werner, John Russo, Hong-Sheng Wu, David Rilett, Ali Ahrabi, Laurie Grove, Douglas Dow and Paloma Valverde, Wentworth Institute of Technology

Bioinformatics is the application of computer technology to gather, analyze and manage biological data. Currently there is a large body of high-quality and freely available bioinformatics databases and analysis tools accessible via the Internet. Anyone with a computer and Internet access could potentially analyze a wide variety of biological data including gene and protein sequences, gene expression data (primarily from microarrays), protein expression data, molecular structures, pathway databases, and medical information. These freely available bioinformatics resources can be used to teach students how to perform traditional gene cloning, make synthetic genes, perform polymerase chain reaction experiments, use molecular modeling for drug discovery, or help them critically search and evaluate medical information. In order for students to understand the relevance of these analyses some knowledge in molecular biology, biochemistry or biotechnology is required. When data sets are large or there is a need to perform repetitive analyses, programming is a very flexible tool that will allow for automation. Programming will also allow to link existing tools together to create powerful data analysis pipelines. The programming language of choice when it comes to bioinformatics tasks is usually Perl (Practical Extraction and Retrieval Language). Because the large amount of data processed in bioinformatics, there is also a necessity to perform statistical analysis to determine the significance of the results acquired. The statistical programming language R has become the data analysis tool of choice in bioinformatics. Both Perl and R are open-source and can be conveniently downloaded from the internet as well. Because of the high demand for bioinformaticians in all sectors of biotechnology and in research, a few computer science professors from the Wentworth Institute of Technology developed four different bioinformatics courses as part of a concentration within their program in 2007. More recently, professors from the departments of Sciences, Computer Sciences and Networking and Biomedical Engineering began a collaboration aimed at developing an Interdisciplinary Minor in Bioinformatics. Students declaring this minor will be expected to take core courses in Biology, Biostatistics and Intro to Bioinformatics (Perl based). In addition students will have the option to take elective courses about the use of bioinformatics tools in drug discovery and medical biotechnology or acquire more advanced programming skills for other applications. Independently of which electives students take, this minor is intended to be student-centered and career-oriented, and therefore will require a constant update of the course content by the faculty. To enhance the interdisciplinary nature and career-oriented characteristics of the courses, several strategies will be discussed by the panel's participants and will be opened to discussion. These strategies include but are not limited to having faculty acting as advisors of one another to develop the course content, co-teaching the courses, developing students' independent projects based on the trends of the job market and encouraging students and faculty to collaborate with one another to publish scholarly works or create new bioinformatics resources.

46

Mathematics Education in Extreme Social and Cultural Environments: Prison education

Georgi Gospodinov, Wentworth Institute of Technology

In many cases, education and in particular mathematics education is presented to social and cultural groups and at institutions that do not have natural mechanisms to support a healthy learning process outside the classroom. This talk will focus on the author's experience teaching and designing college-level curriculum to students at maximum-security prisons in New York State. Many social, cultural, and learning challenges arise in an environment so far removed form the natural social constructs that most of us live in. Deep questions about learning, intellectual growth, and value of education arise. Mathematics takes special focus as a discipline that requires active mentorship and guidance, however, it also allows for tremendous learning progress that does not naturally occur in society, such as a student who can barely add numbers progressing through all levels of education and within the span of 10 years graduating with a bachelor's degree in mathematics, co-authoring a publication currently in preparation for submission.

47

Integrating Lean Design and Construction into the Academic Medical Center environment.

Joseph O'Farrell, Brigham & Women's Hospital

This talk will introduce the complex planning process required in an Academic Medical Center, where the search for excellence in the patient care, research and teaching missions must be balanced against the realities of cost control, efforts to retain, and grow, local market share, and recruiting, and retaining, national level physician-scientests. Partners Healthcare System, Inc. has, through one of its members, Brigham & Women's Hospital, undertaked its first lean project. The project, known as the Brigham Building for the Future (BBF), is a 360,000sf translational research building, with a heavy, though not exclusive, emphasis on neurosciences and muscoloskeletal. The lean process is being used to enhance communication, break down unnatural -- though traditional -- barriers between team members, and share responsibilities for the delivery of a world class science and clinical building in time of tight financial constraints.

48

STEM community outreach via service learning: A new initiative to bring science education out of the classroom

Laurie Grove, Wentworth Institute of Technology

Service-learning integrates community service work with student education and reflection. A new student-led service learning initiative providing STEM outreach to local middle school students was developed by faculty and students at Wentworth Institute of Technology's departments of Sciences and Applied Mathematics during the spring of 2013. This effort was supported through Wentworth's Center for Community Learning and Partnerships and in partnership with Sociedad Latina, a Boston-based organization committed to youth education and development. In this collaboration, four different Wentworth student teams hosted a series of after school STEM-related events through the months of March and April. The Wentworth students brainstormed, designed and taught various topics in science and mathematics using hands-on activities while faculty members provided mentorship. The outcomes of this project for the middle school students extended beyond traditional learning; via hands-on activities that combine building, designing and troubleshooting skills, the students learned how to apply scientific knowledge to problem-solving while having fun at the same time. Meanwhile, the Wentworth students were challenged to step back from their often detail-oriented coursework and consider simple science and math topics from a new perspective. It is often said that by teaching, one truly masters a topic. Hence, developing and presenting simple topics in science and math required the Wentworth students to firmly understand the basic principles at hand and prepare for potential pitfalls. In this presentation, I will discuss the initial launch of the program and provide an example of one of our successful outreach activities. An analysis of the successful components and lessons learned will be provided and future directions of growth will also be discussed.

49

S.E.A.T. (Sensing External Activity over Time)

Mario Cocchi, Gennaro Bonfiglio, Michael O'Brien and Ernest Shedden, Wentworth Institute of Technology

Our team is comprised of two students majoring in Mechanical Engineering Technology and two students majoring in Computer Science from Wentworth Institute of Technology. The purpose of this project is to develop a cross-discipline by combining the skill sets of mechanical engineering and computer science students. The mechanical engineering students will assemble, and test mechanical sensing components to provide an input to software for measuring and displaying data. The computer science students will design and implement software that interfaces with the sensors via an arduino microcontroller. The software will record and display data measured by the mechanical components.,Our project consists of multiple pressure/force sensors which are placed under the seat of a chair. When the user sits down, the chair detects the weight of the user and sitting style. The device can also notify the user if they have been sitting for too long over a period of time. The data collected from

the sensors will be displayed to the user. Movement across the sitting platform can be tracked and displayed to show how the user is sitting in real-time.,The software component will control two timers, one for when weight is detected and one for when no weight is detected. When the user sits down, the first timer is started and runs until the user stands up at which point the timer is paused and the second timer starts. When the user sits back down, the second timer is paused and the first timer continues. This data, if possible, will be displayed in real-time. A statistics page containing cumulative times from previous sessions will also be available. The user will be able to set custom reminders to promote movement as well as postpone currently active reminders. Also, if possible, the weight distribution across the sitting platform will be displayed in real-time. This project has a budget of $100.

50

Project-based Learning for Lower Level Courses

Jiahui Song, Wentworth Institute of Technology

Project-based learning is a dynamic method to inspire students to obtain a deeper understanding of the subjects, apply and integrate knowledge they are studying. It is often used in higher level courses. This paper presents examples and effectiveness of this approach for lower level courses. Undergraduate students get bored with theory in lower level course classrooms and like to see more practical examples. Project-based learning teaches students to explore and solve real-world problems and encourages students' desire to learn. Students who are curious and interested in the subject are easy to teach. They will be active participants in the learning process, and improve their self-directed learning skills which will guide them toward becoming lifetime self-instructors.

51

Using the Blackboard Self and Peer Assessment Course Tool in a Course

Todd Johnson, Wentworth Institute of Technology

This paper describes how the Blackboard Course Management System (CMS) Self and Peer Assessment Course Tool was utilized in a course taught in a traditional classroom learning environment to facilitate the students' anonymous review and evaluation of a series of related assignments submitted by their fellow students. The advantages and limitations of using this course tool are discussed and the lessons learned from implementing this on-line component of the class are reviewed.

52

Electronically Assisted Remote Height Measurement

Jenny Tran, Michael Young, Joseph Marinaccio and Joseph Santacroce, Wentworth Institute of Technology

The objective of this student project was to determine the height of a building by designing a device that would utilize a protractor, linear potentiometer, a soda straw and a level. The only predetermined parameter that was allowed was the distance to the building. Using these four objects and by sighting the top of the building through the straw, an angle was measured to calculate the height. The potentiometer converted the mechanical angle for an electrical measurement. A test of the system measured the height of the Massachusetts College of Art and Design residence hall within a 10 percent error. In order to reduce the error, a second model was developed. This prototype contained an Arduino microprocessor with an ultrasonic measuring system to electronically measure the distance to the building. This technique was proven as a viable approach in a laboratory environment, but due to the limitations of ultrasonic ranging it was not tried to measure the building height. However, this approach leads to a design that automatically measures building height using a laser ranging technique.

53

Does Laboratory Technology Facilitate Students' Learning In Biology Courses?

Ekaterina Zagriadskaia, Ali Ahrabi, Alena Chekmasova and Paloma Valverde, Wentworth Institute of Technology

The Department of Sciences at the Wentworth Institute of Technology taught a Cell and Molecular Biology course at the New Center for Sciences and Biomedical Engineering for the first time in the Fall 2012. This course was initially developed as an introductory biology course for biomedical engineering students, but it is now being offered as a science elective for other programs as well. Topics covered in this course included cell structure; chemistry of macromolecules; membranes; cell signaling and communication; energy, enzymes and metabolism; cell respiration and photosynthesis; mitosis and meiosis; genes and genetics; DNA replication and overview of gene expression. To supplement lecture material, we have developed a set of labs designed to give students a hands-on experience and a deeper understanding of the topics covered in lecture. Overall, students have completed nine two-hour lab experiments during the semester. Four of these experiments used Vernier technology and software (products of Vernier Software and Technology, LLC, Beaverton, OR) and were a great success among the students. We have used the SpectroVis Plus spectrophotometer in combination with the LabQuest 2 or LabQuest Mini data integration systems to test protein concentration in different types of milk and to study enzymatic activity of the enzyme lactase. The lactase lab was done over a two-week period and included investigation of how enzyme activity depends on the enzyme and substrate concentration, pH, and temperature. All data analysis was done with the Logger Pro software from Vernier. We also used CO2 and O2 gas sensors to study cell respiration in green peas. Students worked in small groups to complete all the experiments and quickly became proficient using Vernier sensors and the Logger Pro data analysis program. Students' evaluations and students' grades suggested that the lab component of the course was a huge success and had a major contribution to students' learning. We believe that a large part of this success is due to implementing Vernier Technology in the classroom. Based on these encouraging results, laboratory equipment and software from Vernier is currently being implemented in other Sciences courses at Wentworth Institute of Technology.

54

Why Do Polytechnic Students Never See the Science in Science Fiction: Or How Do We Build the Bridge to Understanding the Value of the Humanities in a Technical Universe "One Humanist's Experience"

Marilyn Stern, Wentworth Institute of Technology

The most frequent comment I receive from students in my humanities classes is: "But this isn't our major. Why do we have to read so much?"Why indeed do our students need the humanities, and how do we build the bridge that not only allows them to understand the contribution of the humanities to their education, but also allows them to enjoy reading and seeing and thinking outside their comfort zone? As a professor of literature and film, I firmly believe in the inherent value of my discipline to the education of my students. I do not believe that building a bridge means simply teaching material that students can relate to. For years, students in my SF/ Fantasy class have responded with blank stares when I ask them to identify the real science in science fiction literature. It ought to be intuitive that students whose lives revolve around technology would at least recognize the science. But they don't. My experience in science fiction illustrates that just teaching something students ought to relate to does not necessarily guarantee a bridge. More importantly, I want to expose my students to the best in literature and film. So how do we build the bridge? We include the humanities in our interdisciplinary courses. No discipline of the human experience exists independent of that human experience. We must start at the faculty level and have discussions that allow us to recognize those points where our disciplines intersect, and then we must collaborate and contribute to each other's courses. Several years ago, I taught drama to an interior design class so that they could understand the drama of the restaurant experience before they began to renovate a space. And this past year, I invited a professor of physics to lecture in my science fiction class, so that he could explain

the real and speculative science in Larry Niven's Ringworld. This led to an assignment for my students in which they examined the basis of the speculative science in a work of science fiction and assessed the value of that speculative science both from the perspective of science as we currently understand it and from the perspective of ethics: should we pursue this idea and if so, how should we pursue it. My students raved about this collaboration and about the assignment. In their student evaluations, they identified this as the assignment they learned the most from. Therefore, in my talk, I will discuss how these collaborations evolved and how I hope to expand upon them in the future. Most importantly, I hope to illustrate how significant collaboration among faculty can be both for the students and for the faculty.

55

Strengthening Project-Based Learning Experiences Through Expanded Interdisciplinary Collaboration Between Colleges of Management and Engineering: A Review of the Endeavors of Two Polytechnic/Technological Universities

Robert Klippel, Michigan Technological University; Abel Adekola, University of Wisconsin - Stout

This paper examines the background of experiential learning within two universities: University of Wisconsin-Stout (Wisconsin's Polytechnic University) and Michigan Technological University. While institutional framework has uniquely shaped experiential learning at these institutions, both have a strong hands-on reputation relative to student learning. As such, the focus of this paper explores how two deans of management/business at the previously referenced institutions are seeking to expand experiential learning opportunities for students within their academic units. More specifically this paper examines ways to provide students with a better understanding of entrepreneurship, and entrepreneurial activities, via project-based learning. Given the polytechnic/technological university framework, as well as a sound understanding of the range of activities which entrepreneurship spans (ideation/innovation to commercialization), it is abundantly clear collaborative efforts with engineering and science-related academic units hold synergistic potential for strengthening project-based learning within the engaged academic units. The paper concludes with a brief discussion of existing collaborative initiatives, as well as those underway, or under review, at both institutions. Hopefully, the presentation of this paper will prompt an expanded "best-practices" discussion relative to key issues examined in this study.

57

The Necessity of Teaching Collaboration Through Communication Skills to Interior Designers and Constructions Managers

Sean Stewart, Edward Sumner and Rachel Pike, Wentworth Institute of Technology

It is likely that most successful professional experiences of an interior designer or constructor involve significant collaboration and though collaboration is a complex process where each party is expected to bring their best game to the table it could be argued that the communication skills we teach in our academic environment are counterproductive where collaboration is concerned as they prevent the players from finding a common understanding and ability to achieve mutual goals. In order to be prepared for entrance into their careers, students must often master an enormous body of technical skills and jargon that enables them to speak like a member of their future profession. One might argue that developing that ability to speak comes at the price of narrowing a student's perspective and thereby limiting their ability to communicate about their field with anyone but a select group of insiders. Though this narrowing of perspective may appear to be intellectually advancing, it may limit their professional successes. Design students and construction management students are trained to think in fundamentally different terms. Interior designers are taught to think about the user's experience in the space after construction is completed. Construction managers, on the other hand, are taught to focus on the processes and logistics that facilitate putting the physical parts of a project together as well as the time and resources necessary to do so. Because these ways of thinking are fundamentally different they are hurdles to be overcome if a successful

collaboration is to take place. Over the past three years, professors of the Interior Design and Construction Management programs have undertaken an exercise where students design a complex corporate office project and develop and track construction budgets through multiple project phases. The process starts with each instructor visiting the other's classroom and exposing the students to their specialty and attitude toward the design and estimating processes. Students are paired and jointly develop project descriptions, schedules of materials, and budgets while simultaneously learning to communicate with their partners, appreciate the other's perspective, and become better collaborators. By realizing communication is the key to collaboration it is hoped that students who participate in exercises like this one will be more successful collaborators in their professional careers. In addition to elaborating on the points above, the paper will argue that the advent of Integrated Project Delivery (IPD) beginning to be utilized in design and construction projects based on Building Information Modeling (BIM) methodologies necessitates an expansion of collaborative student projects such as the one described as it is a necessary preparation for the professional activities that may likely be commonplace during our current student's professional careers. Furthermore, the paper will suggest that as IPD becomes commonplace the shared rewards it offers will make communication skills involved in collaborations not only a necessity for success but also a desirable business model. As such, students taught to have good collaborative communication skills will succeed where others do not.

58

School District UW Stout Partnership for Student Success

Mary Hopkins-Best and Jackie Weissenburger, University of Wisconsin-Stout

The Pathways to College Network stresses the importance of tracking the progression of students from PK 12 through college and into the workforce (http://www.pathwaystocollege.net/pdf/data.pdf). While some states have adopted a statewide student record data system for tracking students, we are not aware of any universities that provide school districts with specific data on how graduates of that district perform at their specific college. In 2011, the University of Wisconsin Stout developed a School District University Partnership for Student Success program to do just that. The partnership is based on a belief in a shared responsibility for student success, and serves to improve PK-16 communication, facilitate a seamless transition from secondary to postsecondary education, and enhance student achievement. School district reports are aligned to school district needs and inform practice at both levels. School district reports include graduate's performance in such areas as placement exams and basic skills courses as well as major selection and retention. Districts are also informed of partnership opportunities ranging from grant opportunities to collaborative teaching and research. The purpose of this session will be to provide attendees with a framework for developing a similar partnership.

59

Re: Empowering the Humanities - Digital Humanities at Wentworth

Ronald Bernier, Christopher Gleason, Lisa Falvey and Jody Gordon, Wentworth Institute of Technology

Empowering the Humanities ,Ronald R. Bernier, PhD. There is a loss of confidence today in college education arguably unmatched at any point in modern American history. Government officials and the general public express concern about the goals and directions of higher education and the degree to which its institutions succeed or fail to meet the needs of society. Business leaders and state legislatures charge that our colleges and universities are overpriced, underperforming, and unaccountable to the public. Moreover, the modern institution of higher education faces declining growth and increasing operational complexity; meanwhile, costs continue to soar and resources become ever more difficult to secure. Indeed, the role and very definition of higher education has changed significantly in recent years. The focus now is on the issues of relevance, applicability, and preparation for working life outside the academy's protective walls, and difficult questions are being asked about cost, efficiency, productivity and effectiveness. This panel addresses this state of crisis in higher education specifically as it pertains to the future of the Humanities, and the decline of liberal education in general within an environment

in which higher learning is increasingly ordered according to the material interests, conditions, and designs of sciences, technology, and the professions, such that the future of the university would seem to render the humanities increasingly marginal, if not invisible. How, then, are the Humanities, or humanities education, to respond, beyond mourning our fate of inconsequence? One promising opportunity, we think, is the Digital Humanities, a relatively new but fast-growing discipline, which interprets the cultural and social impact of the new information age, and creates and applies new technologies to answer cultural, social, and historical questions, both those traditionally conceived and those enabled by new technologies. DH@WIT Christopher Gleason, PhD Wentworth Institute of Technology (WIT), an independent, co-educational, technical design and engineering college located in Boston, Massachusetts, offers a comprehensive interdisciplinary, project-based education that integrates classroom, laboratory, studio, cooperative and experiential learning. Our department of Humanities and Social Sciences (HUSS) is currently working to develop and promote a digital humanities-inflected undergraduate curriculum. Unlike more traditional humanities programs, we are using digital humanities to prepare students for careers outside of academia. This presentation will highlight the aspects of DH@WIT that we consider to be unique. We are already a technology and design based institution immersed in a studio/lab-based culture, so, whereas most institutions with an interest in DH tend to bring technology to humanities, we are bringing humanities to technology. Our department is already highly interdisciplinary and collaborative (with faculty offering courses in Literature, Art History, Film, Music, Philosophy, History, Psychology, Sociology, Political Science, Economics, Cultural Studies, and Communications), and thus we are not hampered by disciplinary boundaries that exist at many other institutions. Our research suggests that DH graduates with a strong background in computer application design and programming are likely to have the best prospects for a job outside of academia. A more tech-training-oriented program would also align well with W.I.T.'s other institutional offerings. Including training in advanced technical skills such as graphic design or computer engineering, the DH@WIT curriculum offers significant advantages to students entering the workforce because their interests and skills are applicable to many opportunities in a wide range of industries. Overall, nationwide employment for occupations directly related to DH degree programs appears to be growing steadily. Thus, we propose a new degree program at Wentworth: a Bachelor of Science in Digital Humanities. This would be an interdisciplinary program of study that combines theoretical and practical courses, with the goal of educating new digital and media specialists for the growing knowledge and information economy. Such a program would provide students with a multi-disciplinary foundation in visual and digital literacy and competency. Because the nature of DH work is applied and project-based, students in the BS program will have hands-on training in studio-based classes, in addition to the theoretical, critical, social, and ethical contexts for thinking about the making, and critique, of new knowledge through Digital Humanities / New Media research and applications. Learning outcomes will include digital literacy, visual literacy, rhetorical competence (visual and verbal), cultural awareness, creative self-direction, and intellectual curiosity. DH@WIT is conceived as our own unique response to the "two cultures" problem noted by Thomas Bartscherer in his introduction to Switching Codes: Thinking Through Digital Technology in the Humanities and the Arts (2011): "an attempt to bring scholars and artists into more robust dialogue with computer scientists and programmers"(2). We will prepare our students to serve as cultural-technological intermediaries. From Pixels to Praxis: Defining Literacy in the Digital Humanities, Lisa Falvey, PhD According to Cushman (2011), the Humanities have traditionally privileged text over alternative signing systems such as sound, image, and film/video, just as they have privileged writing over other forms of production. Because digital media have become essential tools of human communication, fluency in these alternative signing systems particularly for the polytechnic student population should be one of the defining goals of the Digital Humanities. This presentation describes the value of nurturing students' abilities to tie textual and non-textual modalities as a way of increasing overall facility in and across these systems of meaning/making. In addition, it will explore curricular and pedagogical strategies for the development of this fluency (as producers and consumers) in three core digitally-produced areas: the moving image (video, animation, gaming, etc.), video editing, and sound production. In the end, I suggest that developing "cross-system literacies" in the digital humanities inevitably

supports student's dexterity in other non-textual modes of communication that are requisite throughout the polytechnic university. Jody Michael Gordon, PhD Alea iacta est: Crossing the Digital Rubicon or Converting to Digital Workflows at the Athienou Archaeological Project (Cyprus),In 2012, the Athienou Archaeological Project (AAP) made the decision to cross the digital Rubicon and to replace paper-based modes of archaeological data collection with digital ones utilizing Apple iPad mobile tablets. For more than twenty years, the AAP has been focused on the excavation of a Cypro-Archaic through Roman period religious sanctuary located in the central plains of the island of Cyprus. Throughout this time, the project utilized traditional modes of data collection focused on notebook-based daily notes, context sheets, and pencil illustrations. This system was highly detailed and recorded excellent primary data; however, it also created a massive amount of paperwork that was unwieldy to collate, store over the long-term, and analyze effectively. This paper has two goals. One goal is to highlight how recent technological developments in tablet computing and the emergence of strategic approaches to digital archaeological workflows can provide significant scholarly and logistical insights into how humanities projects approach the analysis of large-scale datasets. A second goal is to outline the benefits and pitfalls of implementing a digital approach to data collection, storage and analysis, within a longstanding archaeological project by drawing on our experiences at AAP. Overall, I show how converting to digital workflows via strong, team-based, decisions on the development of protocols, methodologies, and goals, provides immediate logistical and academic benefits, while opening the door to long-term research possibilities related to emergent computing technologies.

61

Cooling Vest System

William Williams, Logen Johnson, Jefry Lopes, Devin Richard, Zenouzi Mansour and Douglas Dow, Wentworth Institute of Technology

Regulation of core body temperature is an important control point of physiological homeostasis in mammals. Periods of hyperthermia, having excessive core body temperatures, induce physiological stress and may lead to heat stroke. Hyperthermia results from a mismatch between the supply and release of heat, due to insufficient dissipation of excess heat within the body to the environment. Negative feedback mechanisms respond to hyperthermia by inducing changes in both autonomic systems (increased blood perfusion to skin regions, increased sweating and reduced metabolism) and volitional behavior changes (adjustment of garments, body position, drinking of cool fluids and other behavior) that work together to cool the body. Physiological regulation of body temperature may become impaired due to neurological dysfunction resulting from spinal cord injury, head injury, disease or old age. The neurological damage that impairs thermal regulation may also impair motor function and mobility, resulting in affected individuals relying on a wheelchair for locomotion. Components of the homeostatic system that may become impaired include 1) detection of core body temperature, 2) identification of a state of hyperthermia, 3) activation of autonomic systems to cool the body, and 4) arousal of conscious awareness of being in a state of hyperthermia and inducing changes in behavior that would cool the body. Electromechanical engineered systems could assist thermal regulation. Electronic temperature sensors can be placed in body locations to detect temperatures that reflect core body temperature. One location that may be suitable for chronic monitoring of temperature would be on the skin near the axillary artery located near the underarm. The temperature detected at this location is considered to reflect core body temperature. Once a state of hyperthermia has been detected by the electronic control system, actuators could be utilized to directly cool the body, and to issue an alert to the individual or caregiver encouraging changes in behavior (garments, position) that would assist cooling. One way to directly cool the body is a cooling vest system. Cooling vests have been developed and tested on helicopter pilots, bull dozer operators, standing surgeons and athletes (pre and post activity). Both able bodied and disabled athletes have utilized cooling vests. In this project, we are designing and testing subsystems for a cooling vest system for chronic use by wheelchair based individuals. Temperature can be detected on the skin near the axillary artery. A cooling system mounted on the wheelchair will cool and perfuse fluid through a vest, when a condition of hyperthermia is detected. If the cooling system does not adequately

restore normal body temperature, an alert will be issued to the individual or caregiver. Results of the testing of this prototype will be useful toward potential development of a cooling vest system that could enhance thermal regulation in many individuals who utilize wheelchairs and would be otherwise at risk for hyperthermia. In general the system will allow heat to be transferred from the body to the air by pumping fluid through a vest and then to a reservoir. The heat transfer of the system is through conduction and convection. The water returning from the vest will flow over a thermoelectric cooler or Peltier device upon entry to the reservoir. This allows the system to more effectively remove heat from the patient, and to pump the heat into the ambient air. The reservoir also transfers heat to the air through conduction as it dissipates the heat from the patient.

62

Inter-Disciplinary Design Mash-Up Project: A Light Fixture For an Art Museum

Peter Greenberg, Wentworth Institute of Technology

The talk presents the results of an interdepartmental project where senior students from two distinct design disciplines worked together on a common design: a tabletop light fixture for a hypothetical art museum. Very different design methodologies are emphasized in each discipline and the interdisciplinary project explored what is gained by having the students collaborate on a common goal. By asking students of these different disciplines to work together in teams, the exercise raised questions of planning and action, of craft and ideas, of materials and method, of logic and intuition, questioning the very method of design itself. The results demonstrate an energetic process that challenged some students' preconceptions and delighted others with a method more broadly conceived than their disciplinary presumptions. Seniors from the different design departments were asked to collaborate on a project for a hypothetical fundraiser for a proposed Museum of Mid-Century Art + Design, the term project for the Interior Design students. For this interdisciplinary project, students worked in small teams of two or three that had at least one interiors student and one industrial student. Over the course of one week, students were asked to produce a completed and functioning light fixture. The students were given off-the-shelf lighting components and were asked to design the diffuser based on the themes of the work of one of five mid-century American painters represented in the museum collection: Willem deKooning, Hans Hoffman, Lee Krasner, Jackson Pollock, and Mark Rothko. These abstract expressionist artists employed a method of art production that accessed direct decision-making and access to subconscious intuition -- as well as logic. Their work was not an illustration of an idea but a direct expression of an idea. Teams of students who produced the cafe table lamp were asked to design by making. They were asked to work at full scale, in real materials to make the actual thing -- not a model or a prototype. Students from the two different departments, Interior Design and Industrial Design, learn to design in very different ways. Interior Design students learn to pre-visualize their designs and to propose unique solutions within the context of a broader space of their project. Interiors students brought a design-intent for their larger project to the collaboration with the Industrial students. Industrial design students learn to design with a high level of material craft and to conceive of an individual object within the context of mass production. The spatial context for their designs is flexible: how would the specific context of the interior design students' museum design influence the approach of designing a light fixture? How would the dialogue between disciplines affect the process? How would the themes of the individual artists guide decision-making? The collaboration asked additional provocations: how would material choices influence the design? What were the properties of those materials that could be exploited to create design resolution? How could the dance of production result in a design? How could materials create translucency and transmit light and color? How were the artist's ideas represented not just forms that resemble the artists' work? The results of the collaboration reveal an energetic exploration of designs and a mash-up of methods. Students created projects that fused craft materiality with analytical design intent. Although this particular inter-disciplinary project was limited to a brief time period, the broader lessons of methods of conception and design that were learned might find applications in all of the students' subsequent project work.

63

Simulation and Project-Based Learning in a Construction Management Program Capstone Course

Mark Hasso, Wentworth Institute of Technology

The main goal of this study is to provide many years of experience in simulating project development in an academic environment in a capstone course. Capstone courses are senior year courses to provide the students the opportunity to fine tune their skills and knowledge in the field of study as team players, leaders and competitors, culminating in an immense understanding of the field of study. During this course students will: Work in teams, Develop management solutions to real world projects, Integrate concepts and principles learned through the Construction Management program, Deliver work in written reports and oral presentations. This course incorporates lectures, guest speakers, site visits, and students are required to complete a study on a project under construction. The students are provided with a complete set of project documents. The study covers several elements starting with the development of the statement of needs, develop a request for proposal for CM services, preliminary phase status report and 80 percent design development the guaranteed maximum price status report. The status reports cover project management, contract management, time management, cost management, safety, risk, quality, and information management. Project team assessment is based on project deliverables and each student is assessed individually and also the group as a whole. The assessment process follows industry standards of practice on the assessment of effective and high-performance teams.

64

Interdisciplinary Collaboration in New Major Design

Lisa Maclean, Patrick Hafford and Suzanne Kennedy, Wentworth Institute of Technology

Wentworth Institute of Technology has a longstanding tradition of innovative education. It maintains a strong commitment to community service, service-learning, and student-centered learning. Wentworth has been moving towards progressive educational advancements to include project-based and interdisciplinary education. This is more reflective of the broader, collaborative, results-oriented environments of organizations today. A new major proposal for a Bachelor's Degree in Computer Information Systems (CIS) was undertaken in 2012 to reflect this focus. Functioning at the intersection of business and technology, CIS offers an education that neither discipline alone can provide. Designing this new major required the same kind of interdisciplinary, cross-college collaboration and co-operation that students will encounter in the program. Faculty, department chairs and deans from the College of Management and Facilities and the College of Engineering and Technology all worked together to produce a flexible, rigorous and comprehensive program of study. It progressed startlingly quickly. This talk will focus on this collaborative planning that went into developing this curriculum, and the problems encountered and resolved along the way. These included course identification, course sequencing and scheduling, prerequisite issues, accreditation requirement review, creating the business plan, and the internal and external approval process. Not only was this major was designed to receive dual accreditation (from ABET and IACBE) but through judicious course selection, it was built entirely from existing courses, posing no financial risk to the college and requiring no new faculty or course development. Wentworth is proud to offer this major, and it has already shown to be a success in retention of current students who were reconsidering their chosen fields of study. This talk will be enlightening for anyone wishing to explore curriculum design or create new majors.

65

Engaging millenials by flipping the classroom

Naomi Ridge, Wentworth Institute of Technology

Millenial students come to college from a high-school experience heavy on standardized testing. Students selecting a polytechnic for their college education generally have strong technical and computing skills, but lack confidence in the analytical subjects which make up the core of a engineering major.,In this paper I discuss how I use the model of "flipping the classroom" to engage and build confidence in freshman physics students. In particular I will address one of the concerns I have heard voiced by other teachers considering using such a teaching model, that is, that students will arrive at class unprepared, and the techniques I have found successful in tackling this.

66

Manufacturing Center

Peter Rourke, Wentworth Institute of Technology

The Wentworth Institute of Technology student section of the Society of Manufacturing Engineers (S007) holds an open house in the institutes Manufacturing Center. Students will be stationed at various CNC vertical machining centers, mills, lathes, rapid prototyping equipment, foundry and welding/fabrication stations, demonstrating student work and projects. If desired, this activity could be for an extended time, and made available on a drop-in basis throughout the days available in the lab (June 5th and 6th).

67

Faculty Guided Projects: The Transition from Theory to Practice

Anthony Duva and Xiaobin Le, Wentworth Institute of Technology

Design projects typically represent opportunities to integrate theory with practical skills. A variety of delivery methods for project based learning are available to educators including independent study based design courses, extracurricular activities or adoption of faculty guided design courses. Each of the first two delivery methods can encounter various pitfalls in achieving desired learning outcomes for the entire student population. By careful design of a faculty lead project based courses, students can experience a simulated work environment while learning practical individual and team based skills which combine the application of theory including the use industry relevant analysis tools. This talk is intended to present a faculty guided project course currently being utilized to foster targeted student learning outcomes as a model to develop other applied design curriculum.

68

Ultraviolet (UV) Water Purification System

David Ketchen, Patrick Laverty, Vincent Coppola, Douglas Dow and Joesph Santacroce, Wentworth Institute of Technology

Clean and safe drinking water is not accessible for 780 million people, and this population is growing. The origin of contaminants in drinking water includes sewage, industrial waste, and many parasitic forms of life. Parasites that could infect a human host following consumption of the water include worms, insect larvae, spores, bacteria and viruses. Nonliving particles in water are not only composed of chemical composites, but also may shelter parasites. The particle may actually help maintain their viability of the parasite in harsh environments that would otherwise have the effect of killing the parasite, such as during sterilization processes. Methods to sterilize water and kill parasites include high temperature (boiling), chemical treatment (chlorine), and radiation treatment (UV light). High temperature would be cost prohibitive for large quantities of water. Chemical treatment requires careful processing to avoid too little (not kill parasite) or too much (toxic to human) of the chemical. Besides chlorine, hydrogen peroxide could function to sterilize water, but has been shown to carcinogenic in animals. Such careful chemical treatment may not be a realistic option in many developing environments where people without access to clean water live. UV treatment of the water appears as an option due to the relatively low cost. Exposure to UV light at a sufficient intensity for a sufficient period of time is considered to kill or disrupt exposed bacteria and viruses. In this project we are developing and testing modules of a system for sterilization of water. The design of the system is intended to be suitable for many developing environments where people would benefit by having access to more clean and safe water. The system has two processes to 1) filter particles from the water, and to 2) sterilize the filtered water with UV light. First the contaminated water will pass through a stainless steel wire gauge filter and flow into a carbon coal filter to remove particles. Next, the water will flow into an enclosed chamber container being radiated with UV light to kill the remaining pathogens. The system is meant to be portable, and process enough water each day to supply the needs for a few families. Electric power may not be available in some environments, but extensions to this system could possibly supply the power through alternative source (solar, wind). The system being developed may be suitable to provide clean drinking water for many people who would otherwise not have access, and thus would improve their health and quality of life.

69

Development of a Project Based Course with a Life Long Learning Component

Joseph Santacroce, Wentworth Institute of Technology

One aspect of a project-based course is to bring the learning experience into the real-world environment. It would seem reasonable that this approach could also incorporate a lifelong learning element to the course structure. This paper presents the development of a project-based course that interleaves design analysis cases with a stream of projects to achieve that end. Each project in the stream has three elements, classroom lecture, a design analysis, and the actual design project itself. The lectures are focused the application of theory, understanding of manufacturer's specifications and an understanding of the "in-house" technical language associated with the topics related to the specific design analysis and project in the stream. The design analysis requires the project team to study a design related to the design project and learn concepts that they are expected to apply to the project. This design analysis teaches the team to develop the creative insight necessary to proceed to the design stage. The lifelong learning component is rooted at this stage of the project. Finally with the classroom lecture, the design analysis and the completed design project, they have achieved a real-world experience that teaches them how to learn in an environment similar to what they will experience in their practice of engineering.
This technique was developed over three semesters of teaching Analog Circuit Design, a course offered to Electromechanical and Computer Engineering students. Traditionally, courses of this nature are taught with a heavy focus upon analysis and supporting computer simulation giving students a strong theoretical background but a total lack of practical design capability, thereby leaving the student with a "design experience" void to be filled in by their employer. However, since this course was originally developed with a device-oriented pedagogy, it offered a great opportunity to apply project based and lifelong learning concepts toward a design discipline that can be applied when practicing engineering after graduation. This three-step approach as described is currently being applied an Analog Circuit Design course during this spring semester.

70

Intelligent Active Aerodynamic Systems

Craig Curtis, Megan Joiner, Chris Hashem, Benjamin Nadeau and Thomas Fuller, Wentworth Institute of Technology

Intelligent Active Aerodynamic Systems (IAAS) are aerodynamic control surfaces that use the shape memory mechanism of Nitinol wires which have been embedded into an elastic medium. Nitinol is an alloy of Nickel and Titanium which possesses pseudo-elastic properties, causing it to shrink a considerable amount when it reaches an activation temperature. By achieving accurate control of the Nitinol and integrating it into an airplane wing, a method for inducing rolling rate can be developed which contains fewer moving parts. With a well-developed implementation of this technology, controlled flight would be made more accurate, more responsive, and have lower turbulence. The shape of the system is manipulated using a microprocessor based digital control system. The control circuit will utilize pulse width modulation to precisely control the temperature of the Nitinol wire in order to change the curvature of the control surface with more accuracy. Sensors are used to measure environmental parameters and are implemented in conjunction with the control system in order to autonomously determine the appropriate surface shape. IAAS aim to revolutionize the use of shape memory alloys in the design of more organic aerodynamic applications.

71

Integrated Project Design, An Interdisciplinary (Architecture/Construction Management) Project Based Learning Opportunity

Charles Cimino and Thomas Taddeo, Wentworth Institute of Technology

The design professions are experiencing an evolving dynamic with the emergence of Integrated Project Delivery (IPD), a new model of operations and cooperation between the design professions, building/construction profession and all forms of ownership entity. As the inefficiencies of a compartmentalized approach to the Design Bid Build (DBB) model become apparent a unique opportunity/demand for a shift in pedagogy is incumbent upon the academic community. The reality of internship and the roles of emerging professionals will migrate to a more collaborative effort designed to bring all parties to the table together and under a single agreement. This scenario can be transplanted into the combined curricula of architecture and construction management and leverage the education, experience and value of every student involved. The architectural component is the Comprehensive Design Studio, occurring in the fourth year of the curriculum and bringing together the design and coordination of the program solution and required systems. As stated in the course syllabus the desired learning outcomes are: demonstrate integration of design concept at large scale with building envelope, building systems and sustainable design strategies (includes structure, envelope, MEP, passive systems, vertical circulation, lighting, acoustics, exhibit working knowledge of building regulations (life safety, occupancy, plumbing fixture count, AD, representation of integrated design through large scale drawings and models, and demonstrate integration of building materials and assemblies, including detailing. The corresponding component in the area of Construction Management is the Construction Project Control course, which addresses the control systems that are commonly used in project delivery. Objectives include: identification of the control system components and the development of a Master Program Schedule, cost analysis, budget preparation and value engineering of select systems, identification of green building opportunities (materials and methods of construction), Building Information Model (BIM) review, and code review for life-safety compliance. For the pilot program four teams of two (one architect/one construction manager) were established based primarily on a combination of BIM skills and a desire to extend their learning beyond the standard course requirements. In addition to basic contact information, construction management students were given full design studio access thus facilitating work arrangements and circumventing the problem of conflicting schedules. Preliminary information gathering at the chosen site was done independently then shared between team members as the design concept developed. When schematic design was defined by the architects, the construction managers began submitting information on building materials and methods for sustainable design and gathering empirical information to provide cost analysis and value engineering. In the final phase of the project we will present an integrated product complete with plans, elevations, sections, details, code review, cost estimate, construction schedule and BIM evaluation. All exhibits will be presented during our talk along with an after-actions evaluation of the strengths and weaknesses of the process.

72

Intra-Disciplinary Integration in Civil Engineering Education: An Approach to Integrate the Various Civil Engineering Disciplines with the Use of an Experiential Studio

Michael Davidson, Leonard Anderson and John Duggan, Wentworth Institute of Technology

Typically, civil engineering education supplements an individual course lecture series with hands-on laboratory exercises. These laboratory exercises tend to deal solely with the material being addressed in the lectures for the particular course. Consequently, not only are these laboratories limited to the one civil engineering discipline but also limited to the material being taught in the specific course. The Civil Engineering Department at Wentworth Institute of Technology is developing for roll-out in fall 2013, an experiential studio. This experiential studio will link several of the civil engineering disciplines in a series of three-two hour studios per week. Four civil

engineering disciplines will participate in this studio with the desired goals of gaining addition knowledge in a specific civil engineering discipline, performing experiments and exercises in a sequence that illustrate the multi-discipline interaction that typically occur on civil engineering projects, developing a better understanding of the role of each discipline in the practice of civil engineering and emphasizing the need for good communication between civil engineering disciplines. This experiential studio is a prelude for a second more independent experiential studio leading to the Comprehensive Capstone Design Course.

73

An Interdisciplinary Team Plans the next Big Dig for Boston

James Lambrechts, Wentworth Institute of Technology

When several architecture and civil engineering students could not find co-op positions for this past semester, it presented an opportunity to pursue an idea for a needed improvement to the Boston subway system. The preliminary plan had been studied in a prior semester by a team of civil engineering students to prove rough feasibility for extending the Blue Line subway from its current dead end at Government Center 2.5 miles through Back Bay and then onward to replace the current trolley service on the D-branch of the Green Line to Riverside. The need for service improvement along the Boylston Street corridor, now serviced only by trolleys in the Green Line tunnel, has been the topic of two recent professional reports. The work of the interdisciplinary team will provide a solution that can fulfill rapid transit through this segment of the MBTA system for the next century. In addition to the new Blue Line route, the team also investigated using the now "freed up" D-line trolleys for service via rapid transit tunnels or elevated structure to Dudley Square. At the beginning of the co-op term, the architecture students were assigned to look at how to convert 12 existing trolley stops into subway stations requiring high level platforms and confined turnstile entrances. The civil engineering students studied tunnel alignment and subsurface soil layering, and possible locations for using elevated segments rather than tunnels. However, as the semester progressed, the two groups activities began to overlap, and "interdisciplinarianism" began to take hold. This semester project reflected real-world design team interaction between architects and civil engineers do their own thing, until interaction is necessary. So after about six weeks of initial planning, the interactions began. One question raised 12 times was "How to fit the expanded new surface stations into the limited space previously occupied by the simpler trolley stops?" But the bigger questions arose with the four new underground stations for the Blue Line in Back Bay; how to fit in the necessary platforms and mezzanines. Mating architectural ideas with engineering necessities is proving to be a very interesting exercise over the final six weeks of the semester, as each group develops a better working understanding of the reality constraints of the project and the design needs of the other discipline. By the end of the semester, the team will develop civil engineering schematic drawings and architectural renderings for a report to be provided to the Mass. Dept. of Transportation, the MBTA, the City of Boston, and several state legislators in the hope that this project will soon be adopted as a remedy to current critical congestion.

75

Students' Perceptions of the Effectiveness of the use of Virtual Strength of Materials Laboratory

Wasim Barham, James Werner, Jon Preston, Yu Feng and Nathan Atkins, Southern Polytechnic State University

Through a grant from the NSF, we have developed a games-based virtual lab simulation for the Strength of Materials lab for civil engineering students. The Virtual Strength of Materials Laboratory is an interactive environment of 3-D objectives for creating and conducting simulated experiments. The 3-D objects are composed of different formats and include text, colors, sound, images, shapes, animations, video, and graphics. Many options are available when utilizing computer based virtual simulations. We can customize the virtual lab experience to the instructor's preferences and highlight specific key points. So far, we have been successful in modeling the tensile and the torsion tests (Barham et al. 2012), both simulations provide a learner-centered service-learning opportunity for our students by engaging their interest in game design and development. The

3-D lab simulation has three different views - namely, the lab view, the data view, and the report view. The Lab View was created to provide the user with general information about the test such as step-by-step instructions on how to conduct the test, selecting and setting up a specimen in the testing machine, and application of loading. The Data View automatically records the test results in a table format and gives the user the option to graphically plot the results in XY scatter. This allows the user to observe the relation between stress and strain and easily distinguish the elastic region and the plastic region. As the results are being recorded in the data view, the student can watch the test running on a small window. The user can observe a summary of the results in the Report View. The effectiveness of using virtual labs in engineering curriculum and its impact on students' learning has faced a lot of skepticism by some and optimism by others. The idea of replacing the physical engineering laboratory with a virtual game-based laboratory needs further research over a long period of time. The lab is designed for long-term effectiveness in education, reflecting the skills and learning strategies of digital natives who are familiar with digital games. The aesthetics are designed to be appealing, which has shown to increase positive responses to the learning experience. This can ultimately reflect retention rates in courses and programs. This approach is intended to create a more immersive learning environment that can foster creating thinking and higher rates of achievement for digital learners. The main purpose of this paper is to show and discuss students and faculty perceptions of the effectiveness of using Virtual Strength of Materials Laboratory. Over 50 students from different engineering programs and 15 educators from different schools tested the virtual lab over the past 12 months. The research team designed a questionnaire that consists of two parts. The first part measures students' perceptions about general aspects of the virtual lab such as easiness to use, clarity, and comparison to physical lab. The second part, measures students' perceptions on specific aspects of the virtual lab such as the interface, data recording and analysis, and consistency of the virtual lab results with the published values. Students and faculty perceptions were gathered and analyzed. In this presentation the results of this research study will be presented.

76

Workshop on Synthesis of Biodiesel at a Polytechnic School

Gergely Sirokman, Wentworth Institute of Technology

At Polytechnic institutions, one of the major challenges is to convince students that the sciences are indeed relevant to their engineering interests. One excellent way to capture the interests of students is to involve them in experimentation that heavily relies on science, in this case chemistry, but has immediate applications in an engineering setting. The production of biodiesel is an excellent bridge for students to be able to see chemical principles at work, and see the immediate relevance of fuels production to their engineering interests. In this workshop, participants will have an opportunity to synthesize their own batch of biodiesel. A hands on experience will show both the simplicity of the process and the complex learning opportunities presented by this synthesis. Chemical safety issues related to the synthesis will be discussed. Particular points of chemical interest, and their relation to engineering topics will be underlined. Further, Wentworth's own biodiesel laboratory, housed in the Blaisdell Biodiesel Lab will be presented to participants. This student built reactor demonstrates the opportunity to really bridge engineering with sciences. Its construction and operation is an ongoing interdisciplinary project, allowing students to learn chemistry, and apply their engineering knowhow to a practical problem. This workshop will be a comprehensive conceptual tour of biodiesel, and the many possible learning opportunities it presents for a science or engineering program at a polytechnic institution.The session will consist of a two-hour laboratory exercise in which participants have an opportunity to make their own batch. Discussion of the relevant chemistry will be incorporated into the session during downtime in the experiment.

77

Greenhouse Effects

Shaun Gallano, Joesph Kniffin, Bryan Bucchianeri, Ryan Forest and Adam Kwok, Wentworth Institute of Technology

This experiment essentially measures changes in a small-scale greenhouse environment. The project would consist of one bean sprout in a pot under a form of a plastic dome, which we were initially thinking Saran wrap since it has a low heat transfer coefficient, to mirror the effects of a greenhouse. The main focus would be using sensors to measure the moisture content in the soil and in the air inside the dome. The sensors and data output would be taken by care of the computer science side or our team while the temperature regulation and structures would be left to the mechanical students in our group. We would water the bean sprout initially then judging on the moisture and temperature outputs we receive; we will send the data to a light (our source of heat) and tell it to turn on and off. The idea is that after the initial watering the water would recirculate going from the liquid to the gaseous state and fall back to the bean sprout in the water state. The main goal of this experiment is to be able to measure and regulate water distribution to a plant on a small scale and extrapolate the effects and theoretically apply it to a large scale greenhouse.

79

Mathematically Modeling a Bungee Jump

Reed Rushing, Kenneth Frazier and Matthew Monteiro, Wentworth Institute of Technology

Project-based learning is the most efficient way to develop the skills to work within a team dynamic as well as exploring topics in greater depth than could be achieved within the classroom. In our junior-level dynamics class our group was tasked with developing a mathematical model of a bungee jump. This was accomplished through analysis of the dynamic forces involved in such an event. All environmental parameters were taken into consideration such as platform height, free length of rope, and the mass of the rider. The governing differential equation was then established from the active forces on the rider. There are two phases that occur during a jump. First, the initial free fall in which the bungee cord itself is not acting on the rider. Next, the moment the rider reaches the free length of the cord and begins to decelerate. The rider will oscillate between the two phases a couple times before bobbing up and down until he/she reaches equilibrium, or comes to rest. To accurately recreate the ride, a step-wise model was developed within Microsoft Excel to show the riders position, velocity, and acceleration at different intervals of the ride. The 4th order Runge-Kutta method was used to approximate the values at each point. Once an accurate model was established, it was used to determine the appropriate cord length for a rider of any given mass to experience a thrilling (high velocity) and safe (G-forces below 3) experience. To validate our work, the results were cross-checked with a dynamics-based software, Working Model 2005.

80

Foot Temperature Sensor

Phillip Mealy, Patrick Butler, William Horton, Jordan Bartlett and Leonard Pratt, Wentworth Institute of Technology

Our group will be using temperature sensors to observe the temperatures at different locations inside various types of footwear. The temperatures will be relayed to the user's mobile device via Bluetooth technology. The purpose for this measuring system is to aid in designing an internal temperature range for insulation development for different types of footwear. Also our measurement system may be used to identify foot temperatures during various activities. For example, in extreme cold weather a user would monitor foot temperature in order to prevent frostbite. The temperature information may be exported to spreadsheet format for charting. This project will employ multiple temperature sensors, an arduino with Bluetooth capabilities, and an application for mobile device users. This is a project occurring in the spring 2013 semester and our team expects to expend approximately one hundred dollars in materials and approximately forty hours total between team members to complete. Our team consists of students from the Computer Science program and Mechanical Engineering Technology program.

81

Intelligent Floor System (IFS)

Pierre Meyitang, Adwait Dalvi, Erik Amaral, Douglas E. Dow, James McCusker and Joseph Santacroce, Wentworth Institute of Technology

This project's objective was to design a low cost device that would reduce and potentially prevent nursing home patients' death due to falls-related accidents. As a result, the Intelligent Floor System (IFS) was created. The IFS is an ultra-low cost, modular, programmable and autonomous patient monitoring system that can be applied over any hard floor surface. The IFS consists of the following: 12 x 12 inch linoleum tiles with embedded Zoflex-based pressure sensors, a Data Acquisition Unit, and a Microsoft Windows based graphical user interface. Each IFS prototype can monitor areas smaller or larger than 64 square feet with a resolution of 9 pixels per square foot. By measuring weight and using the Euclidean distance algorithm, the IFS can detect human bodies (and a multitude of other objects). Once a body is detected, the Intelligent Floor System requests user feedback to confirm the detection. If no user feedback is received within a preset time frame, the IFS contacts a predefined emergency personnel and sounds an audible alarm.

84

Thermal-Electric Generator

Hector Granados, Nick Rrapushi and Dave Sophis, Wentworth Institute of Technology

A prototype of a thermal-electric generator powered by two independent heat sources is designed and tested. Such a device may be useful in some third world countries for inhabitants to locally generate power for a small light or to recharge a battery pack. The design, building, and testing is part of a student team project for a fourth year thermal design course in the Electromechanical Engineering program at Wentworth Institute of Technology. The thermal-electric generator device (TEG) converts thermal energy to electric power due to a temperature differential across its width. A dual heat source design is proposed for flexibility since there are limited fuel resources in the many developing countries. One heat source is solar energy which is focused with a Fresnel lens, and the other is a firebox for burning wood or grass. In addition, on the low temperature side of the TEG, a heat sink is mounted to maximize temperature differential to increase electric power output. The device is lightweight and is intended for individual or small group use.

85

Trends Shaping the Future: A First-Year Course for Civil Engineering Students (a.k.a. Helping Students become Globally Competent Engineers and Citizens)

Michael Kupferman, Wentworth Institute of Technology

Few first-year civil engineering students are aware of the trends affecting the world and the impacts these trends will have on their personal and professional lives. How will a projected global population of 9 billion people by the middle of the century impact them? What are the global challenges for the availability of food, water, energy resources, fixing existing infrastructure and creating new infrastructure? How will society balance and effectively use the advances in technology and information distribution for improving the quality of life? These questions and others have been explored in a first-year course (Trends Shaping the Future) for civil engineering students at Wentworth Institute of Technology. The instructor of this course will share his experiences (pros and cons) developing and teaching the course for the past three years and will encourage others to explore a similar course in their programs. The course has been exciting, thought provoking, and rewarding for both the instructor as well as the students.

86

The WIT Visioning Process. Do. Learn Succeed.

James O'Brien, Wentworth Institute of Technology

This panel will explore the newly implemented vision of WIT. The process, implementation and future of the institute will be discussed with members of the student body, faculty, staff and administration.

87

Comparison of Multi Disk Exponential Gas Distribution vs. Single Disk in Spiral Galaxies

James O'Brien and Erica Rao, Wentworth Institute of Technology

In fitting galactic rotation curves to data, most standard theories make use of a single exponential disk approximation of the gas distribution to account for the HI synthesis data observed at various radio telescope facilities. We take a sample of surface brightness profiles from The HI Nearby Galaxy Survey (THINGS), and apply both single disk exponentials and Multi-Disk exponentials, and use these various models to see how the modelling procedure changes the Newtonian prediction of the mass of the galaxy. Since the missing mass problem has not been fully explained in large spiral galaxies, different modelling procedures could account for some of the missing matter.

88

Project Visualization Application

Shahbaz Gulam, Nicole Hansen and Kevin Chen, Wentworth Institute of Technology

In any small- or large-scale project, the best way to help visualize the overall objective is to be able to envision all of the milestones which will get the team there. Suresh's Angels goal is to create a website that helps project leaders determine, assess, and manage projects in an organized, efficient manner. Project management information systems are primarily composed of three parts: technology, people, and data. This web application will utilize all major components to ensure the decision making process, and thus producing the best end result possible. A project is defined as a scope of work, and Suresh's Angels Project Visualization Application is a scalable software system fit for any industry.

89

Design of a Cam-less Cylinder Head for an Internal Combustion Engine

Byron Roberts and John Campbell, Wentworth Institute of Technology

Current internal combustion engine technology is rapidly becoming obsolete as the cost of oil continues to rise. New technologies that render engines more fuel efficient and involve fewer components are highly desired to offset the ever increasing cost of both fuel and the manufacturing operations to produce such systems. The objective of this design is to conduct research into a new method of delivering fuel and air to the combustion chamber and expelling the inert exhaust gases. This design has the potential to greatly improve the efficiency and electronic control of internal combustion engines while dramatically reducing the number of components traditionally required to supply a fuel and air mixture capable of sustaining combustion.

90

Organization Models for Informal Education and Outreach

Makeda Stephenson and Douglas Dow, Wentworth Institute of Technology

Formal and informal educational systems are both focused on activities to foster student learning, but in different ways. Formal educational systems generally have a linear progression of courses and of student levels. Formal systems derive their authority from a governing body that is typically remote, and to some degree, non-representative. The governing body typically passes directives into the system and expects to see certain measurable results. The results of this process are generally objective and quantized. Such a system has advantages in reporting, due to the objective and standardized nature in which success is measured. However, this structure of formal education has several disadvantages, including serious challenges in adapting fluidly to the needs of local communities and students. In contrast to the formal system, informal education tends towards non-linearity. The ideas and directives tend to come from a representative, critical mass of the population. Advantages to informal learning include the ability to conform nearly completely to the dynamic needs of whomever is being serviced. Foci of informal learning may be actuated by, and or aggregate into, a larger network designed to provide structure and support. The central entity in such a network usually does not wield much power or authority. For example, local administrators of informal learning foci typically tend to not be bound by the wishes of the central entity, but focus on what they see as the immediate needs of their locality. Execution is generally non-standardized and thus very difficult to quantize. In order to make the most of informal education and to enable informal educational activities to happen on a large-scale, a carefully constructed structure becomes essential. Such a structure should enable standardizing, promoting, systematically improving and distributing successful informal education programs. An emerging example of large-scale, structured informal outreach is a fledgling program out of the National Society of Black Engineers (NSBE), known as the Technical Outreach and Community Help (TORCH) program. The structure of this program is being modified to improve function and communication. The new structure follows the general organizational structure of the parent NSBE Society. There is a National TORCH chair and committee, Regional TORCH chairs for each of NSBE's geographical regions, and local TORCH chairs for each chapter. Guidance, general directives, resources and programming are provided by the National TORCH committee while vision and initiative are provided on more local levels. This model addresses the two main challenges in large scale informal outreach, namely direction and local applicability. This system enables the local units to engage in informal education and outreach activities as they see appropriate while providing overall direction to the program nationally. Methods for measuring the success of outreach programs are still under development. Reporting, quantization and standardization are challenges in this model. In this model, there is an organizational distance between the local entities and the national center. This can hamper effective program development. Additionally, due to the independent nature of local activities, often, the regional and national levels are unaware of activities occurring at the individual chapter level.,Another example of a large-scale informal education organization is the international Community Fab Lab project. This project consists of a loosely connected flat network of individual, local, independent entities. The network is considered "flat" because there is little to no hierarchical structure in the network. Each foci is free to carry out activities as they sees fit. Resources, operation and programming are all the responsibility of the local entity. Individual entities share similar tools and capabilities across the network, but there is no formal standardization of programs or activities. This network has grown exponentially since it's inception in 2003, driven by common ideologies. While the network is flat, the Center For Bits and Atoms at MIT provides a central "rallying" point, co-hosting network conferences and providing limited support for network-wide, infrastructural development. This model allows for the widespread growth of a unique, self-selecting, dynamic community, but often creates frustration due to the lack of operational and programmatic support.,The advantages and disadvantages of these structures for informal education will be discussed, with the hope of developing improved organization models for many types of informal education that would benefit many students and society.

91

Minnesota's Wolf Population and the Effects of Hunting

Beau Burgau, Wentworth Institute of Technology

It is becoming a recent phenomenon that states, particularly in the West and Midwest, are removing wolves from the Endangered Species List. These states have deemed that the wolf population has grown to a point where they no longer need protection, and the federal government is allowing these states to manage and regulate their own wolf populations. Many hunters are pleased with this result because they have been subject to wolves depredating livestock and big game, like deer, with no repercussions. Minnesota has the highest wolf population of the lower 48 states and recently established a hunting season for 2012. This paper presents a model of the wolf population in an attempt to determine if hunting regulates the wolf populations, or if the wolf population will fall to the point of again needing federal protection. This study models the wolf population while protected on the endangered species list and not hunted with their growth rate as a constant. The number of wolves will increase proportionately to the current number. Additionally, the number of wolves will decrease depending on how many wolves the environment can support, the carrying capacity. This creates a set of differential equations to show the effects hunting has on the population. These equations show that the wolf population will remain consistent if the same amount of wolves is hunted each season. Lastly, the final equation considers a lower target harvest that varies cyclically every four years and produces results that cause the wolf population to drop near-extinction after 20 years.

92

The Future of Off-Line Polytechnic Education

Charlie Wiseman, Larry Carr, Christopher Gleason, Michael Kupferman, Gergely Sirokman and Durga Suresh, Wentworth Institute of Technology

The last decade has seen a surge in online and distance education. More and more universities and colleges, including top tier schools across several disciplines, are offering online programs to students throughout the world. One consequence is a decrease in the rate of enrollments in traditional off-line degree programs. Other disruptive changes are on the horizon that will likely continue this trend. For example, on-line learning resources such as Codeacademy, Khan Academy, MIT OpenCourseWare, and Stanford's Coursera offer an enormous number of courses and learning resources for free or a very small fee. These resources offer quality training along with "badges" or other proof that a student has attained certain skills. All of this leads to the question: what is the future of off-line education? Why should students pay for four years in an undergraduate program when they can complete the same material on-line for a fraction of the price in less time? How do traditional programs stay relevant in this environment? What will future employers actually look for in young hires? Is this nothing but hype?

93

Wireless Energy Transmission By Scalar Electromagnetic Waves

Mehdi Goulamaly, Khaled Bounar and Salah Badjou, Wentworth Institute of Technology

The world is in an energy crisis with diminishing energy sources and increasing demand. Much electrical power, the most useful form energy, is lost in power transmission lines and the process requires a costly and potentially dangerous infrastructure. Over a century ago, Nikola Tesla developed patents on wireless power transmission, using the interior of the Earth as the medium of transfer from one location on Earth to another. He performed historical large-scale experiments. However he was unable to pursue them because of lack of funding. The educational and professional communities are also mostly unaware of Tesla's claims of the existence of scalar or longitudinal electromagnetic waves having superluminal speeds and the science behind them. The objectives of this research and design project were to replicate Tesla's lost experiments on wireless power transmission and determine if scalar electromagnetic waves having superluminal speeds actually exist by designing modern

low-cost versions of Tesla's experimental systems. The experiments and systems developed confirmed the over-unity energy production claimed by Tesla, where the system outputs more power than is input. This is similar to sailing boats harvesting free wind energy with minimal input by the sailors. In the present experiments, the free energy in question is ambient vacuum electromagnetic energy. The results obtained regarding scalar waves were inconclusive and these require additional experimentation.

94

The Solar Thermoelectric Generator

Sean R. Amaral, Ryan P. Andrews, Alejandra P. Garcia, Michael P. Jurkowski, Mansour Zenouzi College of Engineering and Technology Electromechanical Engineering Program Wentworth Institute of Technology

Energy consumption is, undoubtedly, a universal concern. The fourth-year Thermal design project aims to convert solar energy to thermal energy, which can either be used directly or converted into electricity. The Solar Thermoelectric Generator project, utilizes thermoelectric generator technology to produce sustainable electricity from the sun. Thermoelectric generators work by converting a temperature differential into electric current. By implementing the same design used in satellite dishes, the Solar Thermoelectric Generator focuses sunlight of its concave "dish" shape onto a thermoelectric generator. The large surface of a satellite dish allows the Solar Thermoelectric Generator to redirect a large amount of sunlight onto the thermoelectric generator to produce as much "renewable" energy as possible. A heat sink on the "cool" side of the thermoelectric generator creates a larger temperature differential and allows the Solar Thermoelectric Generator to produce a maximum output of 378 watts, 35 amps, and 20 volts, from this particular TEG. To compensate for the ever-changing position of the sun, the Solar Thermoelectric Generator is retrofitted with a light tracking system. A light sensor communicates with two axial stepper motors that adjust the dish position vertically and horizontally to allow for highest potential power generation throughout the course of a day. Because the Solar Thermoelectric Generator is designed to be located outside, in a potentially hazardous environment, it is waterproof and durable to withstand the unpredictable forces of nature. The vision of this project is to increase the awareness of the school to introduce green technology.

95

Effects of Cell Phone Radiation on the Cardiovascular and Autonomic Nervous Systems

Sean Iacobone, Emily Trabing and Salah Badjou, Wentworth Institute of Technology

Magda Havas has recently performed an extensive and carefully conducted study that demonstrated for the first time that 2.4 GHz microwave radiation from cordless phones affect the heart rate and Heart Rate Variability (HRV) and the autonomic nervous system. The population size was 25 and the age range 37 to 79. In the present project, an experiment was designed involving the measurement of the HRV and heart rate, and the amplitude of the R-wave with an EKG sensor, in order to investigate the effects of cell phone radiation on a younger student population. The same general observations as Havas were made, i.e. 2.4 GHz microwave cell phone radiation triggers the stress response confirming and extending Havas's conclusion that electromagnetic microwave radiation act as a systemic stressor on a younger student population. This project illustrates how project-based interdisciplinary research may be implemented in an undergraduate curriculum with minimal funds.

96

Digital Cigar Humidification

Andrew Beale, Jackie Ellett, Eric Boiselle, Elizabeth Wu and Daniel Wieder, Wentworth Institute of Technology

For cigar aficionados and casual smokers alike, keeping cigars fresh is an incredibly important process. Cigars that are left in normal room conditions will dry out and lose their distinct flavor. To prevent this, smokers keep their cigars in humidors to preserve the freshness of the tobacco. Humidors create an environment for cigar storage that emulates the tropical climate where they were produced. The humidity within the humidor needs to be kept at approximately 70 percent to ensure proper freshness, though during dryer parts of the year it is acceptable for the humidity to drop to as low as 65 percent and during summer as high as 75 percent. As a part of the Senior Engineering Collaboration project at Wentworth, our group containing students from both Mechanical Engineering and Computer Science created a digital cigar humidor that uses a sensor to read humidity and temperature. The data is displayed on an attached LCD screen as well as containing an LED which turns on when the humidity is within the 65 -75 percent range.

97

Design of a Chirp-Based Ground Penetrating Radar for Efficient Imaging of Underground Structures

Wesley Fletcher, Christopher Lampe, Aidan O'Rourke, Ryan Wilson, Khaled Bounar and Salah Badjou, Wentworth Institute of Technology

Ground Penetrating Radar is a powerful device used to image subsoil structures and is used widely in geophysical exploration, archeology, civil engineering, and nondestructive testing. Current GPR systems are costly and use impulse radar techniques that are limited to a single microwave frequency and use inefficient antennas resulting in poor image resolution and limited ground penetration. On the other hand, air-based radars have incorporated the latest advances in electronics such as solid-state rf power amplifiers, and the use of frequency modulation (FM) in the form of chirps, which allows for more efficient ranging and image resolution. The present design project involves the development of an efficient low-cost GPR system based on the latest advances. It illustrates how a R,D project may be incorporated into undergraduate design education.

98

Design of an Efficient Navigation System for the Blind Modeled on the Bat's

Evan Felger, Conor Hennessy, Sean Iacobone, Valeria Martinuzzi, Emily Trabing, Khaled Bounar and Salah Badjou, Wentworth Institute of Technology

It has been recently demonstrated that a blind person may learn to retrain his visual cortex neurons to perform auditory functions, thereby significantly enhancing the blind's abilities to navigate freely without a cane. This has been spectacularly demonstrated by blinds who go as far as "recklessly" mountain biking. Such blinds emit audible clicks with their tongues, as the bats do, except that the latter's clicks are in the ultrasonic frequency range and are therefore inaudible. The present project involves the design of a low-cost state-of-the -art ultrasonic system, closely modeled on that of the bats in order to provide the blind with an affordable efficient convenient navigation system that would replace optical images with "sound images" and produce ultrasonic clicks automatically.

99

Design of an Efficient Integrated Physical Therapy Machine Providing Simultaneously Biomechanical, Electrical and Heat therapy for Back Injuries

Ashley Catan, Adwait Dalvi, Dennis Desmond, Jefry Lopes and Salah Badjou, Wentworth Institute of Technology

Back injuries and pain are common and involve enormous resources for their care. Current physical therapy machines provide separately biomechanical stimulation in the form of leg movement exercises, electrical stimulation of muscles, and heat therapy stimulation to relieve pain. In this design project, the three techniques are integrated into a single low-cost efficient device and its effectiveness is demonstrated. This system was developed in a three-credit one semester-long course of Junior electromechanical design.

101

Interdisciplinary Projects utilizing an Industrial Robot for Mechatronics Students

Chan Ham, Southern Polytechnic State University

It presents the development of two robot projects utilizing the Kawasaki ZZX130L robot. The main objective is to provide Mechatronics students project-based interdisciplinary learning directly connected with the real engineering world. Each project covers all key technical elements in Mechatronics: structure/mechanism, sensor, data acquisition, actuator, and control system. Therefore, students can learn an interdisciplinary system development that requires not only synergistic integration of multiple expertise but also team work towards project success. In addition, the project serves as a platform for students to apply their class learning to a real industrial robot that fosters their practical experience and promotes technical confidence. The first project is to simulate a functional industrial palletizing process. The major developments are the electronic circuitry, programming, computer communication protocols, integration of sensors and actuators, and mechanical design of an end-effector (gripper). It can pick up a pallet and place it in the necessary staging area, but also deliver products (a five-gallon bucket in the case of this project) from a conveyor onto the pallet. The second project is to construct and manipulate a universal jamming gripper attached to the robot. The main application of the project is the use of the Kawasaki industrial robot to manipulate objects of different sizes and shapes through the use of a prototype universal gripper. This included programming the teach pendant and developing electronic and pneumatic systems. The mechanical design revolves around building an end-effector made of 3D printed plastic designed using SolidWorks and a balloon membrane filled with granular material to conform and grip a variety of objects. It has been successfully achieved to incorporate this project-based learning into the Mechatronics program at the Southern Polytechnic State University. The groundwork established in these projects fosters students to apply their class learning to a real interdisciplinary industrial system. These projects have proven to be a vital learning tool for seeing robotic functionality in real-world situations. As a result, this project-based learning is very effective to train students' interdisciplinary knowledge and skills.

102

Impact of Interdisciplinary Engineering Education on Teaching Innovation to First-Year Students

Sylvain Jaume, Wentworth Institute of Technology

In 2011 Wentworth Institute of Technology developed the Interdisciplinary Engineering program, an individualized curriculum that provides each student the flexibility to integrate an engineering course of study with electives of her or his choice. This program is aimed at preparing tomorrow's engineers to a profession where innovation skills will make them more competitive and where inventions tend to happen at the crossroads of different disciplines. By providing a curriculum that bridges boundaries between disciplines we want our students think creatively, critically and globally, i.e. to switch from a mindset of knowledge consumers to a mindset of knowledge producers.,In this study we analyzed the impact of an industry project-based learning on first-year students in the Interdisciplinary Engineering program compared to first-year students in a different program. We presented the students with a wide range of real-world situations they would face in their engineering career including global societal challenges, industry case studies, workshops with guest speakers and simulated job interviews. The material was adjusted how the class was learning and key concepts were reinforced based on the individual needs of each student. ,To accurately evaluate how students were developing competencies in innovation and to provide regular feedback to our students, we designed a frequent assessment method that covered student's engagement, creativity, critical thinking, teamwork and communication skills. We observed that students enrolled in the Interdisciplinary Engineering program were more comfortable in the industry project-based learning model, were able to draw connections between disciplines and could think beyond technical feasibility and approach new concepts such as marketability of their invention. We will share with other educators the findings of our study and make some suggestions to improve the education of innovation in the engineering curriculum.

103

Teaching First-Year Engineering Design Projects across Faculty's Disciplines and Students' Disciplines

Sylvain Jaume, Gloria Ma, James McCusker, Xiaobin Le, Durga Suresh, Douglas Dow and Frederick Driscoll, Wentworth Institute of Technology

In spring 2013 six faculty at Wentworth Institute of Technology bridged the boundaries of their respective disciplines (biomedical engineering, computer science, electrical engineering, interdisciplinary engineering and mechanical engineering) and taught Introduction to Engineering Design to 135 first-year students enrolled in three different majors (biomedical engineering, electromechanical engineering and interdisciplinary engineering). When course registration started, the six sections of this revised course were open to all students, irrespective of their major. In an effort to make the course more relevant to the challenges of today's world, the faculty shared their ideas and the best practices in their disciplines and defined a common vision for Introduction to Engineering Design, the first course in the sequence of design courses at Wentworth Institute of Technology. They worked together to write the course syllabus, the grading scale, the course policy, the project descriptions and the lab instructions. This 14-week course was split into a four-week design project under faculty's guidance followed by a 10-week design project based on each team's proposal. During the guided project research skills were taught and students learned to do a literature search, to analyze a research paper, to write a research paper and to create citations and a bibliography. From the beginning students had to exercise public speaking and deliver a technical pitch in front of the class. Because we want our students to go outside of their comfort zone and open their eyes to the world, they were encouraged to attend seminars and register for an engineering society on campus or outside of campus. The teaching of the design process was done through case studies from industry, which helped the students understand the new concepts into a real-world context. After learning the concepts of engineering design during the first four weeks, the students applied these concepts on a project of their choice and worked in teams during ten weeks. Together the faculty created a pool of project descriptions and collaborated with each other to share their expertise. The students could either pick a project in the pool or submit their own project proposal. To cross-fertilize ideas among students from different disciplines each team had to include at least one student from a different major. During this 10-week project the students learned by doing: they performed a needs assessment, generated alternative designs and learned the importance of maintaining an engineering notebook. To effectively learn by doing the students had to experience failures and successes. We all learned by mistakes and we wanted our students to be in a real-world environment where they could learn by experience, positive or negative. When facing a challenging situation the students worked with the faculty to identify the reasons, to address the issue and to learn the lessons. At each step of the course we emphasized constant participation, professional ethics and respect of their peers during teamwork and oral presentations. The lessons we learned at Wentworth Institute of Technology could help other institutions develop similar initiatives. First the focus must be how to efficiently work together, how to speak in public, how to manage time and tasks in order to deliver on time. Those concepts are new to students entering college and need to be taught in their first year to ensure a successful college experience and a solid preparation for the job market. We hope to engage a discussion about engineering education across faculty's disciplines and students' disciplines and see new ideas cross-pollinate between our polytechnic institutions.

104

Inspiration Detection Algorithm for Electromyogram

Anita M. Petrilli and Douglas E. Dow, Wentworth Institute of Technology

Algorithms capable of accurately detecting inspiratory activity in respiratory muscles may serve to time the triggering of implantable pacemakers or mechanical ventilators, and thus, may improve the quality of life for many individuals requiring assisted ventilation by matching ventilation to physiological demands while

minimizing interference with other behaviors (e.g., talking or swallowing). We are developing an algorithm to detect the timing (onset and duration) of inspiratory events from the electromyogram (EMG) signal. Even following paralysis of the phrenic nerves and diaphragm muscle, more upstream sites still contain neural activity that reflects the intrinsic inspiratory drive from the brain. Using these signals to control the onset of assisted inspirations would help match ventilation to physiological drive. As a platform to develop inspiration detection algorithms for testing of this concept, EMG signals of the diaphragm of rats during natural cycles of inspirations were analyzed. A state-machine was utilized for classification. Inspirations were detected with 98 percent accuracy in anesthetized and awake rats. Following detection of inspiratory events by the algorithm, 80 percent of the inspiratory burst durations still remained, allowing for treatments, such as functional electrical stimulation (FES), to induce muscle contractions for inspiration. Application of this algorithm with EMG signals of more upstream inspiratory muscles may prove useful in cases of bilateral diaphragm paralysis as a result of phrenic nerve injury or tetraplegia.

105

Detection of Respiration in Central Venous Pressure Using State Machine

Alejandra P. Garcia and Douglas E. Dow, Wentworth Institute of Technology

Reliable information from patient monitors enhances treatment for critically ill patients. Redundant sources for information would aid identification of faulty sensor and leads, and improve presentation of physiological data. Respiratory information can be obtained from several sources, including airway pressure and central venous pressure (CVP). CVP signals have been analyzed using frequency information to isolate the respiration related part of the signal or to obtain statistics about respiration. This study uses a state machine algorithm to detect the timing of each cycle of respiration. A state machine has advantages of enforcing a predictable cycle of expiration and inspiration. The detection of respiratory cycles can be done in real-time, allowing identification of irregular periods between inspirations and prolonged periods with no inspiration, for which an alert may be issued. The algorithm was tested on data obtained from the PhysioNet database of recordings from intensive care patients. The airway pressure signal was used to determine the “true values” of the timing of each respiratory cycle for checking the accuracy of the algorithm analyzing the CVP signal.

106

Design of a Concussive Head Impact Detection System for Contact Sports

Matthew Joyal, Dylan Powers, Alex Schwarzkopf and Salah Badjou, Wentworth Institute of Technology

Brain concussions resulting from impacts on helmets of players are a major source of injury and subsequent health damage and costs. Current systems are expensive and do not accurately monitor all the relevant biomechanical parameters, particularly the inertial forces and torques on the brain resulting from impacts causing brain damage. The following project involves the design of a low-cost accurate system consisting of two three-axis accelerometers and a microcontroller mounted on the player’s helmet that wirelessly transmits acceleration data to a labVIEW-based laptop where the signals are processed and the impact forces on the brain determined and compared to injury thresholds. The output allows coaches to monitor the occurrence of concussions and their locations and take preventive actions to avoid further damage. This system was developed in a three-credit one semester-long course of Junior electromechanical design.

107

Design of an Electromagnetic Device to Accelerate Wound Healing

Salah Badjou, Valeria Martinuzzi, Wentworth Institute of Technology;
Jorge Lujan-Hernandez and Dennis Orgill, Brigham and Women's Hospital

The use of electromagnetic fields to accelerate wound healing has been shown to be a promising effective and low-cost alternative to pharmacological and vacuum-based therapies. In addition, there is evidence that the mammalian body naturally produces its own endogenous electric field in the process of wound healing. In the following project in collaboration with the Division of Plastic Surgery at Brigham and Women's Hospital, a system is designed to generate an electric field and forces to accelerate and monitor wound healing in test animals, particularly mice. An experimental system is also developed to measure the strain induced by the electric field. Results of the experiments are discussed.

111

Making life easier, one pair of pants at a time

Thomas Breese, Adam Gowaski, Robert Jellison and Sean Molloy, Wentworth Institute of Technology

Team Olmec will be implementing a mechanism that will use sensors to record weather data for personal reference. The data recorded will include temperature, humidity, and dew point. With this data, the device will visually inform the user as to what clothing would be appropriate for any given day.

112

Humanities Education at Polytechnics: A Case for Poetry

David Downey, Wentworth Institute of Technology

Sustained student engagement is often a problem in teaching the humanities at a polytechnic. For the individual instructor, the creation of the syllabus is the first step in scaling the peak of student engagement. This task is perhaps even sterner in the literature classroom the Millennial's who sit before us bring shorter attention spans and myriad diverting devices. What great works will they respond to and write well about and how can we instill in them a passion for the written word that will serve them now and in their future? Drawing on recent successes in two specific courses offered at Wentworth Institute of Technology -- Literature of the Modern Age and Twentieth Century Literature -- this talk will argue for heavy doses of poetry for the polytechnic major walking into required and elective literature/humanities courses.

113

Smart Scheduling Alert System for Time Sensitive Construction Projects.

Jon McGee and Hussein Abaza, Southern Polytechnic State University

When construction crews are building a project that is time sensitive down to the hour and must be completed in a matter of days rather than months, it is often necessary to keep crews available at their posts twenty four hours a day, rotating shifts as necessary. This drives up the cost of labor by keeping crews on the clock even when those crews are not actively working on the project, just in case they are needed on a moment's notice. This research suggests a notification system that uses smart phone applications and scheduling software for updating the schedule and notifying crews instantaneously. As a proof of concept, this system was used in an airport runway project. We developed a system by which Primavera could notify specific foremen of updates to the schedule on an hourly basis, increasing the flow of communication and reducing down time during an extremely time sensitive project.

114

Edge-Saturation Effect on Finite Size 0-D Carbon Nano-Ribbons - a Density Functional Theory Study

Louis Cirello, Rhode Island College; Li Chen, MCPHS University

Using computational simulation and Density Functional Theory, we have studied the absorption of various foreign molecular/atomic groups saturated at the edge of semi-conducting, finite-size armchair carbon nano-ribbons (ACNR). The effect of this edge-saturation was studied in terms of its impact on HOMO-LUMO gap, electronic structure and spin distribution. A comparison was made between the non-saturated pristine ACNRs and saturated ones, as well as, between different saturation species, different doping sites, different doping concentration and ACNR length. Our results suggest that the type of elements play a more important role than the concentration and/or doping sites in terms of the change in HOMO-LUMO gap, which leads to the possibilities of using ACNRs as nano-scale chemical sensors. The doping of some elements also introduces a spin distribution different from the pristine ACNRs.

115

Text Books: Ebooks Vs. Print

Adeel Khalid, Southern Polytechnic State University

In this research, the student book buying patterns are studied. Ebooks are becoming more and more common. Based on a research survey, we analyze whether students prefer ebooks or print editions. Comparisons are done across disciplines, level of the course (freshman to graduate), whether the student owns a laptop/desktop/tablet, student work commitments, financial needs, and age among other factors. Some professors give the option of using the ebooks, while the others do not. Students may or may not know about the availability of ebooks for their courses and their decision may be impacted because of that. Students may make decisions to purchase ebooks or print edition based on cost, readability, availability, and ability to take notes, impact on the environment, and ease of use, logistics and the level of the usage of the book in a given course. Students also take into account the resale value of the book at the end of the semester.

116

Separating the Signal from the Noise in Statistical Analyses

Francis Hopcroft, Wentworth Institute of Technology

Statistical analysis of all sorts of data are routinely presented at technical conferences to indicate a causal effect of positive change based on some previously implemented strategic decision. They are nearly always wrong. This talk explores some of the problems with statistical analyses and the issue of separating the “signal,” or the true cause and effect data, from the “noise,” or background data that may be highly correlated, but are totally unconnected to the cause and effect claimed.

117

Stress and Strain

Max Paronich and Tung Tran, Wentworth Institute of Technology

Our team is to develop a system to monitor machinery for malfunctions in its normal operating condition. This device will use an accelerometer to measure the resonate frequency of the machine to determine if a malfunction has occurred or is about to occur. An arduino will transfer this data to a computer in order to stream the data real time so a machine operator can understand the limitations of their machine. This project could be adapted to many different aspects ranging from industrial manufacturing optimizing efficiency and reducing downtime; to a race car driver monitoring the fatigued parts of their vehicle to increase safety and win a race.

118

Improving the Systems Engineering Requirements Analysis Process: A Few Tools and Techniques

Adeel Khalid, Southern Polytechnic State University

The technological complexities of today's engineering breakthroughs require a robust engineering process to promote successful product, systems, or software development. Systems engineering is that process. Employed across a diverse set of engineering fields, and inextricably linked to the tenets of project management, the rigor in which systems engineering is applied may often make the difference between project success and failure. In this paper, we review the systems engineering tools and techniques widely known throughout the community of interest but that are not necessarily known or applicable to working with customers to generate requirements or to provide feedback to the customer to vet the stated and derived requirements. The tools and techniques presented in this paper are just a subset of those available to systems engineers. Many more exist that may be customized to assist systems engineers in requirements analysis. Systems engineers should not have to conduct extensive research to locate and evaluate such tools and techniques. Instead, it would behoove the systems engineering community to develop a tools and techniques bible; that is, a source for systems engineers to review tools and techniques applicable to particular processes, where they can then determine, based on a balance of time and cost to the project, those best suited to advance and support the requirements process.

119

Teaching Aircraft Design Course Using Real and Virtual Wind Tunnel

Adeel Khalid, Southern Polytechnic State University

As part of the aircraft design and performance class, students perform sizing calculations from the conceptual sketches, select airfoil and geometry, calculate thrust to weight ratio and wing loading, and then perform configuration layout before doing disciplinary analyses e.g. propulsion, aerodynamics, structures, weights, stability and control, economic analysis, trade studies etc. In this work, students are encouraged to design their aircraft using Computer Aided Design (CAD), use that model to create a prototype, perform (a) wind tunnel analysis and (b) Computational Fluid Dynamics (CFD) analysis and compare the results of two analyses. This hands-on approach forces students to perform design iterations because of fabrication, test or other limitations, which they do not anticipate otherwise, and in turn helps them understand the and internalize the aircraft design process. In this paper, the design process is described and several examples of student designs are demonstrated.

120

Drowning Alert Device

Pierre Arthur Elysee, Wentworth Institute of Technology

The objective is to alert lifeguard or parents as soon as a drowning occurs. "The majority of children who survive (92 percent) are discovered within two minutes following submersion and most children who die (86 percent) are found after 10 minutes" according to the National Safe Kids Campaign. Drowning can happen quickly and quietly even in the presence of parents and/or lifeguards. The propose drowning alert device will signal a drowning right away. It will work for adults as well. The drowning alert device will have an embedded system to control the water pressure and the body's velocity. Either one of these two events will send a wireless signal via a wireless transmitter or an RFID tag to alert lifeguards or personnel.

121

Impact of Community Engagement by Engineering Students on Various Attributes of Learning

Tim Hellickson and Chris Swan, Tufts University

Recent, and repeated, calls for increasing the number of students in the STEM fields has lead to calls-for-action to enhance and/or change the engineers are educated. One result of this call is the recognition that a paradigm shift in engineering education is needed; a shift that not only broadens the diversity of those who participate in engineering, but also the attributes provided by and the benefits developed from engineering. With respect to these desired aims, recent research has indicated, and espoused, the positive contributions of community engagement (CE) in engineering education. This awareness has often come obliquely with some of the most engaging CE opportunities originating outside the traditional academic learning space (i.e., the classroom). However, a thorough understanding of the outcomes, beneficial and otherwise, is lagging. Therefore, an appropriate research question is how do service-based experiences affect the developmental processes of engineering students? Such research requires a coordinated, comprehensive, and long-term examination. A research project, termed the Engineering Pathways Study, is a first step in this long-term examination. The project aims to evaluate what desired attributes of future engineers are impacted by a student's involvement in CE efforts and how these attributes develop over the time of a student's undergraduate education. The project consists of a sequential, but staggered longitudinal study of engineering students; primarily from four institutions. Cohorts were developed based on student's level of involvement in curricular and extracurricular CE activities. The project has used various quantitative and qualitative instruments to explore the impacts of CE on engineering students learning; specifically, traditionally technical attributes (e.g., ABET Criteria 3a-e) as well as a mix of non-technical attributes (e.g. global awareness, social context of problems, self-efficacy, identity, civic development, intercultural sensitivity, and psychosocial well-being). This presentation focuses on a preliminary analysis of the first round of quantitative results. In summary, preliminary analysis of these quantitative-only results indicates that, in general, CE experiences have a positive impact on students. Specifically, over 250 student responses were collected during the Spring 2011 term with students grouped into levels of CE experience as none, low, or high. Analysis focused on specific knowledge and skills that students perceive they possess at a given snapshot in time. Comparisons of students with respect to class level (first-year and junior), gender, and academic rank (low/moderate/high GPAs) strongly indicate that increased CE experiences lead to a perceived higher achievement in desirable engineering attributes, such as knowledge and skills, attitudes, and self-efficacy. Future quantitative data reduction and analyses will 1) be compared to qualitative data collected from student interviews; creating a stronger and richer characterization of the impacts CE and 2) evaluate how student responses may change over time. It is hoped that the project will add to the growing body of evidence that CE has a positive benefit on an engineers ability and desire to learn.

122

Mixed Methodology: Engineering Students Participating in Learning Through Service, an Achievement Goal Questionnaire

Tim Hellickson and Chris Swan, Tufts University

Our three-year project seeks to measure various indicators related to the acquisition and retention of desirable attributes for future engineers. The study measures how these indicators are influenced by participation in Learning Through Service (LTS) activities, and how LTS participation influences student development over the course of the undergraduate education. The ISES project, also called the Engineering Pathways Study, is a collaborative effort that involves a sequential longitudinal study of cohorts of students at three universities: Michigan Technological University, Tufts University, and James Madison University. Students at these institutions are joined by a cohort of students associated with EWB-USA student chapters from across the U.S. The LTS efforts considered by this study can be either curricular or extracurricular and the impacts on students will be compared to students who have no LTS experience. The impacts of the ISES project will be interpreted with the use of a concurrent embedded methodology, using an achievement goal questionnaire and semi-structured interviews.

123

Statistical Analysis of Travel in Urban Boston

Samuel Irwin and Zachary Buzaid, Wentworth Institute of Technology

Boston: a city, like most urban areas, with a terrible transportation problem. Imagine that it is 5 p.m. on a weekday and you need to make a meeting across town. What is going to be your choice of transportation? Do you take a train, cab, or bicycle? The mission is to account for common factors and setbacks in modern Boston's rush hour traffic, and provide the average commuter with the most efficient way to get to where you need to be in the shortest period of time. Using statistical and probabilistic methods we will make our recommendations, as we plan to be able to produce a model that will be able to compare each form of transportation in multiple ways. Factors in which each form of travel will be ranked on will consist of cost, speed, and consistency.

124

Carving Your Initials into Google: Developing An Online Persona

Guthrie Andres and Jarrod Slavinskas, Emmanuel College

Your default online persona is a search engine's aggregation of all your online activities. Tweets, Facebook photos, videos of you that your friends uploaded to YouTube, documents you've posted in Scribd, and results from races you ran when you were nine, are all likely to appear when people Google your name. This persona that you didn't intend to create and possibly aren't even aware of, is available to anyone who wants to see it -- potential employers, current students, and your mother. For students transitioning to the professional world, this can present a problem. They no longer want to be seen as students and they need to be seen as hard-working, skillful, motivated professionals. Creating an online persona is the process of carving initials into Google. It involves proactively replacing the default search results with purposefully created and thoughtfully promoted results that present a unified identity. From building an online persona, students not only increase their chances of being hired, they also learn about web design, social media, and writing, skills that are highly valuable in the professional world.,In this hour and a half workshop, you'll see well-crafted examples, learn about the tools and techniques used to create and maintain a professional online persona, and think about the overarching reasoning behind creating one. This workshop will be led by a student at Emmanuel College and a staff member from the Academic Technology and Innovation Group.

126

Redefining Gender and Identity in Virtual Space

Gloria Monaghan, Wentworth Institute of Technology

This paper explores the meta-myth and novel, Frankenstein, and how it pertains to the 21st Century in terms of learning about and teaching technology. The implications of the story of re-creation and departure from the garden of Adam and Eve in the 21st Century impact society on multiple levels, including cloning, gene splicing, synthetic cell replication and so on. Students are asked to engage in a virtual environment and recreate their identities as a way to re-create their social, gender and physical identity. This four-year study examines gender choices and behaviors of students in Second Life (SL), which is a massively multiplayer online game (MMOG). Second Life is a virtual learning and networking tool that impacts collaboration, identity and education for college students on a global level. This study examines the connection to student learning (decision-making) in SL and gender identity. If we move beyond our physical bodies or recreate our gender, how is learning impacted? Gender and sexual identity in physical space are becoming more and more difficult to ascertain as technology moves forward creating virtual spaces where gender alliance and sexual identity are in question or maybe even irrelevant. In virtual space the digital projection (avatar and chosen environment) is the user's gender identity, which may or may not reflect the user's actual gender or sexual preference. If gender is a moot point in virtual space, how is learning impacted? This study focuses on student avatars and the reactions and relations in SL and first life and how it connects to literature and myth.

127

Interweaving Scholarly Research and Project-Based Learning in the Classroom: An Introductory Course in Biochemistry and Bioinformatics

Devin Howe, Susana Vasquez Trujillo, Kirsten Wilde and Laurie Grove, Wentworth Institute of Technology

This spring semester, students in the course Proteins, Medicine, and Disease completed original research projects that combined basic concepts in biochemistry with faculty research. The first half of the course was an introduction to the field of biochemistry, with an emphasis on medicinal approaches within disease research. The students also acquired skills in bioinformatics and laboratory techniques used within the field of drug discovery. In the second half of the course, students used their skills to address fundamental questions stemming from the instructors own research. These questions revolve around the basic mechanisms of how medicines work in three important target areas; influenza, Alzheimer's Disease, and inflammation-related diseases. To address these topics students used structural bioinformatics to explore the molecular-level basis of drug efficacy, drug resistance, and drug selectivity. The combination of basic research and classroom learning provided to the students hands-on experience solving real-life problems and introduced independent undergraduate research in the classroom while contributing to the faculty member's own professional development and research. Presented will be an explanation and analysis of the fusion of classroom learning and academic research as well as student presentations of the final project results.

128

Effect of Additives on Engine Performance and Air Pollution

Haifa El-Sadi, Michael Jackson, Francis Hopcroft, Richard Roberts and Richard Student Melo, Wentworth Institute of Technology

Additives can be encountered in many different industrial applications. They are used in the treatment of automobile engines as well as in railway, road-building machinery, turbines and other industrial machinery including rotating and friction bearings/gears. They are also used as a base coating, in Shipbuilding, in oil and gas equipment applied in offshore oil extraction, in pipelines and in product pipelines, and bridges.,This project resulted from a collaboration between mechanical and civil department faculty. The project is an investigation of the effect of adding specific additives to gasoline to increase engine performance and to study the effect of those additives on air pollution. A Dyno engine tester has been used with a gas analyzer connected to the Dyno to study the effect of exhausted gases on air pollution as a result of using gasoline only and gasoline with additive. A preliminary review of the data suggests that the additives generally resulted in an increase in engine efficiency with a concurrent slight reduction in air pollutant output with all data relative to operation of the same engine using gasoline without additives. Full analyses of the outcome data are currently underway and those results will be available prior to the presentation.

129

Primary School STEM Project: Design and Construction of Model House with Electric Function

Nicole McColgan, Liam Holohan, Jacob Croft and Douglas Dow, Wentworth Institute of Technology

The global economy demands higher productivity of each worker. Good jobs are increasingly require proficiency in science and technology. The American educational system increasingly produces a smaller percentage of graduates with the necessary skills in science, technology, engineering, and mathematics (STEM). Many students at a young age develop a self image of not being interested or capable of doing STEM activities. This creates an opportunity for early childhood and primary education to spark an interest in STEM areas. Hands-on projects that design and build functional models of things the students can relate to may increase confidence and interest in doing even more STEM activities. In this project we plan to design, build, and test a simple STEM project.

The project is for primary students to use simple prefabricated STEM project components to engineer, build, test, and construct electrical wiring. Specifically to have students design and electrically wire a model house. The house could be made out of cardboard material and have electrical function, such as LED lights, switches, and power (from a battery). Then they would try to build their design. After actively solving and problems that arise toward a mechanical and electrical functioning model house, they would modify their diagrams and discuss what was learned. Students would draw simple diagrams of the house and electrical pathways. The modules should be tested with small groups of children. Feedback from students and teachers will allow improvement in this educational project. The motivation is that the experience of actively doing this project will expand the students interest and confidence in STEM activities, and will be more likely to select STEM classes and experience in their future development. Future graduates of high school and college will be more likely to pursue careers and have success in the increasingly competitive global economy.

130

The Importance of Group Collaboration to Further a Dscipline

Matthew Arsenault, Anthony Polidoro and Sara Zettler, Wentworth Institute of Technology

Project-based learning in groups is an integral part to the development of design and design education. The overall benefits that stem from this type of education helps develop collaboration skills not only between individuals in a studio environment, but also applying material between classes for the advancement of a core program. The significance of this type of learning became exposed through a week long project in which groups of three students were to research and build a model of an existing piece of architecture in order to understand specific criteria based off of material learned in a branch class of the core curriculum. The “facade study” project completed, led to the discovery of importance for cross-class learning and group based projects and how this type of education will benefit students across studio leading into the future. The project created more collaboration between students for the benefits of their designs as well as to help tie the total curriculum of Architecture between each class.

132

Residential Induction Water Heater

Nilu Jariwala, Mehdi Goulamaly, Mark Piontkowski, Ashley Catan and Mansour Zenouzi, Wentworth Institute of Technology

Energy shortage and adverse environmental impact of using fossil fuel for energy production motivate engineers to improve the efficiency of appliances. This project attempts to solve some of these issues by creating a residential induction water heater that could potentially replace the costly, bulky, and energy consuming water tank heaters commonly found in many homes. The design uses induction heating, which rapidly increases the temperature of objects. Induction heating is a non-contact heating process that uses high frequency electricity to heat materials that are poorly conductive. Since it is non-contact, the heating process does not cause any corrosion or fouling on the heating element allowing the system to better maintain its effectiveness over time and is very efficient because the energy is generated inside the object that is being heated as opposed to exchanging energy through various boundaries. Induction heating treatment is already applied in the metallurgical industry for processes such as forging and welding but its use is limited by the amount of power required to heat metals. The proposed project uses the same type of process to heat up flowing water. A high power alternating current signal within a copper coil is generated to heat up a metal pipe through which water passes. The water will then be heated by the metal pipe through convection. The Residential Induction Water Heater provides constant flowing hot water at average residential flow rates for typical household applications in a cost effective and energy efficient manner.

133

Aerodynamic Drag on Semi-Trailer: An Undergraduate Research

Mir Atiqullah, Southern Polytechnic State University

Semitrailers were introduced in the 1920s and since then they have revolutionized the transportation industry and has become heavily dependent on these big rigs. They are very much fuel hungry because of their size, weight and to some extent aerodynamic crude shape. Their geometrical designs have not evolved much to make them aerodynamically more streamlined that could improve fuel efficiency. While over 5.6 million such commercial trailer trucks are registered in the country and with increasing diesel fuel prices, it is more important than ever to study their aerodynamics, redesign for reducing aerodynamic drag and help make these big rigs more fuel efficient. Resistance to motion of solid through fluid such as water, air, is commonly known as Drag which increases with speed and much dependent on the profile or shape that slices through the air. Higher drag resistance, just like road and tire resistance, is a major reason for loss of energy and thereby lower fuel mileage. Drag resistance is caused by both surface friction as well as air pressure difference around the vehicle that is developed as vehicle moves through air. It would be advisable to completely redesign the shape and size of these semitrailers but that may not be feasible for all semitrailers on the road. Another intermediate approach would be to retrofit the existing semitrailers with devices that change the overall profile to be more aerodynamic. During the recent past a wide range of such add on devices have been introduced. Our undergraduate students are well trained in CAD and simulation software. Two students were selected for the current study who worked under the supervision and guidance of the author. This experience will strengthen their CAD modeling and simulation background but more importantly they would gain valuable knowledge in various areas including fluid dynamics, drag phenomenon and the factors that affect it, current advances in this field, as well as use of wind tunnel for experimental drag studies. The study was directed on two fronts: CAD and Drag simulation as well as experimental modeling and testing. First a base CAD model and then various modifications were developed using an industry standard CAD package. These models were then imported into Computational Fluid Dynamics (CFD) software. These followed by modeling add-on devices to reduce drag. The simulations were repeated with various combinations of these add-on drag reducers. The areas targeted for drag reduction study included gap between tractor and trailer, lower sides of the trailer between front and rear wheel sets, and rear of the trailer. The results showed varying effectiveness of these add-on devices, individually and in combination. Scale models of the trailer truck were built using wood as well as Rapid Prototyping (RP) directly from CAD using polymer. These models were then tested in the wind tunnel at speeds between 35 and 75 miles per hour. The data and the trends in Cd values compared well with the simulated values. The combined studies involving both CFD and scale model in wind tunnel provided a comprehensive knowledge and understanding of the drag in semi-trailers and factors that affect it. Various add on shapes were devised and tested for their effects on drag resistance of semitrailers. Future studies may include further varieties and locations of these devices as well as complete redesigns of the trailer-trucks. The undergraduate students developed excellent proficiencies in CAD, CFD, as well as use of wind tunnels, the best outcomes from this study.

137

Total Knee Replacement Implants

Dylan Bagshaw and Shankar Krishnan, Wentworth Institute of Technology

Thousands of people suffer from knee joint discomfort as a result of knee injuries, osteoarthritis, rheumatoid arthritis and post-traumatic arthritis. Some of these conditions are corrected surgically by total knee replacement (TKR). It is reported that over 700,000 knee replacements are performed in the United States in 2010. Several knee replacements have utilized continuous technological advances and most procedures are generally known to be successful. However, the Food and Drug Administration (FDA) has reported the recall of several knee implants due to labeling errors, durability issues and compatibility. These issues may require expensive revision surgery. The objective of the study is to review the problems with knee implants done currently

and make recommendations for improving the lifespan of the knee implant and reducing the number of complications. Modern knee prosthetics have several components that replicate the bones and are biocompatible. The knee prosthetic is composed of the tibial, femoral and patellar components and a suitable binding cement to hold them in place. The tibial component is a cobalt chromium alloy metal tray and an ultra-high molecular weight polyethylene (UHMWPE) spacer. The femoral component is also a cobalt chromium alloy metal coated with polyethylene. The patellar component is UHMWPE with a titanium alloy metal backing. Finally, the cement is an acrylic polymer made of polymethylmethacrylate (PMMA). Various factors are taken into consideration when designing a knee replacement. These include the patient's needs, material selection, functionality and balance, and manufacturability. There are difficulties finiding the perfect combination of these parameters to suit every patient. The expected lifetime of an artificial knee is about 20 years. All knee implants are not ideal fit for the patients. Unfortunately, patients may suffer from loosening, osteolysis and metallosis sometime after implantation. Such issues result in joint pain, inflammation that causes a loss in range of motion, and fatigue fracture. Joint mobility, strength, material biocompatibility and reliability are important factors in knee implants. Such knee replacements as the Stryker Eius Unicompartmental Knee system experienced a higher than normal revision rate, forcing it to be recalled in August, 2011. The Oxinium Genesis II and Profix II, both manufactured by Smith , Nephew, were voluntarily recalled based on a higher than expected number of revision surgeries due to loosening. Some of the problems encountered with TKR can be addressed by introducing new methods, materials and procedures. Simulating with pressure sensors on specific contact areas of the knee joint may give insight on problems with various materials and different combinations of those materials. The simulations can provide information on stress distribution which may lead to improved contours of the prosthesis. In addition, TKR effectiveness can be improved by materials that are biologically compatible and non-corrosive, lubricants that provide for a greater range of motion and lifespan, and cement that prevents loosening with time. Surgeons are increasingly using robots for assistance in TKR procedures which increases precision and may prevent the removal of the cruciate ligament and menisci. Removal of the cruciate and menisci create an ongoing challenge to restore full kinematic function of a healthy knee joint. The use of magnetic resonance imaging (MRI) also improves the outcome of TKR. One goal during the surgery is to keep as much of the patient's original joint, another goal is to shorten the operative time and using MRI images in pre-op preparation may help. In conclusion, the needs for TKR and corresponding surgical procedures have been increasing. Despite the success of many TKRs there are areas in which improvements can be made. The present undergraduate research study covers review of some of the problems and suggests recommendations for increasing the lifespan of the knee implant while decreasing the number of complications. These improvements coupled with other technological and medical advancements may greatly enhance the overall efficacy of TKR.

138

Middle-School STEM Project: Using Minecraft Game Environment to Introduce Logic and Programming Basics

Kylan Nowell, Kevin Palmer and Douglas Dow, Wentworth Institute of Technology

In the global economy, good jobs are increasingly difficult to obtain. Many jobs require proficiency in logic and technology, especially computer programming. Many job seekers do not have the required skill because at a young age they may have decided that they were neither capable of nor interested in science, technology, engineering, and math (STEM) activities. Thus, as they progress through the rest of their education, they do not choose to undertake STEM related courses or experiences, and when they enter the job market they will not be qualified for the growing number of jobs that involve logic, math and programming. Companies in the United States have trouble finding enough qualified workers computer programming positions. Computer programming enables devices that improve every aspect of life. Learning how to program does involve many abstract concepts and often seems to be a daunting task. Many programing languages have tutorials and methods that have tried to help people new to programming, or at least new to that programming language, with this learning curve,

including LabView, which represents machines in a virtual space. One example is Karel the Robot. This is an instructional tool used by colleges such as Stanford to help teach the basics of programming, but this technique is already over 20 years old. For youth of today, even the best of these programming tutorials and learning tools may seem as boring or uninspired. Plus, the complicated structure of coding is still present, so learning the logic would be similar to learning the logic behind a more complicated language. So a question to ask is, how can younger people more easily become interested in a programing? We propose exposure through a programming experience within a familiar and comfortable environment as early as possible. An earlier exposure may increase interest in and self identification as a person who is capable of programming, and thus be more inclined to pursue further programming activities. Getting prospective students interested in programing is no easy task. On the other hand, many youth spend much time and energy in computer game environments. Within the game environment, they are comfortable with the abstractions, goals, rewards and punishments, and even gain a level of proficiency within those abstract constructs. One opportunity is that within a particular game, Minecraft, a user controlled capability with programming-like functions has been provided, called Redstone. The game of Minecraft became quite popular after the release in 2011 for the "do anything you want" playstyle. A key feature that the game introduced is Redstone, a material that acts as a wire which can be used to activate objects in the environment. Because Redstone functions in a similar manner to a programming script, Redstone could be used to demonstrate and allow some interactive manipulations of the basics of the logic behind programming. By using Redstone, students can examine fundamental programming concepts, such as for-loops, while-loops, and Boolean logic gates (AND, OR, NOT). By setting up the Redstone into patterns on the ground, the signal (like a voltage) that runs through the pattern can open doors, activate pistons, and play notes of music. By offering a game-based reward for completing challenges involving this wiring, a sense of accomplishment may be instilled during the learning process. In this project we will design with Minecraft a series of challenges. Explanation of the key concepts will be provided as needed. The middle-school students who use this system may increase their self identity as a person who is capable of and enjoys programing. They may later make a series of life decisions that increase their engagement in programming and related STEM activities, and thus become more prepared for the competitive global marketplace.

139

NSF STEP Grant to Improve Performance in Early Mathematics Courses

Ophir Feldman, Wentworth Institute of Technology

Early mathematics courses at polytechnic institutes are of particular importance to STEM majors as they provide the gateway through which students in these majors must pass in order to proceed to more advanced courses in the sciences, engineering and mathematics. The Wentworth Institute of Technology Ensuring Early Mathematics Success (EEMS) for STEM Majors NSF STEP Grant will provide an integrated program of academic support and intervention services to increase performance and retention among three at-risk populations: 1) STEM majors who transfer to Wentworth from other institutions, 2) incoming freshmen with risk factors known to be associated with increased risk of failing first-year mathematics courses, and 3) students in the general population who underperform in first-year and subsequent mathematics courses. The proposed program will expand access to an existing framework of college access and success programs and provide access to new services designed to address the specific challenges we have identified as barriers to degree completion by these at-risk groups. Specifically, a) STEM majors transferring to Wentworth from other institutions will participate in a credit-bearing summer bridge program to bring them up to the mathematics preparedness level of their peer group, b) entering freshman STEM majors identified as being at risk of failing first-year mathematics courses will participate in a summer mathematics bridge program to bring them up to the mathematics preparedness level expected for incoming freshmen, and c) all STEM majors will participate in Peer-led Team Learning to improve their performance in math courses and reduce the risk of course failure that contributes to attrition or an increase in time to degree.

140

Vectored Battle: Physics Lab as a Game

James O'Brien and Gerely Sirokman, Wentworth Institute of Technology

Vectors are a critical component of many subjects engineering students have to study. Vectors are usually introduced in introductory physics courses in order to be able to do calculations with two dimensional motion. Laboratory exercises dealing with vectors usually involve a map, and constructing a series of vectors from point a) to point b). While adequate at demonstrating the use of vectors, the labs tend to not be particularly engaging. This presentation will discuss a laboratory exercise wherein vectors are used describe the motion of pieces in a ship battle game. Vectors are used to conduct movement, and players vie for position using math, to deliver strikes against their opponent's vessel. By presenting vectors in a game, students should be more engaged in the topic, and better able to learn.

141

Flipping the University Engineering Classroom

Ethan Danahy, Tufts Unviersity

Flipping the Classroom is a concept gaining popularity in K-12 education where teachers assign video lectures (a la Khan Academy) for homework, thus freeing up in-class time for working through problems in the face-to-face collaborative environment of the classroom. Does this have a place at the university level? Could this structure benefit an engineering class? Professor Ethan Danahy from Tufts University "flipped" his introduction to engineering course on robotics in the Fall of 2012. Leveraging homemade mini-lessons recorded with a minimum of technology, he was able to free up precious face time with the students in the classroom from required lecture topics to instead either drive interactive conversations towards exploring the topics deeper or including more hands-on in-class project work. This talk first briefly introduces the idea more, then describes his strategies towards implementation, and finally reflects on the inclusion of such a method in higher education.

142

Primary School STEM Project: Cornstarch Monster and Sound

Benjamin Ford, Cameron Walkulak, Pamela Mudge and Douglas Dow, Wentworth Institute of Technology

Good jobs are increasingly difficult to find in the global economy. Many of the good jobs require an understanding and proficiency in areas related to science, technology, engineering, and math (STEM). Many job seekers do not have the necessary STEM related requirements because at a younger age (maybe during middle-school or high-school) they developed a self image that they are neither interested in nor capable of STEM activities. If they would have had positive and engaging STEM related experiences at a younger age (primary-school) the development of their self image may have been different. Possibly they would have enjoyed the STEM activity, sought more ways to have STEM experiences, and little by little developed a strong self image of being interested in and capable of STEM courses and activities. Recently, many experiments or demonstrations have been developed to allow primary-school students to have an engaging STEM experience. Ideally, the students would be both interested in or entertained, as well as made to think or to gain insight into a STEM related concept. Reports have recently been made of a demonstration that entertained kids involving a mixture of cornstarch and water on a vibrating membrane. The mixture clumped together forming what looked like strange, moving monsters, given the name "cornstarch monsters". Sound and pitches are vibrations at certain frequencies that mechanically vibrate air, water, solids and other materials. Our project is to develop a sound vibration and cornstarch monster lesson to used within a sound vibration module in a primary-school science lesson. The students will mix cornstarch with water, place a plastic membrane over a horizontally mounted sound speaker and pour the cornstarch solution on top. A series of pitches will be played through the speakers, ranging from very high to very low pitches.

The students will observe the resulting vibrations of the cornstarch solution on the speakers for each pitch. A discussion will have the students try to interpret the results, concluding with a relation between high pitches and fast vibrations, and low pitches and slow vibrations. A sinusoidal plot of the electrical signal that generated each pitch would relate the sound, visual image of the wave, and the dynamic movement of the cornstarch monsters. For each pitch, both the electrical signal to drive the speaker and the related sinusoidal plot can readily be obtained from websites using a computer or mobile device. This lesson should both catch their attention as well as relate the concepts of sound pitches and vibrations. Many of the students may have a memorable experience of this audial and visual science experiment. Their interest in science and their desire to engage in further STEM related activities may be strengthened.

145

Primary-School STEM Project: Artificial Lung

Mary E. Rodgers, Maria F. Gonzalez and Douglas E. Dow, Wentworth Institute of Technology

Recently, reports have shown that America's youth have a declining interest and self-confidence in the academic areas related to science, technology, engineering and mathematics (STEM). One explanation is that many youth, prior to high-school or college, have established a self identity that they are neither capable of nor interested in STEM activities. These youth will have a low potential to obtain a good job in the increasingly competitive global economy, since many jobs require proficiency in STEM related skills. Possibly, if students at a younger stage, such as in primary-school, experienced engaging STEM related activities, their self confidence and interest in STEM would grow, and they might become more likely to make decisions that would lead them into a successful STEM-based career. The purpose of this project is to have primary-school students undertake an experiment that involves principles of physics to explore a physiological function they consciously do every day using familiar materials. This project is building on many recent attempts to identify engaging STEM activities for younger students. Further improvement, refining and experimentation may lead to more robust and engaging projects. In this project, students will assemble an apparatus to model an artificial lung, using simple components that are familiar, such as an empty plastic bottle, balloon, and some tape. The procedure involves cutting off the bottom of the water bottle (discarding the bottom half), cutting a balloon in half, and then placing the bottom half of the balloon around bottom end of the bottle bottle where the bottom had been cut off. Tape secures this junction of balloon and bottle. The top half of the balloon is then placed inside the water bottle and connected to the outside through the top of the water bottle. This junction is also secured by tape. Now the balloon inside the water bottle resembles a lung in the lung cavity. A small pocket of space inside the balloon is created that is also inside the water bottle, with the top of the bottle being a small opening for the air to escape. When the bottom part of the balloon is pulled down, a vacuum inside the water bottle then works to inflate the balloon inside the water bottle. When the bottom part of the balloon is released so is the air inside the balloon, this resembled a lung breathing out. This utilization of pressure and vacuum, resembles air flow in the lungs during breathing. Prototypes of educational lessons for this activity will be developed and tried, first on college students, and later on small groups of younger children. Projects such as this one may give more primary-school students experience undertaking STEM activities that may increase their self-confidence and interest doing even more STEM related activities.

146

Primary-School STEM Project: Conductive Solutions to Transfer Electric Current and Drive Actuator

Bashair S. Alhajhouj, Hebah M. Alyousif and Douglas E. Dow, Wentworth Institute of Technology

Many people have difficulty obtaining good jobs. Many jobs in the competitive global economy require understanding and skills related to science, technology, engineering and math (STEM). Job seekers may not have undertaken the necessary background courses in these critical areas. More people may have selected STEM courses if they would have had some engaging STEM experiences at a younger age, such as during primary-school. The purpose of this project is to develop a science and engineering experiment that explores aqueous solutions having different electrically conductive properties. The students will be able to observe the level of conductivity of each solution in two ways: value from an electrical meter and output of a visual actuator, such as a light emitting diode (LED). As conductivity increases, the brightness of the LED should increase. The experiment should help students begin to think about electrical charge, dissolving of ionic solids like salt, chemicals in a solution, and electrical circuit principles. The design of this experiment should be simple, safe and easy to obtain the necessary materials. The materials include a solution container that will be filled with dissolving substance like salt or sugar in water, measuring spoons, stirring rod, battery, wires, switch, LED and digital multimeter (DMM). The actuators in the experiment may be expanded later to include a fan, heater or audio speaker. The experience by primary-school students may increase their interest in and likelihood to seek more STEM related activities in their future.

147

Space, Modality, and Technology: A 3-Dimensional Framework for Converged Learning

Zvi Szafran and Samuel Conn, Southern Polytechnic State University

21st century universities must contend with numerous new challenges, including a more technological society that focuses on balancing learning with work, family, school, and other life priorities. An expectation of anytime/anyplace learning, along with continually emerging Internet applications and technologies, have pushed traditional formats and models in higher education to shift in new directions. While most universities now offer some courses and programs live, in hybrid format, and online, they see these as separate endpoints with separate attributes. The presenters suggest an alternative view: that learning spaces, differing modes and formats for learning, and types of technology employed are the three axes necessary to create and define a continuum matrix of innovative pedagogical and ragogical approaches in support of the new normal in higher education. In this presentation, they examine how the various intersections of learning spaces, instructional modes, and categories of technology now available can define a continuum of different educational environments. Each dimensional convergence constructed through these intersections can be optimized to lower educational costs, reach larger populations of underserved students, maximize instructional resources, and leverage technology to improve learning efficacy. This conceptual framework will be presented as a baseline study to establish a mechanism for improved instructional design, faculty development, shift in focus from teaching to learning, and design and creation of multi-functional learning environments. Moreover, this study provides a foundation for future research involving the various complex combinations of space, instructional modality, and technology.

148

Object Placement Detector for Home-Based Arm Rehabilitation System

Michael Carando, Nick Anderson, Tim Juitt and Douglas Dow, Wentworth Institute of Technology

Arm and hand motor function can become impaired due to stroke, trauma, disease and old age. Physical therapy enhances recovery of some motor function. Many patients have at most limited access to physical therapy due to the costs, insurance limitations, and difficulty of travel to the clinic. Home based physical therapy would increase accessibility, as well as allow guidance, monitoring and feedback from a physical therapist at the clinic. However, compliance and quality of un-monitored exercise sessions are often low, and a therapist may have difficulty interpreting the results to give the most beneficial further guidance. A computer-based home therapy system could provide instructions to the patient, monitor the results, and make a summary of the sessions for review by the patient, caregivers

or therapist at the clinic. Several methods to monitor home-based therapy sessions have been reported. A video conferencing system allows remote audial and visual communication between therapist and patient, but is not ideal because measurements or extent of force or motion is not conveyed. A more efficient use of the therapists time may be to not be engaged during the entire video conference exercise session, but to only periodically review summaries of the sessions. Another system uses the Xbox 360's Kinect game system, which can track the positions of limb joints during motions, but force information is lacking. In this project, we will design, build, and test modules of a system to monitor the placement of objects on certain locations, such as on a platform or shelf at some height above the tabletop. Each utilized object would have a different weight that would help the system to identify which object was placed on the platform. A force sensor on each target location would be monitored by the computer. The system will provide the patient with instructions, and monitor the completion of arm movement tasks by noting the time and weight of objects placed on the target locations. Results of this prototype system should aid development towards home-based rehabilitation systems that can be safely used at home, while obtaining data that would be useful for monitoring the success of the therapy sessions by the patient, caregivers or therapist at the clinic.

149

Annex Connector

Quinn Levine, Wentworth Institute of Technology

I have worked on designing a Connector building for the Annex Building of Wentworth Institute of Technology. It uses its surroundings, light, and parti to help and construct a building from concept to final design.

150

A.R.C.H.E.R. - Autonomous Remote Controlled Hazardous Environment Robot

Ryan Moyen, Edmond Hebert and Ashley Yu, Wentworth Institute of Technology

A.R.C.H.E.R. is a senior design project by Edmond Hebert, Ryan Moyen, and Ashley Yu. A.R.C.H.E.R. stands for: Autonomous Remote Controlled Hazardous Environment Robot. In the current day an age un-manned vehicles are becoming more necessary and favored for it protects personnel on the field in various situations. A.R.C.H.E.R. is a robot designed for just that. A.R.C.H.E.R. is equipped with various sensors that would be typically used for hazardous environments. Various sensors typically used on the field will be incorporated on the A.R.C.H.E.R. unit. Some of which are temperature, radiation, and gases. This information is fed back to the controller unit. Information is then displayed on the screen of the controller unit. This controller unit is a touch pad tablet, Microsoft Surface Pro, which will display data and allow control of the A.R.C.H.E.R. unit. A main feature aside from sensors is video and audio streaming from the A.R.C.H.E.R. unit to the controller unit. The benefit of this robotic device is that it is generally cheaper to create, potentially modular for various sensors, small in size, and is controlled by an easy to use controller system application. A.R.C.H.E.R. provides a barrier of safety for personal on the field when needing to assess hazardous environments. A.R.C.H.E.R. is also able to traverse most terrain and can climb stairwells.

152

The (inter)Discipline of Architectural Education

Marc Neveu, Chala Hadimi and Troy Peters, Wentworth Institute of Technology

This panel will bring together three perspectives that demonstrate the embedded interdisciplinary in architectural education. Building Performance: the Science of Architecture High performance buildings have become increasingly important as the world population escalates and at the same time natural resources abate. It has been shown that decisions made early in the design process have a greater impact on the final performance of a building than decisions made later in the design. At the beginning of a building design it is therefore critical that the architect knows how to make informed decisions based on science to estimate the best Structural, Acoustical and Thermal performance of the building so it can later be optimized into the highest performing building.

Pedagogically students of architecture must learn how to apply basic physics to complex problems in a way that does not hinder but also enhances the design process that also includes, aesthetics, history, program, life safety, etc. Some of the tools and methods that will be discussed are Energy Simulation software and High Dynamic Range photography that are used during the studio design process. This paper will look at the way science is used to design buildings and some of the tools and methods that students use in design studio to design high performance buildings. Your Problem is Our Problem. The practice of architecture is dependent on collaboration; architects work with clients, community groups, engineers, interior designers, contractors and lawyers, to name a few allied individuals and professionals critical to the process of completing a building. The studio in architectural education attempts to replicate the profession, challenging students to resolve design problems in a project-based format. Sometimes these projects are situated in the community, with ñrealò clients, and sometimes students work in teams, but typically each student works independently, devising a design solution of her own, tied only to the limited ñrealityò of a pedagogical exercise. In the studio, seldom, if ever, are skills in interdisciplinary collaboration and an understanding of allied disciplinary questions and methods highlighted as major learning objectives. Given how important these skills and understandings are to the practice of architecture, how might we frame student projects as a process of problem definition (rather than problem resolving) in which students uncover and confront the various and interconnected disciplinary questions within the parameters of a project? That is, how might we shift the pedagogical projects of studio to critique the traditional boundaries of architecture, and support the interrogation of overlapping disciplinary questions, and the cultivation of interdisciplinary relationships? This paper will set out to demonstrate the embedded interdisciplinary in architectural studios. Saturday Sessions. Myron Goldsmith (1918-96) was a unique figure in the development of tall building design. He successfully blended the roles of architect, engineer and professor throughout his tenure at Skidmore Owings and Merrill (SOM) and in the Department of Architecture at the Illinois Institute of Technology (IIT). Indeed, many of the projects supervised by Goldsmith and his colleagues, to include the pre-eminent structural engineer Fazlur Khan (1929-82), directly influenced built work. The few published studies of Goldsmith acknowledge, but do not fully explore, the innovations that Goldsmith oversaw as thesis advisor to many graduate students at IIT in the 1960s. An essential link between the student work and the large-scale office projects at SOM were the "Saturday Sessions." There, architects, engineers and students met for weekly reviews at IIT and a lengthy and lively lunch at Bertucci's restaurant in Chicago. Goldsmith encouraged the free exchange of scholarly and practical ideas during these Saturday Sessions and we argue that this was a vital part of Goldsmith's pedagogy. This paper will discuss the relationship between interdisciplinary project based learning at IIT and the professional practice at SOM.

153

Serving a statewide mission via distance education: 17 Years at Southern Polytechnic

David Stone, Southern Polytechnic State University

Southern Polytechnic State University has been offering distance education within the State of Georgia since 1996, when the State of Georgia's first online graduate program was developed (Master of Science: Quality Assurance). Over the course of the past 17 years there have been changes made to the structure, administration, and processes that have been used to support distance education guided by our special purpose mission. The presentation will provide a description of how the original efforts were established, the design of the original efforts, structure, and goals, as well as provide an overview of how the initiatives changed over time. The current state of online learning and a discussion of future directions will be provided. Through the use of original documents, meeting minutes and other data sources the presentation will provide a view into the evolution of the distance education program.

154

A minor in Web Design and Development for Non-computing Majors

Ronald Vullo and Catherine Beaton, Rochester Institute of Technology

For nearly two decades the web has been an integral component of what we do and teach in computing and will continue to grow as an essential part of everyday life. Over that time there has been a shift from a passive user mode, to an interactive user mode. Web development skills are now vital to non-computing disciplines so we have created a minor in web design and development for non-computing majors. Needs for these skills are becoming increasingly evident in other fields of study, as students recognize the universal infrastructure web technologies provide, and the benefit of a solid computing skills foundation. In this minor we help them develop significant technical depth, despite their non-computing backgrounds. The minor in Web Design and Development for non-computing majors provides students a path to in-depth technical knowledge that is flexible and uses an Active Learning methodology of simultaneous learning/doing experiences and supports different learning styles. Students learn and experience both the theory and practice of web development hands-on. The minor's success is demonstrated by its rapid growth.

155

A First Year Math Course for Applied Math Majors at Wentworth Institute of Technology

Amanda Hattaway, Wentworth Institute of Technology

In the Fall of 2012 and in the Spring of 2013 we ran a first year applied math course sequence called Methods and Topics in Applied Math I and II. This course is a course for applied math majors that aims to give an overview of what one can do with a math degree (including a lecture series and how I got that started), tools for a math major, electronic portfolio building, and topics such as cryptography and portfolio theory. In this talk I will give an overview of the course, requirements for students both inside and outside of the classroom, student activities and projects, student feedback and success and failures. This talk could be interesting for instructors that wish to or already teach first year courses.

156

Modeling the Nephron with Differential Equations

Liam Stokinger and Elena Grillo, Wentworth Institute of Technology

The kidney is an organ in humans that controls the levels of extracellular fluid, acids and bases, blood volume and concentration of sodium in the body. The concentration of sodium is very important in keeping our bodies up and running. If sodium levels are too high relative to the amounts of water in the body then one runs the risk of hypernatremia, or dehydration. If the levels of sodium are too low then one can fall victim to hyponatremia, the effects of which include nausea, headache, muscle weakness, cramps, seizures and coma. The nephron is basic functional unit of the kidney; there are approximately 1 million nephrons in the human kidney. In this poster presentation and in our talk we replicate prior models of nephron sodium regulation and concentration and suggest future work. This project crosses the boundaries of biology and mathematics.

157

Synthetic Biology: Student Driven Advancement at Local Polytechnic College

Christopher Bennett, Wentworth Institute of Technology

Synthetic biology is an emerging science dealing with either engineering or reprogramming of proteins, bacteria, and other biological entities through gene/sequence manipulation in order to influence or control biological systems at the molecular level. However, not much advancement in this field can be accounted for over the past 10 years. Ideally, progress towards collaboration among colleges, universities, and research institutes should be made in coming years; implementing collectives that share materials and research more naturally. Currently, many in-depth classes and experiments being taught on synthetic biology would be taken at a graduate school. This should not be the case because research on synthetic biology can be cost effect and easily implemented into curriculums, even at high school level education. At Wentworth Institute of Technology, undergraduate biomedical engineering students are beginning their work with synthetic biology by manipulating the gene expression of E.coli HB101 K-12-lyophilized. They have experimented with expressing GFP, green fluorescent protein, activated like a toggle switch ("ON" or "OFF") through the introduction of arabinose during the transformation process. This experiment is reasonably easy and cost effective. Also, the procedure was involved enough that it gave students some insight into technical skills: pipetting, thermocycling, bacterial transformation, bacterial purification, etc. Forthcoming, students will be experimenting with growing manipulated bacterial cultures. The bacteria, during log phase growth and with the introduction of some alcohol, produce a banana like smell. The idea is to incorporate a specific transcriptional inverter into the DNA plasmid, which acts as a High/Low, 1/0, True/False response similar to binary logic. Genes can be designed in silico, on a computer, prior to their applications; overcoming many complications with ease. For this experiment, the desired response is false and bacteria replicate and produce a banana like smell. This experiment was first pioneered by neighboring MIT, for the first time in 2008. Studying synthetic biology through experimentations is an exciting step made by sophomore biomedical engineering students at WIT. These students are the first at their school to do such experiments in bacterial transformation and bacterial purification, and will be the first to grow cultures that smell like bananas. This has all been made possible by a sophomore level course called directed study in biological research and is a required class for two minors: biology and bioinformatics. Students chose to pool efforts and focus their studies and experimentations on understanding applications of synthetic biology. Student driven projects and classes play a vital role in taking strides towards progression at WIT. Contrary to traditional learning, in which a set curriculum is taught, this class gives students the opportunity to inevitably choose their learning path. Through this open-ended style of class, many more "first time" experiments could be done at WIT in the future; depending on student interests as well as motivation. Also, since biomedical engineering is very unspecific to one core focus, typical of numerous other majors, this class gives students the opportunity to focus on learning what they are most interested in.

158

A Thermodynamics Approach to Explaining Organizational Behavior

Russell Pinizzotto, Wentworth Institute of Technology

Using thermodynamic principles to describe organizational behavior leads to a very different way of thinking about complex groups of people. For example, the First Law of Thermodynamics states that the internal energy of a system is equal to the difference between the heat supplied to it and the work that it does on its surroundings. Internal energy is a state variable that describes the condition of a system at a particular point in time. The analog in an organization is that its internal energy can also be thought of as the difference between the work it performs and the "heat" that is supplied to it. If the organization does not perform work, the heat supplied still remains as internal energy. Organizations that perform work effectively will have lower values of internal energy, that is, they will perform at a higher level than other organizations. This presentation will demonstrate how many of the concepts embodied in the Laws of Thermodynamics have analogs in organizations. Understanding these principles may lead to more effective organizational management.

161

A Machine Learning Approach to Designing Guidelines for Toxicity

Barry Husowitz, Wentworth Institute of Technology

A significant effort is being made to evaluate the toxicity of chemicals before they are introduced into the environment. Experimental approaches to assess the toxicity of chemicals can be expensive and time consuming. Therefore, there is a great need to develop computational and statistical approaches to predict the toxicity of chemical prior to their introduction into the environment. This study shows how support vector machines a machine learning approach can be used to derive guidelines for the design of safer chemicals for acute aquatic toxicity. In this study feature selection was accomplished by a combination of a recursive feature extraction (RFE) method and a pairwise correlation method using support vector classification. The two most relevant features or pair correlated features where determined to be log (P_(o/w)) and ΔE. A hyper plane or curve describing the boundary between these two properties for toxic and nontoxic chemicals was determined by support vector classification. The hyper plane or curve that was obtained shows that chemicals whose ΔE > 8 eV and whose log (P_(o/w)) < 2 will have reduced acute aquatic toxicity. Validation of this finding was accomplished by both an external validation and by a Y-scramble test. High performance accuracies where obtained for the validation sets and the results of the Y-scrambled test showed that chance correlation was unlikely. This work shows how support vector machines can be utilized to derive design guidelines for chemicals with reduced acute aquatic toxicity, not only for the species considered in this study, but also for potentially more aquatic species. My previous work on support vector machines for acute aquatic toxicity will presented along with my proposed future work to study the toxicity of various other classes of chemicals.

162

Modeling Mesoscale Structure in Polymers for Efficient Anhydrous Proton Transport.

Barry Husowitz, Wentworth Institute of Technology

I will present previous work of Monte Carlo simulation studies of course-grained models of some recently developed comb polymers for anhydrous proton transport applications. We have constructed simple coarse-grained models of comb polymers that incorporate the chain architecture but require only a single chi-parameter for interchain interactions. We have studied these models using Monte Carlo simulations using the single chain in mean field (SCMF) method developed by Muller, de Pablo and their coworkers. We use SCMF to determine the mesoscale structure and relate it to the polymer architecture in the models. We find that the SCMF method allows us to study the spontaneous self-assembly of the model comb polymers into mesophase structures with both lamellar and cylindrical symmetry consistent with those seen in the experiments. Our calculations also suggest an explanation for the disordered morphologies found for some of the polymers. This model can also be used to study the formation of self-assembled structures formed by polymer cross-linking. With the aid of polymer cross-linking possible morphologies or self-assembled structures containing multiple channels for proton conductance could be "locked-in." In turn these structures could enhance proton conductance and provide a useful way to form more effective anhydrous proton transport membranes. My previous work on the self-assembly of comb polymers along with my proposed future work on polymer cross-linking for anhydrous proton conductance will be presented.

163

Rethinking Finite Math: Bridging Boundaries between Mathematics, Economics, Finance, and Business.

Gregory Bard, University of Wisconsin-Stout

How does one present a course in mathematics to business students? How does one teach potentially challenging topics when the students have trouble with basic algebra? How do you get students to think through a word problem? How does an instructor motivate students who are convinced that mathematics is useless for their career track? How can you get students to try to model actual economic phenomena? What technologies can help an instructor conquer these challenges? Why do we teach mathematical economics only to the business majors, why not to future engineers as well? The vast majority of textbooks for ñFinite Mathematics" or ñBusiness Mathematics" courses are 10th or higher editions of textbooks written in the 1970s and 1980s. A lot has changed in the world in the last 30 years! For example, student's algebra skills appear to be much worse, but their exposure to probability and statistics is much better than it once was. The dot-com revolution, the sub-prime-mortgage-crisis, and the growth of international commerce have presented instructors with a huge wealth of highly relevant discussion topics -- but the textbooks do not talk about them. This talk will discuss what technology can do to solve these problems, from taking real-world economics data from the web and building models in MS-Excel, to using SAGE to remove boredom from the matrices and the simplex method, from writing applets that demonstrate mathematics with animations to using rendering tools to make lovely Venn Diagrams, from all the advantages and disadvantages of using e-books, to challenges of making fundamentally realistic models, from techniques to find applied examples for exciting lectures with minimum preparation time to projects that are challenging, yet accessible, and easy to grade....and last but not least, techniques for bringing this material into the engineering classroom as well.

164

Synergistic Power Of Multisensory Learning for Teaching Environmental Technology Systems and Materials.

Robert W. Tango, Southern Polytechnic State University

At Southern Polytechnic State University, the five year professional Architecture program has a prescribed series of courses required. The Architecture technology course sequence is a compression of topics to learn; each one capable of being an independent field of study. Organized into four separate courses titled Environmental Technology I to IV, each course addresses a segment in an order of need corresponding to the sequence of design studios. Environmental Tech I, which this paper will focus on, addresses wood, steel and concrete construction systems and materiality associated with each. Grasping the conceptual understanding and conceptual documentation of these critical areas is challenging because of the wide breath of material needed to be covered. Experiencing failures in how students were able to grasp the vast amount of material required to be taught in this course lead to this experimentation. Student retention ability improves by applying multisensory strategies to the pedagogy. "The human brain has evolved to learn and operate in natural environments in which behavior is often guided by information integrated across multiple sensory modalities" according to studies from the University of California Dept. of Psychology. Initially each topic's material must be distilled down to essentials; the basic building blocks and the basic rules of thumb. Then repetition of the essentials in different sensory formats establishes and reinforces the learning. A student hears it, sees it, seeks it, touches it, records it, reproduces it and is tested on it in a prescribed way. Going beyond the lecture classroom is where the significant learning occurs as students build bridges with industry and simultaneously heighten comprehension. For example, a teacher can introduce the concept of a hamburger in pictures, and words, but if the student goes to a restaurant and sees it being cooked then cooks one himself and eats it, the learning is cemented. A similar implemented process for my academic realm builds the student's "toolbox" and adds value to each new technical topic introduced during the sixteen week semester. Environmental Technology and second year Architecture Design studio occur simultaneously. The goal is also to bridge the boundaries of both classes and strengthen results in each in a synergistic fashion. Pros and cons experienced in the development of this polytechnic multisensory pedagogy will be unfolded in this paper and presentation.

165

Building a sustainable town/gown engagement model

Patrick Hafford, Charles Hotchkiss, Erik Miller and Sandra Pascal, Wentworth Institute of Technology

This panel discussion will examine a successful model that combines service learning and community engagement through interdepartmental collaboration. Wentworth Institute of Technology is located in the Boston neighborhood of Mission Hill, an area containing a blend of peoples, cultures and economic strata. The Institute works with community partners to bring student and faculty expertise to community development projects. That work is viewed as both a valuable form of community relations and a means of enriching student's curricular and extracurricular learning. Consequently, Wentworth has evolved a unique partnership between the Business office, which funds and manages the Center for Community and Learning Partnerships, and the Academic Division, which supports the Service Learning Committee. The collaboration allows projects to be conceived and executed using multiple resources, including work-study students, co-op students, class projects, and individual senior projects. This approach is particularly effective in allowing the continuation of projects over multiple semesters a frequent problem in community-based learning. The results include more meaningful learning experiences, strong interdepartmental cooperation, and better community relations with the institute being viewed as a valuable part of the neighborhood. This panel will examine two case studies showing it is possible to effectively incorporate curricular and extracurricular service learning over longer-term projects.

166

Gravity Fed Water System

Laura Boyd and Matthew Raison, Wentworth Institute of Technology

We are taking on one of the biggest problems in the world approximately 7.8 million people are without access to clean water. This crossed many socioeconomic boundaries. Through an analysis of a gravity fed water system we will explore one easy and cheap option for supplying water to a community. The success of gravity-fed water systems can be seen in the system used for New York; it has earned the reputation of producing exceptionally clean water with no additional treatment required. A gravity fed water basin is meant to transfer and filter water from a large body of water down to a village or town. Finding the optimum conditions and locations for setting up one of these water systems up can start by using Bernoulli's equation for fluid flow. In this talk and poster presentation we will go over the work of previous researchers and suggest future work such as applications of this to chaos theory, fractal geometry, and numerical analysis to turbulent flow.

167

Implementation of Undergraduate Research Projects using Planarian Regeneration and Planarian Databases at the Wentworth Institute of Technology

Kelsea L. Miller, Makeda K. Stephenson and Paloma Valverde, Wentworth Institute of Technology

Planarians are non-parasitic flatworms that have a unique population of stem cells called neoblasts, which can give rise to all of the differentiated cell types present in the adult organism during regeneration or normal homeostasis. These animals are used extensively in research institutions in the investigation of stem cell and regenerative biology. In the past planarians were mostly used in undergraduate biology courses and some AP zoology courses in high school to introduce bilateral animal symmetry, asexual reproduction and head or tail regeneration. Because planarians are small invertebrate animals, inexpensive, easy to maintain and regenerate quickly they can be used as model systems in undergraduate teaching institutions to satisfy requirements of accrediting agencies and to introduce hallmarks of the real research process without requiring an animal protocol approval. Based on the wealth of information available about planarians, many original projects can be designed and implemented by instructors and students in either directed research courses at early stages of their program or in senior design projects. This paper describes a series of projects designed and implemented by sophomore level biomedical engineering students during Fall 2012 and Spring 2013 by focusing in the regenerating properties of

planarians, the use of planarian databases (example http://smedgd.neuro.utah.edu) and publications or biological tools provided by the instructor about a set of genes important in cell proliferation, regeneration and cancer. Some of these projects were implemented at the biology lab as part of a directed-research course during Fall 2012 (Biol406, directed study in biological research), whereas others are being performed during Spring 2013 by using freely available bioinformatics databases. In addition to the projects implemented so far, biomedical engineering students will describe other designs that can be put in practice in future offerings of Biol406 or in other advanced courses of their program to enhance their inter- and trans-disciplinary research nature.

168

Design and Construction of a "Remote Underwater Surveillance System (RUSS)"

Geoffrey Reimann, William Bishop and Lindsay Grumbach, MassBay Community College

A collaborative research and design project between the Engineering- and Biotechnology Departments at MassBay Community College produced a novel submersible called the "Remote Underwater Surveillance System (RUSS)." RUSS's versatile design allows the comprehensive study of the understudied, narrow gauge and cluttered urban waterways of America. The initial deployment of RUSS (June 2013) will entail a survey of the San Juan Estuary of Puerto Rico which is an environmentally and economically important waterway of that island. An interdisciplinary team of students from the Engineering and Biotechnology Departments collaborated in the design, construction, testing and use of RUSS as well as the formulation of its scientific mission. RUSS's scientific mission is allowed by its technological highlights: Integrated digital system and user interface providing sensor data transmission command, video/photo, compass, and imaging sonar. A hull/enclosure that will withstand pressure at depths of up to 100 ft. while readily allowing maintenance access to internal systems and components; Electronics that control power transmission, thruster management, lighting for murky environments typical of urban waterways; Mechanical arm and collection devices that facilitate the procurement, recovery, and containment of aquatic samples. The project team involved students training in the areas of electrical engineering, mechanical engineering and marine biotechnology. This research and development project conferred real-world collaborative experiences that require the use of problem solving, critical thinking, and technical considerations: Power requirement; Environmental constraints on construction materials and electronics; Available manufacturing and fabrication capabilities.

169

Healthcare and Poverty in the United States

Eric Hart, Daniel Paquette and Nora Shea, Wentworth Institute of Technology

We will discuss which groups of people have the least health insurance coverage, and poverty rates, and the correlations between health insurance and poverty levels. We will be giving a summary of what the healthcare safety net is and the percent of people covered by the government or private insurances. We will also take a look at the comparison between the 2000 census and the 2010 census and explain what happened in the ten-year span to change the healthcare system in certain states. A large focus of this project will include an in depth analysis of the age, gender, and locations of people in the entire United States and where these different groups fall into the healthcare system. Our project will include many graphs and lists of data to support our claims using tools from our first year math course that we are a part of. Despite national current healthcare reform, our work seems to indicate that many people may remain in the US without adequate healthcare. This work bridges boundaries between the disciplines of sociology, economics and statistical analysis.

170

Investigations of Omega-complexity of Chaotic Systems

Georgi Gospodinov and Shayna Jackson, Wentworth Institute of Technology

Chaotic systems have been a difficult area of study. While they are deterministic in nature (not stochastic), their trajectories are complicated and oftentimes have a fractal dimension. Because of the complex nature of the system there are few integer-valued invariants that can be used to describe their behavior quantitatively, such as Lyapunov exponents, fractal dimension, and Omega-Complexity. The latter associates to a fractal trajectory a number that measures its behavior qualitatively, and looks for a dominant component or direction in which the fractal develops. We will present our investigation of the properties of Omega-Complexity in 2D and 3D systems, along with time delay embeddings up to 4 dimensions. Some of the current applications of Omega-complexity try to establish connections between the multi-dimensional visibility graphs of dynamical systems using the Omega-Complexity of the underlying system.

171

Data Assimilation in the Study of the Dynamics of Cancer

Georgi Gospodinov and Matthew Shakespeare, Wentworth Institute of Technology

Cancer is a widespread disease that emerges in a variety of ways, and each type of cancer requires a specialized unique approach. With a great deal of the study work finished, the processes of application and interpretation become the playgrounds for breakthroughs in the field. Through interdisciplinary work with other fields, such as mathematics, physics, engineering, biology, and chemistry, scientists have developed a wealth of knowledge for just what this disease is and how it works. The physical body allows for tremendous adaptability within its processes and for optimization the use of space, externally and internally. By looking at the spatial processes and models of specific cancers, a powerful technique called data assimilation can be used to refine, reinterpret, and model the long-term propagation and growth of these cancers. This will create a deeper understanding across many types of cancer, and may even provide the doorway for new methods and approaches to be developed.

172

Building Undergraduate Research, Inter-Departmental Collaboration

Georgi Gospodinov, Wentworth Institute of Technology

This is an open panel invitation for a discussion of effective ways of building and maintaining active undergraduate and faculty research in a primarily teaching-based institution. Challenges, new ideas, use of technology, and student leadership will be discussed. Faculty and students are all invited to participate.

173

Topological Tools for Analysis of Dynamical Systems

Georgi Gospodinov, Elena Grillo, Matthew Shakespeare and Kai Yuen Fong, Wentworth Institute of Technology

A recent breakthrough in research has allowed for surprising and deeply illuminating applications of tools from topology to the analysis of dynamical systems, in particular, chaotic systems. Oftentimes, medical data has fractal structure and requires sophisticated analysis in order to extract any relevant information. Recently, researchers have begun using topology to study dynamical systems at a semi-global level, looking for patterns, underlying manifold structures, and invariants of the system. One such example is the association to the state trajectory of a dynamical system a certain graph called the visibility graph of the system. The visibility graph is able to encode important information about the properties of the underlying dynamical system, and allows for interesting new ways of understanding dynamics. We will present work on two joined papers, on developing basic ideas of visibility graphs, as well as extending the visibility construction to higher dimensions.

174

Engaging Students with New Technologies Utilizing a Fabrication Laboratory in the Industrial Design Classroom.

Jennifer Astwood, University of Wisconsin-Stout

This poster highlights the benefits of utilizing a fabrication laboratory (Fab Lab) within the context of the Industrial Design senior studio. Students learned how to use a Fused Deposition Modeling (FDM) machine by doing project-based learning. Students were given a project brief to design an object and attachment mechanism that would enhance an experience for a specified user. My students were eager to learn how to use an FDM machine to enhance their design skillset. The students were constrained by designing within one cubic inch and printing an ABS prototype through using a FDM machine. Utilizing an FDM machine to create functional prototypes allows students to get a taste of what a production model would look and feel like. This opportunity gives students a new perspective on the design process. By printing a plastic prototype from an FDM machine, design students learned about their product's usability. They learned if the product was the right thickness, had the right feel, how it functioned and most importantly, how their design could be improved. This poster will highlight students' perspectives and project results.

175

The Inclusive Classroom: the Whys and Hows of Supporting Retention of Under-represented Students

Chris Haigh and Peter Fowler, Wentworth Institute of Technology

There is considerable research and interest in retention of students from under-represented groups in STEM education such as women and students of color. The classroom environment is a pivotal space for education, engagement, and retention for all students, but particularly for under-represented students. Faculty play a key role in the success of these students. This session will provide an overview of the inclusive classroom, which allows all students to fully participate and engage with course content and instructors. An opportunity for participants to share successful strategies will also be provided.

176

Interdisciplinary Entrepreneurship Education: Combining Best Practices from Business Management Programs with Practical Applications from Non-Business Programs

Rick Trilling, Wentworth Institute of Technology

Entrepreneurial studies are an integral part of many undergraduate and graduate Business Management programs. As the advantages of interdisciplinary learning in general lead to cross-program educational opportunities, the inherent interdisciplinary nature of entrepreneurship in particular offers a sound connection for bringing its lessons to, and combining with, non-business academic programs. Important benefits of such "cross-pollination" include students in the non-business programs being exposed to fundamental concepts as well as best practices of entrepreneurship; while those in the business management programs discover that the curriculum does not exist merely in the abstract. The opportunities for synergy rest in the fact that what is theoretical to one group is practical application to the other; in combination, the full picture of real-world entrepreneurship is available. The interdisciplinary entrepreneurship educational model is the next logical step in the process. The proposed talk intends to examine recent research and examples of successful implementation in academia.

177

Finding a Balance: Developing the Interdisciplinary Course

Carol Sexton, California Polytechnic State University, San Luis Obispo

In today's professional disciplines, in this case, business, the explosion of knowledge and information from a wide variety of disciplines creates several problems for course development: 1) attempting to compress information into a single course; 2) developing faculty expertise and awareness of current knowledge and information; and 3) facilitating students' understanding of the relationships among the various disciplines. This paper attempts to address these problems through analysis of the case of a particular management course that needs to incorporate knowledge and information from psychology, sociology, philosophy, political science, law, cultural studies and labor economics.A variety of strategies and methodologies are presented, including mind mapping the course, creating learning cohorts, and encouraging self-directed learning.

178

Improving Accuracy for Cardiac Electrical Axis Determination from ECG

Robert Beatrice, Christopher Lampe, Bartholomew Katehis and Shankar Krishnan, Wentworth Institute of Technology

Due to the high incidence of deaths due to cardiac diseases, early diagnosis of cardiac diseases is recommended by cardiologists. A common technique used to diagnose heart conditions using the electrical activity of the heart is electrocardiography (ECG). The cardiac electrical axis (CEA) can be determined using a patient's ECG and can aid in diagnosing certain serious cardiac abnormalities. The CEA axis is used to detect ventricular hypertrophy and other heart conditions such as left anterior and posterior fascicular blocks, atrial septal defects, etc. The objective of this undergraduate engineering project is to compare various methods of determining the cardiac electrical axis and propose the method with high accuracy for clinical use. This project was undertaken to provide undergraduate research experience outside the academic curriculum (during summer) to interested students from Biomedical Engineering, Electro-Mechanical Engineering, and Computer Engineering Technology. The mean cardiac electrical axis is the sum of the waves of depolarization and repolarization traveling through the heart. To calculate the CEA the amplitude of the QRS vectors for the six limb leads of an ECG are used. The amplitude of the QRS vectors for each lead is found by taking the sum of the Q, R, and S peaks. In Method I, the most biphasic lead is used to approximate the CEA. In Method II, the CEA is calculated using leads I and aVF as the x and y components. In Method III, the CEA is calculated using the amplitudes of leads I and aVF with a different mathematical relation. In Method IV, the CEA is calculated by taking the sum of all the QRS vectors of the limb leads, as derived from the definition of the mean electrical axis. The four methods selected in this study were applied to 15 cases of ECG readings. The results reflected different states of axis deviation, of the cases chosen in this study four had right axis deviation, two had left axis deviation and nine had regular axes. Method I is only a useful as a visual approximation and can only result in multiples of 30Â° and does not provide accurate results. Method II and III had similar results, for normal axes and axes with left axis deviation Method III calculated larger CEA than Method II. For axes with right axes deviation Method II calculated greater angles than Method III. The difference between Method II and III is greater for larger angles. Method III uses a similar formula to Method II but with a correction factor of 1.1547 applied to compensate for the different strengths of bipolar (I, II, III) and unipolar (aVR, aVL, aVF) leads. Method IV uses the six limb leads to calculate the CEA, this results in more varied electrical axes than Methods II and III. Method IV has more chance for error when determining the amplitudes of QRS vectors. Method IV can result in greater or smaller angles depending on the amplitudes of the other leads. Method IV is much more accurate when the amplitude of the leads can be auto-extracted using a computer program. Method III is the more practical when determining the amplitudes without computerized assistance especially in primary care. The present project is an example of the method of performing comparative evaluation of a few available approaches to determine parameters of interest for decision making in a biomedical engineering application. Further studies may involve attempts to quantify specifically defined parameters to facilitate comparative evaluation and decision making to meet the end users' needs. In conclusion,

Method IV provides the most accurate way to calculate the cardiac electrical axis because it uses all six limb leads, not just lead I and aVF, and is important in correct diagnosis thus being useful to clinicians. The outcome of the cardiac electrical axis determination can be combined with other cardiovascular test results in order to make comprehensive diagnosis of patient's cardiac conditions.

179

A System to improve Elevator Efficiency

Thomas Creighton, Patrick Hannon, Christopher Mitchell, Michael Webb and Salah Badjou, Wentworth Institute of Technology

Current elevators stop at requested floors on a first-come-first-serve basis. When an elevator is full, it still stops at floors requested from outside. This introduces wasteful delays and energy consumption. In the current project, an electromechanical system is developed that detects when the elevator is full, and as a result overrides the programmed commands from the elevator microprocessor so the elevator does not stop at floors requested from outside. This system will operate as a low-cost add-on system to current elevators that will speed up their operation and improve their overall efficiency. This project is developed in a three-credit Junior-level one-semester course of Electromechanical Design.

180

Design of a Cold Weather Car Heater

Eric Apple, Bret Creegan, Tyler Frasca, Ben Van Etta and Salah Badjou, Wentworth Institute of Technology

Cars are poorly thermally insulated. In cold weather, this leads to longer periods for heating the car interior. This creates more stress on the engine, more fuel consumption, and inconvenience to the driver. In this project, an electromechanical system is developed whereby the car is better insulated and an electrical heating system is designed to reduce the time required to reach a comfortable interior temperature. This system will operate as a low-cost add-on system to any car. This project is developed in a three-credit Junior-level one-semester course of Electromechanical Design.

181

Research Learning Community (RLC): A Novel Approach to Scholarship of Learning

Mir Atiqullah, Adeel Khalid, Beth Stutzmann, Donna Colebeck, Rajnish Singh and Wei Zhou,
Southern Polytechnic State University

Research Learning Community (RLC) is a collaborative entity among faculty members from various disciplines from all across the campus of Southern Polytechnic State University. It was structured under the auspices of Center for Teaching Excellence (CTE), a resource center for the faculty. The sole purpose of RLC has been learning how learning happens and what can be done to be more effective as instructors. Learning can be defined differently depending on the subject or objective of a course. Like students, the members of the RLC decided to do group study about learning which proved to be very intriguing and effective because of the diversity of fields and teaching experiences of the members. RLC members range from senior professor to freshman instructor. While much of the experiential inputs are originating from experienced faculty, the junior ones are contributing their view of contemporary younger students as well as a fresh perspective on teaching and learning. The RLC members share common values of excellence in teaching and dedicated to pursuing the Scholarship of Teaching and Learning (SoTL) for eventual benefit to the students. The RLC members bring their successes, failures, and new ideas, and share them, seek help and work together which constitute the research on learning. Some recent studies by the Community included modern phenomena such as online teaching, eText vs. Print text, and use of portable device such as iPad, Android tablets etc. in lectures. Some members have already tried effective teaching methods observed from fellow members and report noticeable improvement in learning. Some expressed their intention to use some of the effective teaching methods in their classes, especially online and hybrid classes. The

RLC process also inspired a faculty in writing a grant proposal with interdisciplinary collaboration. The synergy of the members while keeping focus on best practices seem to provide productivity and efficiency in research. The RLC outcomes are disseminated in the form of conference and journal publications for the benefit of others that are interested in the pedagogy of learning and interested in trying various potential methods that may enhance learning. This panel presentation is intended to make the audience aware of the structure of the RLC, mechanism of research and the experience of the group in achieving its goal of learning how learning happens. To work with faculty from completely unknown fields is learning by itself. The members of RLC also experienced unintended benefits from the group activity namely collegiality across multiple departments and schools within the institution as well as appreciation of other disciplines. The panel will also offer various ideas to the audience as to their suitability for study and will welcome participation in the discussions that may ensue.

182

Floor Sensor Module for a System to Detect Episodes of Falling

Andrew Tyler, Chelsey Small, Kayla Wright and Douglas Dow, Wentworth Institute of Technology

The risk of falling increases with old age due to impaired balance, sensory input and speed of response, and due to increased risk of stroke and heart attack. The risk of injury due to a fall also increases with age, at least in part due to increased frailty of bones. Many older individuals live alone. If they fall and need help, they themselves need to be the one to issue an alert for help. Due to the fall they may be unable to do this. The longer the delay before medical assistance arrives, the worse the prognosis for recovery. An example of an available system to enable fallen people to call for help is the Life Alert system. This consists of a necklace worn by the user and can be clicked when the individual cannot get up after falling. The system has helped many people. However, in certain situations the person cannot activate the system, such as becoming unconscious, forgetting to wear the device, or lacking of mobility to reach the device due to the nature of the fall. Another approach would be to have a system continually monitor the residence and detect cases of an episode of a fallen person who may need help. After detecting a potential case of a fallen person, the system could take steps toward calling for appropriate help. In this project we will design, build and test a module of a system to detect the pattern and distribution of a weight over a section of a floor using a grid of force sensors. Signals from the force sensors will be processed and routed to a computer for analysis. The floor will be subdivided into tiles that are each supported at the four corners. The tiles will be equipped with the force sensitive resistors (FSRs) that will measure the weight at each corner. Results of this project will help aid development towards a floor sensing system which could be installed into the residence of elderly people who live alone or in an assisted care facility. Such a system should increase the speed of help arriving following an episode of falling. This system should reduce the risk of an elderly individual who has fallen from not getting timely help due to loss of consciousness or inability to call for help.

184

Rehabilitative Feedback for Laminitis Prevention

Jocelyn Morelli, Edward Bockley, Heather Davis, Ashley Wolfrum, Ilie Talpasanu and Douglas Dow, Wentworth Institute of Technology

Laminitis, a life-threatening disease in which the soft tissue between a horse's bottommost foot bone and inner hoof wall deteriorates, can develop from exposure to a variety of conditions including carbohydrate overloads and uneven weight distributions in their limbs. The need for researched, practical solutions to this common affliction is significant. A feedback system design intends to use sensor-driven programming to monitor temperature and digital pulse fluctuations, both early indicators of laminitis in a rehabilitating horse, and activate Peltier cooling with thermoelectric modules to slow inflammation.

186

Bridging Boundaries: Digital Engagement and the Museum

Mark Nunes, Southern Polytechnic State University

This talk explores opportunities for collaboration between polytechnic institutions and cultural institutions such as art museums. In particular, it discusses an applied research project that aimed to deploy social media as a tool to engage young adults in cultural practices that have been traditionally reserved for a limited few. Starting in August 2012, students at Southern Polytechnic State University began collaborating with the High Museum of Art in Atlanta on a project called Choices and Voices, which aimed to engage twenty-something museum-goers-or more precisely potential museum-goers -- in a more engaging and participatory museum experience. Students developed a project they entitled HighWithoutWalls, which made use of a mobile phone application that would allow any individual to share with a community of user's art that they encountered in their everyday lives-be that graffiti, art, found art, or readymades-and then like the contributions of other participants as well. The result of this collaboration -- a "leader board" of best liked discoveries -- was a crowdsource-curated show that the High displayed as projected images within the museum. While simple in principle and design, crowd-sourced curation is profoundly disruptive to a number of still-unchallenged beliefs about the role of museums within contemporary culture. In effect, such a challenge undermines the ongoing assumption by museum professionals that museums are sanctuaries charged with preserving the last vestiges of aura in an age of digital reproduction. At the same time, it taps into a growing range of "content creation" functions that have become a common element in social media practices. Projects such as HighWithoutWalls invite outsiders into the art world -- not only by including previously excluded or ignored work, but by ceding judgment and opinion to a powerful, and previously excluded voice: the voice of the crowd.

187

Student's Role in Breaking Boundaries: Student Projects

Jia Lee and Paloma Valverde, Wentworth Institute of Technology

Fluorescence is the ability of a molecule or substance to absorb and emit light. Not every molecule is fluorescent. A common characteristic of fluorescent molecules is the ability to absorb light of a certain wavelength then emit the light at a longer wave length. The electrons within the fluorescent molecule become excited by the light and move up in energy levels. However these increased energy levels are not stable, thus the electrons lose energy and return back to the original energy level. The lost or emitted energy is in the form of light waves. Since the light has less energy than the light absorbed, the wavelength of the emitted light will be longer than the original. ,Fluorescent proteins are naturally synthesized in animals. The jellyfish Aequorea victoria produces GFP. It is interesting to know how the protein actually works within the jellyfish. There is a protein within Aequorea victoria called Aequorin. When Aequorin binds to calcium ions, a blue light is emitted. This blue light is then captured by the GFP; a subsequent green light is then emitted. Jellyfish use this natural fluorescence also called bioluminescence to attract prey to their tentacles. For Biological research and testing fluorescent proteins are used for detecting, tracing, and studying certain molecules of interest. Green Fluorescent Protein (GFP) is one example of a fluorescent protein. GFP has many applications in biology. Say a researcher is interested in the mechanism of Insulin metabolism; he or she would attach the GFP gene to the end of the gene that codes for Insulin. The cell or bacteria will now produce a fluorescent version of Insulin. The researcher can see and study how the Insulin affects a cell because the fluorescence can be seen and measured using specific devices such as a Flurometer or Confocal Microscope. GFP and other fluorescent proteins can become embedded and combined within the genes of any cell. Fluorescent molecules are also attached to certain dyes. Dye can be used to stain certain areas of cells and can also be used in electrophoresis. The transformation of a gene and the purification of that protein is one of the student projects done at Wentworth Institute of Technology. The Transformation of a cell's DNA is the first step in the process of the GFP transformation. In this experiment, a bacteria cell's DNA is transformed

to express GFP. In order to unwind the DNA double helix, the DNA must be cut with restriction enzymes. These enzymes cut DNA according to a specified sequence of base pairs. The ability of restriction enzymes to cut specific sequences is one of the keystones of the transformation process. After the DNA is cut at the specified location the reaction is heated up so the two strands separate. Once the target area of the DNA is free, the GFP gene is inserted into the DNA. Now the DNA will express GFP along with the original gene expressions of cell. The Purification of the GFP will result in a solution that glows green under a UV-light. This step is done by using lipophilic matrix. GFP and other molecules will bind to the matrix. Certain solutions also called washes will be used to detach the undesired molecules. Finally the wash for GFP will be used, thus the purification process is complete. Fluorescence is an important tool in a biomedical engineering because it has such a wide range of uses. Biomedical engineering is the combination of many different subject areas. Fluorescent molecules can be used to solve problems in medicine and science because it allows for the user to have a visual representation of they are seeking to study.

188

Student response systems and student engagement.

Ted Greene, Wentworth Institute of Technology; Cristy Maldonado, Tufts University

Recent studies have shown that the use of Student Response Systems (aka "clickers") can encourage active learning and student engagement in the higher education classroom. This presentation offers implementation scenarios and strategies for faculty use of the clicker in both hybrid and online courses along with recommendations for question formulation. Through a description and example of how student responses can be used in various scenarios, a working knowledge of the approach and usefulness of the outcome will be highlighted.

189

LokT - Lock/Unlock Doors Without Keys

Sam Houtchens, Wentworth Institute of Technology

In today's fast-paced world where there is a constant need for the "bigger and better," we sometimes can forget that true ingenuity can come from the smallest of places. Our design began as a simple solution to a simple problem: "How can we lock and unlock our doors without the need for keys?" but through creativity and persistence we were able to create a product that can truly make life just a little easier for the world as a whole. The product name is Lokt, and the way it works is actually quite simple. There is a motor attached to the deadbolt you wish to have wireless control over and you also download our app to any android device. From there anytime that you click "unlock" or "lock" on the appropriate app, it will send a wireless signal to an ardunio motherboard that is attached to the motor and it will complete the respective action that you desire. The ardunio has its own server, so not only will it send the signal instantly; but you also don't have to deal with any 3rd party programs that might interfere with the signal. Overall, while this project might not be the technological advance of the decade; at least it might cut a few minutes off of our daily commute, and if the entire universe was created in less than a second, every second we save could be vital.

190

Value of Immersive International Experience: A Co-op in Costa Rica

Samantha Barrett, Wentworth Institute of Technology

Engineering students in the United States often lack knowledge, experience, and appreciation of the values in other cultures that restrict and inform the engineering solutions to different problems. In an increasingly interconnected world, engineering challenges demand more multicultural awareness from those involved. It can be difficult to fully appreciate the values of another culture without being fully immersed within that culture for an extended period of time. There is no amount of television or reading that can convey the subtle nuances of the day to day life in another country. This lifestyle is an exact product of the values of that culture. Because of

the multicultural challenges around the world, engineers, especially of the United States, often times work calls for problem solving throughout the world. It is very important that not only are the problems solved but that the solutions also preserve the values of those affected by the products or processes implemented. The problems faced with the engineers now become much more difficult because the quickest and most cost efficient solutions do not always meet the standards or values of those in that culture. Living in Costa Rica for three months gave me the chance to experience and understand some of the effects of cultural values on day to day life. I was provided a family to live with and of course expected to adjust to their lifestyle. Showers lasted not much longer than five minutes to conserve water. However, rarely did you want to spend longer than this because the water was ice cold. Food was never left to go to waste and trimmings were separated from the trash for compost. Every house had a barrel for trash as well as separate barrels for plastic, aluminum and glass to be recycled. Most families chose to walk or ride bicycles instead of driving. Monday through Friday I walked to work which was at a sustainable farm. The majority of the work was done by hand, with minimal machine work and less waste. My jobs consisted in maintaining the rain forest nearby, having knowledge about and up keeping of all the plants on the farm, organizing documents and files about the plants, and finding ways to grow and expand the farm. I was always invited into their meetings and strongly encouraged to give my ideas on the business. At the beginning of my stay I would try to input my ideas but they were never feasible given the available resources and values of Costa Rica. However, I understood how to meet their needs and could give valuable input. My co-op experience changed the way I believe biomedical engineering challenges should be approached to form solutions. Envisioned solutions are often shaped by one's perspective, and may lack qualities preventing it to be the very best solution possible. The different solutions of biomedical engineering depends heavily on the group of people that product or process affects. In order to appreciate the values and needs of a particular group it is important to really interact with the people in that group. With a more appreciative understanding of the different needs and qualities of groups, within our culture and abroad, the greatest solutions possible can be developed.

191

Clinical Utility of Ventilatory Quantities: Guidelines for the Non-Specialist Clinician

Robert Moran, Wentworth Institute of Technology

The complex and rapidly changing environment of emergency and intensive care requires support from Intensivists of various specialties as well as many different ancillary direct care-givers. One of the most crucial components is the measurement and interpretation of certain blood and physiologic quantities that are needed for patient assessment in many critical and chronic situations-from lung injury/disease to heart attack. Summarized as "Ventilatory Quantities," they include Arterial Blood Gases-especially carbon dioxide and acid-base, as well as physiologic quantities such as lung volume and flow measurements. In each category there are multiple analytes, each having its own and inter-related normal and acute values-but just as important are the physiologic implications of each. While established in the physiologic literature, some groups of these measurements may not be familiar outside the specialty field. It is not uncommon for the non-specialist physician to see and be required to treat patients with lung dysfunction due to either trauma or acute complications of patients with underlying chronic disease. This is typically the case in smaller, remote clinical units, or when major events involving mass casualties occur, such the West, TX fertilizer plant explosion where explosive forces caused pulmonary and other barotrauma, and non-specialist physicians and others had to treat at or near the incident, prior to evacuation to higher level care facilities. To serve as an aid for both diagnosis and treatment, we developed/edited from the literature, a series of charts identifying the various quantities/parameters relevant to Ventilation and Perfusion and the diagnostic and therapeutic implications of each.

192

Clinical Utility of Critical Analytes: Interpretive Guidelines for the Non-Specialist Clinicians

Robert Moran, Wentworth Institute of Technology; Nancy Gunther-Orsatti, Siemens Company

The complex and rapidly changing environment of emergency and intensive care requires support from Intensivists of various specialties as well as many different ancillary direct care-givers. One of the most crucial components is the provision of certain blood measurements that are needed for patient assessment in nearly all critical situations-from blood loss to lung injury/disease to heart attack. Summarized as Arterial Blood Gases, Electrolytes, and Hemoglobin-Oxygenation quantities, in each category there are multiple analytes, each having its own and inter-related normal and acute values. Even among intensivists, some groups of these measurements may not be familiar. When major events involving mass casualties occur, such as the Marathon Bombing or the West, TX fertilizer plant explosion, non-specialist physicians and others may be called in to provide medical care. To serve as an aid for both diagnosis and treatment, we developed/edited from the literature, a series of charts identifying the various quantities/parameters in each category noted; their typical analytical and clinical limits, and the diagnostic and therapeutic implications of each. Using these charts, posted in Emergency Departments and Intensive Care areas, the non-specialist physician, as well as specialists working outside their field and ancillary technical personnel will have a well documented tool to aid assessment of patients in those acute environments. These charts are currently being distributed by Siemens Healthcare Diagnostics, but the information contained in them is available and reliable for all.

193

Good Design Is Good Citizenship II: From Social Engagement to Scholarly Engagement

Zvi Szafran, Rich Halstead-Nussloch and Bill Carpenter, Southern Polytechnic State University

In our 2012 Polytechnic Summit presentation, we introduced a pedagogical model that demonstrated that good design is good citizenship. We illustrated this model with observations showing how students can engage with each other and citizenship through design. Over the past year, we have expanded on this approach based on design education, which is a primary component across our polytechnic curricula. Our main goal has been to move our focus from social engagement to scholarly engagement. The proposed session is innovative in its research and modeling of the relationship between design and citizenship education. It aligns with our polytechnic vision in that our students will need keen design skills to build the bridges, solve the problems and to actively and positively contribute to their communities. Our presentation will illustrate this innovation in architecture, bringing in Gropius' scholarly foundations from the Bauhaus; distance education, bringing in research and development on learning dynamics based on community norms; and shared governance, bringing in principles of cross-discipline methodology. In this presentation we will: 1) Share our polytechnic, cross-discipline model, based on solid design education. 2) Illustrate how design education supports both good citizenship and scholarship. 3) Engage the audience with polls and thought-provoking questions. 4) Provide recommendations and suggestions for adaption at your campus with Q,A.

194

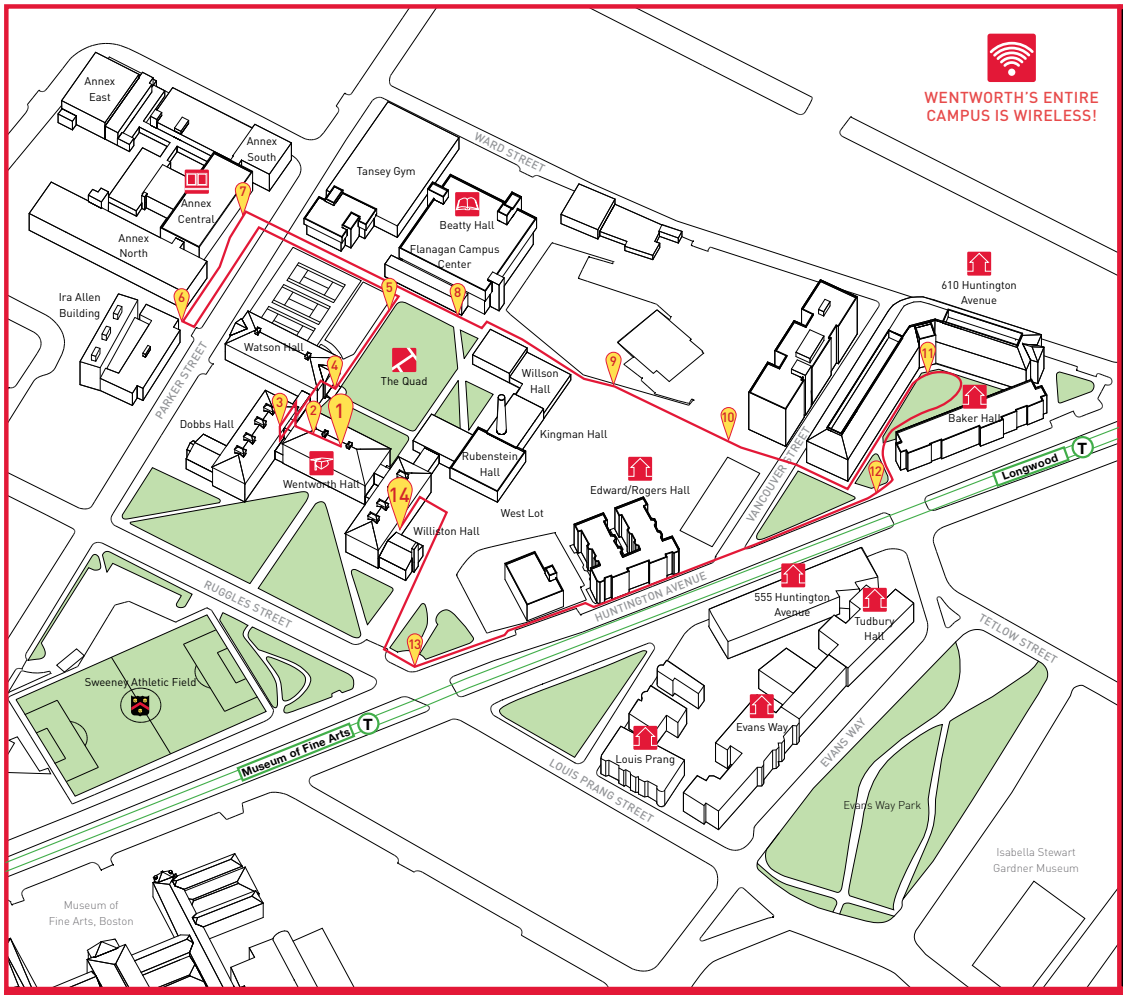
A Mathematicians Perspective on Teaching Linear Algebra and Differential Equations to Biomedical Engineering Students

John Haga, Wentworth Institute of Technology

Due to its interdisciplinary nature, the field of biomedical engineering requires knowledge of a wide variety of scientific, engineering and mathematical principles. In particular, students should be comfortable modeling using linear algebra and differential equations. Traditional differential equations courses offer examples extracted from population biology, mechanical engineering, physics and chemistry; however because of the recent development of the biomedical engineering discipline many math courses lack examples relevant to this particular field. In this short talk we will examine a few examples of accesible problems which can be implemented in linear algebra and/or differential equations courses geared specifically for biomedical engineering students.

WENTWORTH INSTITUTE OF TECHNOLOGY

CAMPUS GUIDE AND MAP



The Career Services Center provides support to students during the cooperative education (co-op) process as well as during job searches. Co-op is an important feature of the Wentworth curriculum and has been part of the educational model for more than 30 years. Wentworth students are required to complete two semesters of co-op prior to graduation.

The Flanagan Campus Center is the hub of student life at Wentworth. The campus center is home to the bookstore, the cafeteria, the Schumann Fitness Center, the Intercultural Center, Wentworth Internet Radio Experience (W.I.R.E.), a recreation room, study areas, and the Office of Campus Life.

The upper floors of Beatty Hall house the Alumni Library (second floor), the Division of Technology Services (third floor), and the Learning Center (fourth floor).

The quad is the center of Wentworth's 31-acre campus. Many events are held here, including graduation, various club events, and our Welcome Back BBQ.

Annex Central contains Blount Auditorium and the Casella Gallery. Blount serves as a classroom and presentation space for guest speakers. The gallery exhibits regional artists and student displays. The lower level of Annex Central is home to the construction management and civil engineering labs. Annex North contains architecture studios. Annex South houses the industrial design, interior design, and facility planning studios.

Currently 75 percent of new students live in campus residence halls. Residents enjoy the use of high-speed and wireless Internet, cable TV, laundry machines, vending machines, and exercise equipment. Residents also have access to study rooms, performance space, lounges, and recreation rooms equipped with pool and air hockey tables.

SELF-GUIDED CAMPUS TOUR

1 Start the tour by exiting the Admissions Office (Wentworth Hall). Turn to your left to see the entrance of the Student Service Center (Williston Hall). The center houses the Financial Aid Office, Bursar's Office, and Registrar's Office. Turn to the right and walk down the hall to see the Career Services Center (Wentworth Hall).

2 Proceed up the stairs across from the Career Services Center to the second floor of Wentworth Hall and visit a typical classroom (Wentworth Hall).

3 Continue down the hall to your right and look out the window. Immediately across the street you will see Sweeney Field, home to Wentworth Athletics. Beyond that you will see the Museum of Fine Arts and the skyline of Boston. Further down the hall you will find the Electrical Technology Lab (Dobbs Hall), a space used by engineering students.

4 Return to the first floor and continue down the hallway through Watson Hall and exit into Wentworth's quad.

5 Walk across the quad toward the Flanagan Campus Center and along the path leading to the tennis courts. On your right, the Nelson Recreation Center houses the Tansey Gymnasium, the main basketball court, and offices for the athletics program.

6 Continue down the pathway and cross Parker Street to the Ira Allen Building. Ira Allen houses the Center for Sciences and Biomedical Engineering, as well as state-of-the-art laboratories and classrooms for the College of Arts and Sciences.

7 To the right of Ira Allen is the Annex, a complex of three buildings for Wentworth's design programs and studios. Design students have dedicated studio space beginning in their second year.

8 Return to the quad. Enter the Flanagan Campus Center, which includes study, recreation, and activity spaces for students. Wentworth's dining hall, Beatty Cafeteria, is upstairs.

9 Exit to the quad and proceed along the walkway to the left. You will pass one of Wentworth's many Blue Light Phones. These phones offer a direct connection with the public safety department.

10 Continuing along the walkway, you will pass the C-Store, a convenience store shared with the other schools in the Colleges of the Fenway. Further down the path is one of the many campus residence halls, 610 Huntington Avenue.

11 The Office of Public Safety is housed on the first floor of 610 Huntington Avenue. As you walk around the corner of the building you will find the Kosta and Maria Papoulidis Quadrangle. The other residence hall on this quad is Baker Hall, a facility dedicated to first-year students.

12 Return to the pathway near the leopard statue and look across Huntington Avenue to the residence hall, 555 Huntington Avenue. This building contains the Center for Community and Learning Partnerships. Located behind 555 Huntington Avenue, Evans Way and Tudbury Halls house first-year students. They face Evans Way Park and the Isabella Stewart Gardner Museum.

13 Walk to your right, you will see the MBTA's Green Line (known as the "T") running along Huntington Avenue. Nearby transit stops on the Green and Orange Line connect Wentworth easily to other areas of Boston. As you continue down the street you will pass Edwards Hall and Rodgers Hall. Proceed to the corner of Huntington and Ruggles Street. You will see Sweeney Field on the other side of Ruggles Street. The main entrance to Wentworth's campus will be on your right.

14 Walk through the West Lot and enter the ground floor of Williston Hall to see the Manufacturing Center. This innovative facility serves as an applications lab for engineering students.

WIT.EDU

POLYTECHNIC SUMMIT 2013

facebook.com/PolytechnicSummit

#polysummit

Planning Committee Members

Jane Allen
Karen Britton (co-chair)
Amanda Hattaway
Chuck Hotchkiss (co-chair)
Robert Lind
Karmon Runquist
Robert Yee

Program Committee & Abstract Reviewers

Salah Badjou
Ron Bernier
Douglas Dow
Anthony Duva
Haifa El-Sadi
Pat Hafford
Amanda Hattaway
Tim Johnson
Todd Johnson
Xiaobin Le
Robert Lind
Gloria Ma
Michael Macphail
James McCusker
James O'Brien
Masoud Olia
Greg Sirokman
Durga Suresh
Charlie Wiseman
Emma Smith Zbarsky

Thanks very much to the Wentworth Physical Plant staff, Chartwells staff,
and the many other volunteers who made the 5th Annual Polytechnic Summit possible!