1. Change Team for Diversity, Equity, and Inclusion

Scott Ashford, Kearney Professor and Dean
Goal 1 in our strategic plan is to become a model of an inclusive and collaborative community

• **Disrupted faculty hiring process for diversity**
  • Last three years over half new hires women and minorities

• **Added Associate Dean for Faculty Advancement**
  • Primarily to guide recruitment and P&T process
  • Unexpected benefit as resource for faculty in need

• **Established the “Change Team” in Fall 2016**
  • 25 faculty and staff across the college
  • Did not turn out as expected
Change Team for College of Engineering as envisioned

- A cohort of 25 change leaders
  - Original charge to become empowered to co-facilitate two 2-hour seminars on inclusivity and equity in engineering
  - Hired a consultant to help train and develop materials
  - Found we could do it ourselves, let consultant go

- Change Team revised original charge
  - Achieve foundational, working understanding of diversity, equity, inclusion, and social justice among majority of College of Engineering faculty and staff
Change Team for today

• Proceeding with one seminar
  • Necessary, but not sufficient
• Establishing Professional Learning Communities
• Commissioning a “DEI Committee” in each school
  • Pre-recruitment of faculty
  • Facilitate change of Position Descriptions for staff to empower them to participate in community building
• Establish sounding board for Associate Dean
• Delivery of session at new faculty boot camp
• Expand disruption of hiring practices to staff
See me at tonight's reception (drinks are on Oregon State) 
Email me at scott.ashford@oregonstate.edu
2. Redesigning the UG curriculum for HKU Engineering

Professor Norman Tien
Dean of Engineering
The University of Hong Kong
What kind of HKU Engineering student do we want?
Redesigned UG Curriculum

A structure built on a solid core with flexibility of individual study plans
Build a HKU Engineering Student

Your ideal first year Engineering student should possess?

What goes into the brain?
Knowledge subjects...etc.

What do the hands learn?
Design, project work, experiential learning, soft skills...etc.

What goes on the tool belt?
Language, programming, MatLab, soft skills...etc.
Existing First Year’s Courses (6)

- Maths IA
- Maths IB
- Physics
- Programming

Plus TWO of these (General Engineering Intro courses):
- CIV
- CS
- EEE
- IMSE
- ME
- MedE
- Life Sciences

New First Year’s Courses (7)

- Maths I
- Maths II
- Engg I
- Engg II
- Engg III
- Engg IV
- Programming

AND...

- Designing complex systems
- Thermodynamics
- Social responsibility
- Materials science
- Artificial Intelligence

HKU Faculty of Engineering
“It is easier to change the course of history than it is to change a history course”

Change Leadership in Higher Education:
A Practical Guide to Academic Transformation - Jeffrey L. Buller
3. STEM Learning Ecosystems

Gregory Washington, PhD
Stacey Nicholas Dean of Engineering
The Henry Samueli School of Engineering
Professor, Mechanical and Aerospace Engineering
Women have seen no improvement in STEM since 2001

Women remain as scarce as ever in engineering, computing, and advanced manufacturing.

<table>
<thead>
<tr>
<th>Women as a percentage of the:</th>
<th>2001</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Workforce</td>
<td>13%</td>
<td>12%</td>
</tr>
<tr>
<td>Computing Workforce</td>
<td>27%</td>
<td>26%</td>
</tr>
<tr>
<td>Advanced Manufacturing Workforce</td>
<td>10%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Source: Change the Equation, “The Diversity Dilemma,” 2015
Employment Challenge...

Skills Gap Challenge...
Institutes of Higher Education

Business Community

Learner Centric

STEM-Rich Institutions

Formal PK-12 Education

Family

Out-of-School Programs

Source: Ellen Lettvin, US Department of Education
STEM Funders Network Membership History
OC STEM Partnership

- The most comprehensive Non Government movement to improve PBL STEM Education in the Country
- Moving to UCI over the next two months
- Will strengthen our ability to implement and expand STEM education initiatives
- Puts UCI in the center of the National discussion on STEM Education

Leyla Riley
Director of Academic Innovation
STEM Learning Ecosystems for 2016
37 Communities...and Counting
4. Women in Engineering, Mathematics and Science Program
University of Wisconsin-Platteville

Molly Gribb, PhD, PE, Fellow ASCE
Dean, College of Engineering, Mathematics and Science (EMS)
gribbm@uwplatt.edu
UW-P is an access institution

- 7,793 students at UW-P; 65% men
- Nearly ½ enrolled in the College of EMS; now 15% women
- New freshmen:
  - 78% WI residents
  - 41% First generation
  - 26% Pell eligible
- 7 ABET accredited programs
- Math, chemistry, broad field science, and sustainable & renewable energy systems
- 21% of all BS engineering degrees awarded in WI (2015-16)
2016 ABET Claire L. Felbinger Award for Diversity Recipient

https://vimeo.com/189794716
How can we attract more women, underrepresented students?

Molly Gribb
Dean, College of Engineering, Mathematics and Science
UW-Platteville
1 University Plaza
Platteville, WI 53818
gribbm@uwplatt.edu
5. Global Engineering Field School at the Cradle of Humankind

A partnership between the Turkana Basin Institute & The College of Engineering & Applied Sciences at Stony Brook University

Fotis Sotiropoulos
Dean, College of Engineering & Applied Sciences
Stony Brook University
Fotis.sotiropoulos@stonybrook.edu
@CEASdeanSBU
Lake Turkana, Kenya: The Cradle of Humankind

The Turkana Basin Institute
Ileret, Kenya
Turkana Basin Institute: A test-bed for engineering innovation for off-grid environments

- Hydroponic gardening
- Reverse osmosis system
- Wind energy
- Solar powered ground water pumping station
- Rain water capture & storage
- Experimental water purification systems
A unique opportunity for students to experience & understand the survival challenges of local people
2017 CEAS/TBI Global Engineering Field School

- Students to spend 6 weeks in rural Kenya having a unique socio-cultural experience

- Take 2 3-credit courses at TBI facilities:
  - Engineering challenges in the developing world
  - Socio-Culturally Constrained Engineering Design Innovation

- Work on projects in the field seeking to improve the lives of local people

- Develop ideas to pursue in their senior year Capstone Project
  
  **The Energy/Food/Water Nexus**

- **Social entrepreneurship**: Best ideas selected for seed funding
Capstone project example: Low Maintenance, Mobile Vegetable Cooler for Off-Grid Market Applications

32% of product is lost due to waste in hot conditions.

No infrastructure or grid power for standard refrigeration.

- Combined Thermoelectric and Evaporative Cooling
- Solar Powered
- Low maintenance
- Mobile

“Cool-Tool” in transport mode

Photo credit: Jared Nyataya/Nation Media Kenya
For more information:

Fotis Sotiropoulos
fotis.sotiropoulos@stonybrook.edu
@CEASdeanSBU

www.ceas.stonybrook.edu
www.turkanabasin.org

We are seeking to partner with engineering colleges to expand the program in coming years.
6. 4-min idea: The Voice-Activated College
The Voice Activated College

Utilizing Amazon Alexa by building a Skill to create a natural language interface to the college. . .

A simple and expandable connection to College Engineering using a burgeoning home (and office) oriented voice-only technology.
### Exhibit 32: Total Echo+Alexa Family Devices and Transactions - $11b By 2020

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Echo Family Device</td>
<td>$24</td>
<td>$384</td>
<td>$1,058</td>
<td>$1,345</td>
<td>$2,033</td>
<td>$3,019</td>
<td>$4,056</td>
</tr>
<tr>
<td>Revenue ($m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transaction Revenue</td>
<td>$0</td>
<td>$0</td>
<td>$279</td>
<td>$877</td>
<td>$2,117</td>
<td>$3,596</td>
<td>$7,076</td>
</tr>
<tr>
<td>Revenue ($m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Echo Revenue</td>
<td>$24</td>
<td>$384</td>
<td>$1,336</td>
<td>$2,222</td>
<td>$4,150</td>
<td>$6,615</td>
<td>$11,132</td>
</tr>
<tr>
<td>Revenue ($m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: MSUSA

---

### Voice-First Device Footprint

<table>
<thead>
<tr>
<th>Year</th>
<th>Millions of Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
</tr>
</tbody>
</table>

VoiceLabs Analysis combined with research from CIRP, KPCB and InfoScout
David Ferro
dferro@weber.edu

Ahmed Bouzid
Co-founder & President
The Ubiquitous Voice Society
January 20, 2017

ahmed.bouzid@gmail.com
7. All in the Family?
Mentors in Engineering 101

Bob Kolvoord
Dean, College of Integrated Science and Engineering
Motivation

Reimagined 1st year experience in order to:

a) equip students for success in both the classroom and the engineering profession

b) facilitate retention of engineering students, especially of underrepresented groups.
The course content focuses on:

a) Human Centered Design & Design Thinking - a problem solving approach that enables students to tackle design challenges in teams.

b) Systems Thinking - Helping students understand the world as interconnected systems.

c) Professionalism and Ethics - Helping students understand the role of the engineer in our department and our profession.
Learning Communities

To facilitate the creation of communities within the first year students, the class is divided into “family” teams of approximately 10 students. Each of these teams is lead by two upperclass leaders who serve as mentors for the group.
Assessment

• Formal and Informal assessments (both qualitative and quantitative)

• Largely positive impacts on Freshman (motivation/growth mindset, self-efficacy, identity as an engineer, community)

• Uniformly positive impacts on Mentors (laboratory for leadership)
Summary Details

Structure
~130 students
~12 “families”
~24 ENGR Leaders

Monday’s: Classroom learning

Wednesday’s: Breakouts in “families”

Learning Activities
Design Challenges, Presentations, & Critiques
Reflective Essays
Reading Quizzes
Canvas Discussion
Small Group Discussions
E-Portfolio’s
Video presentations

Objectives
Connecting to our Community (Exposure)
Opportunities (Access)
Professionalism
The brainpower for this effort comes from JMU Engineering Faculty: Kyle Gipson, Justin Henriques & Callie Johnson Miller

Gipson et al. (2015) – ASEE Conference Paper (Paper ID #11580)

For more information, please contact me
kolvoora@jmu.edu
INNOVATION PALOOZA

An annual celebration of innovation sponsored by CIT

- Companies demonstrate emerging technologies
- Researchers show new technologies
- Lightning talk from industry innovators and thinkers
- Connection of technology to the arts
- Impact-a-thon
IMPACT-A-THON

- A “hack-a-thon” for social problems
- Teams have 5 days to innovate a solution to a hard social problem
  - Temporary shelters for the homeless in winter
  - Playground access for kids with disabilities
IMPACT-A-THON
(CONTINUED)

• Teams are judged based on:
  – Understanding of problem
  – Solution concept
  – Demonstration of solution
  – Quality of prototype
  – Clever use of technology

• Judged by academics, relevant social organizations, industry

• Top prize of $1000 and pride of winning motivate dozens of teams to participate
INNOVATION
EDUCATION INITIATIVES
ACROSS THE COLLEGE

Integrated Innovation Institute

- Graduate education in integrated product, service and software innovation and management

MS in Technology Ventures

- Bi-coastal (dual option) that explores world class technology and innovation and Silicon Valley entrepreneurship education and ecosystem

Engineering and Technology Innovation Management

- MS degree in technology R&D innovation management

Swartz Center for Entrepreneurship

- New integration of entrepreneurship education, programming, and acceleration across CMU

Innovation Palooza...
10. Freshman Engineering Honors Experience

John R. English, PhD, PE
Dean and Irma F. and Raymond F. Giffels Endowed Chair in Engineering

jre@uark.edu
Freshman Engineering Honors Experience

John R. English, PhD, PE
Dean and Irma F. and Raymond F. Giffels Endowed Chair in Engineering

jre@uark.edu
In 2007, we implemented the Freshman Engineering Program (FEP), a common first-year experience for engineering students.

FEP Academic Program
- Engineering Problem-Solving Skills
- Informed Choice of Major
- Professional Development

FEP Student Services Program
- Orientation and Academic Advising
- Peer Mentoring
- Academic Assistance

part of the Introduction to Engineering course sequence taught by FEP
For 9 years, FEP students in our Honors College with advanced placement in mathematics have had the option to participate in a first-year research experience.

The experience begins with a seminar series featuring a variety of faculty research in the College of Engineering.

Students then spend about six months working in teams of two on a research project mentored by a College of Engineering faculty member.

The experience includes all the content of the regular Introduction to Engineering course sequence.

In addition to the research, we emphasize written and oral communication, as well as the use of library research resources.
The experience culminates in mid-April with the annual, Honors Engineering Symposium.
This year, we are piloting a first-year innovation experience for the same population of students.

The experience begins with a seminar series featuring a variety of experts in innovation, invention, and entrepreneurship.

Students then spend about six months working in teams of three or four on an innovation project mentored by a College of Engineering faculty member.

We typically have about 60 students in the research experience, and our innovation pilot includes 15 students. Our long-term goal is 40-40.
11. Developing an Entrepreneurial Mindset through Integrated E-Learning Modules

Ron Harichandran, Dean
rharichandran@newhaven.edu
Framework

• Flipped classroom model

Deliver content via short Online Module

Engage students through (Blackboard) Discussion

Assess through Project & Final Exam Question

Integrate e-Learning Module

Reinforce learning through a Class Project
<table>
<thead>
<tr>
<th>Universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Clara</td>
</tr>
<tr>
<td>Embry Riddle</td>
</tr>
<tr>
<td>Ohio Northern</td>
</tr>
<tr>
<td>U. Alabama, Birmingham</td>
</tr>
<tr>
<td>Wichita State</td>
</tr>
<tr>
<td>Tulane</td>
</tr>
<tr>
<td>Lawrence Tech</td>
</tr>
<tr>
<td>Penn State</td>
</tr>
<tr>
<td>Manhattan College</td>
</tr>
<tr>
<td>Michigan Tech</td>
</tr>
<tr>
<td>Cal State, Chico</td>
</tr>
<tr>
<td>Western New England</td>
</tr>
<tr>
<td>Villanova</td>
</tr>
<tr>
<td>James Madison</td>
</tr>
<tr>
<td>Marquette</td>
</tr>
<tr>
<td>U. of the Pacific</td>
</tr>
<tr>
<td>U. Connecticut</td>
</tr>
<tr>
<td>U. Cincinnati</td>
</tr>
<tr>
<td>San Francisco State</td>
</tr>
<tr>
<td>U. Virginia</td>
</tr>
<tr>
<td>Clarkson</td>
</tr>
<tr>
<td>Lafayette College</td>
</tr>
<tr>
<td>U. Of Dayton</td>
</tr>
<tr>
<td>U. of the Pacific</td>
</tr>
<tr>
<td>U. Connecticut</td>
</tr>
<tr>
<td>U. Cincinnati</td>
</tr>
<tr>
<td>San Francisco State</td>
</tr>
<tr>
<td>U. Virginia</td>
</tr>
<tr>
<td>Clarkson</td>
</tr>
<tr>
<td>Lafayette College</td>
</tr>
<tr>
<td>U. Of Dayton</td>
</tr>
</tbody>
</table>
THANK YOU!

CONTACT US
KEEN@newhaven.edu
www.newhaven.edu/KEEN
Jianmin Qu

12. School of Engineering
Tufts University
Medford, MA 02155
Phone: 617-627-3237
E-Mail: Jianmin.Qu@Tufts.edu
Bridge to Engineering Success at Tufts
Program Model

- Six week bridge program during the summer before freshman year begins.
- Obtain college credits for Physics & Calculus I.
- Beyond the first summer, cohort model scaffolds 4 year experience.

Student Profile

- Low income, first generation
- Rank top 5% in high school
Scaffolding Success

1st yr
Academic & Social Integration

2nd yr
Major/Degree Focus

3rd yr
Honing Career Goals

4th yr
Secure Job or Grad School
Example Programming (4th yr)

Fall Semester

Tufts University
Center for STEM Diversity Resume Book
Fall 2015

Spring Semester

ADULTING 101: FINANCIAL LITERACY
MONDAY, MARCH 28
12 PM, NELSON AUDITORIUM

ADULTING 102: ANALYZING YOUR BENEFITS
WEDNESDAY, APRIL 6TH
12 PM, NELSON AUDITORIUM

Life after College
Want to know more?

Please visit

www.stemdiversity.tufts.edu
13. Synthesizing Maker Spaces with Corporate Partnership to Transform Undergraduate Interdisciplinary Design Education
Kenneth Lutchen, Dean (klutch@bu.edu)

- In 2015 Boston University Opened a new 15,000 sq. ft. Engineering Product Innovation Center (EPIC), a large maker space combined with design and collaboration studios.
- EPIC is Directed by Prof. of Practice, Gerry Fine, former CEO of Schott, Inc and Executive-VP for Product Development, Corning, Inc.
- EPIC Engages a set of key industry partners at the forefront of advanced product design and manufacturing innovation.
- EPIC & Industry used to transform engineering curriculum and to catalyze and sustain a new culture of design/creation/innovation for all of BU
  - new required courses for all engineering students in students
  - expose students to the technical, innovation and design skills they feel are needed in the modern day workforce
  - Innovation / Creative Space for students from all majors at BU to “play” and prototype during non-class times
Facility Includes:
- Computer Aided Design
- 3-D Printing
- Robotics
- Laser Processing
- Materials Characterization
- Supply chain management
- CNC, etc

A Unique 15,000 sq. ft. Hands-On Maker-Space Facility To **Educate All** Engineers On Product Design-to-Deployment-to-Sustainability
The Impact of the EPIC Industrial Advisory Board

Help Grow Physical Infrastructure:
• Donations of equipment (eg. lathes, specialized 3D printers, Introns, etc)
• Guiding & advising on purchases (eg., advanced collaborative robots)
• Providing engineering resources for equipment installation.

Sponsorship of Special “Design/Professional” Events:
• Nine day design challenges.
• Panel discussions with both undergraduate and graduate students.
• Leadership training sessions.

Active Engagement in Student Projects (from sophomores to masters).

Actively Advised & Engaged re Curriculum Enhancements:
• New Masters in “Product Design and Manufacture.”
• Modification of our Undergraduate Design Course Sequences.
• Introduction of a New Required Sophomore Course: “Introduction to Engineering Design.”
“Introduction to Engineering Design”

~250 Students Each Semester, utilizing:
• 4 Faculty (2 sections each)
• 2 Teaching Engineers (4 sections each)
• 8 Undergrad Assistants (1 section each)

Focus of the Class is:
• Interdisciplinary Teamwork
• Reverse Engineering & Building Prototypes
• Rudimentary Engineering Design
• Oral and Written Communications
• Flipped Classroom Pedagogy

Projects have included:
• Mechanical Testers (w/ P&G)
• Hazardous Material Detectors
• Tape Dispensers for the Cognitively Disabled (w/ Perkins School)
• Low-Cost Baby Incubators
• MEMS Test Chambers
• IOT Pill Dispensers (w/ Intel)

Feedback has been excellent from both faculty and students.
An **EPIC** Way to Connect Engineering Education to Design and Industry

- The Lorraine A. Tegan Design Studio
- Hardware and software for computer-assisted design,
- Rapid 3-D prototyping and additive manufacturing tools
- Machine shop, featuring multi-axis CNC machines, mills, lathes, etc
- Electronics design and fabrication: PCB fabrication, surface mount soldering.
- An automated, robotic manufacturing line
- A materials characterization laboratory
- Robotics and “autonomous” systems research & design facility
- A metals foundry
- A complete carpentry shop

http://www.bu.edu/eng/current-students/epic/
COOL IDEAS WRAP-UP