Developing Outstanding Engineering Technologists to Serve the Global Society

PRESENTED BY:
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ETIC CONFERENCE
BALI, INDONESIA
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Simple Vision

“My job is to make the World smaller…”

- Creating opportunities...
- Removing obstacles...
- Enhancing Awareness, Diversity, & Inclusion
- Staying True to the Land Grant Mission
- An Educated – Inclusive World will serve us well
Basis of this Discussion

- My Personal global interactions over the last 20+ years
- Focused on better understanding of global operations / collaborations
- Perspectives offered today are mostly my opinions
- My College’s Recent Transformation to the Purdue Polytechnic
- Concepts presented are for your consideration when thinking about "Developing Outstanding Engineering Technologists to Serve the Global Society"
- Perspective is focused on my own US Students
Today’s Discussion

- Identifying the “needs”
- One approach to addressing these needs (TECH 330)
- Purdue Polytechnic Institute’s Transformation
- Other Observations
- Closing Remarks
Growing need for engineers and technologists with comprehensive understanding of their profession

- Culture,
- Humanities,
- History, and its impact on internationalization / globalization.
- Leadership / Overall Awareness
- Transdisciplinary and Interdisciplinary activities
- Be Prepared to Address Global Challenges.
The Result: The T-shaped Professional Integration of Humanities, Math, & Science

- Student-centered
- Industry & Community Based

Integration of Humanities, Math, & Science

21st Century competencies

- Deeper learning
- Analytical reasoning
- Effective communication
- Critical thinking
- Managing complexity
- Collaborative work
- Self-directed learning
- Cultural awareness
- Innovation

Technology S-curve Driven Curricula

- Technical content
- Domain theory
- Domain fundamentals
- Problem-solving skills
- Research skills

Depth of knowledge

Student-centered Industry & Community Based

Methods

- High TRL research
- Student-centered teaching
- Cross-functional learning
- Work-based learning
- Internships
- Co-curricular experiences
- Industry driven curriculum

ETIC 2015
Engineering Technology International Conference
The Result: The T-shaped Professional Integration of Humanities, Math, & Science

Focal Points for Our Discussion Today

Integration of Humanities, Math, & Science

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Reinforcing the “T-Shaped Professional”
Key Findings for Survey of Employers

Intellectual and Practical Skills
- Critical thinking and analytic reasoning 82%
- Complex problem solving 81%
- Written and oral communication 80%
- Innovation and creativity 71%
- Quantitative reasoning 55%
Reinforcing Global / Cultural Awareness

Key Findings on Employer Priorities*

- Global issues / knowledge about societies & cultures outside the US 78%
- Teamwork skills in diverse groups 67%
- Applied knowledge in real-world settings 78%

Industry Reasoning for Globalization

- Shifting Global Markets
- Global Economy
- Global Clients
- "World is Flat"
- More Exposure to Market Shares – "Bottom of the Pyramid"
- Foreign Direct Investment (FDI)
Addressing the Need

*TECH 330- Technology and the Global Society*

The course examines the interplay of technology, globalization, and ethics. Students will explore concepts and issues related to outsourcing; global competitiveness; communications; contemporary issues; cultural differences such as inequality, security, sustainability, and quality of life; and the ethical dilemmas that often emerge as a result of the impact of technology.

Provide knowledge and a higher level understanding of the principles behind globalization of technology and its regional and global markets.
TECH 330 - Course Learning Outcomes:

1. Understand cultural norms, interactions, societal ethics and the impact of culture on business and industry.
2. Become familiar with international law and customs, security, import/export rules.
3. Understand the logistics of international travel including the use of passports and visas.
4. Understand issues involved in leading international teams and managing international projects.

At the end of this course, the student will have the ability to research and assess multiple variables that effect Technology in a Global Society.
TECH 330 Course Topics

- Basics of Cultures
- Worldwide Education
- Business Cultures
- Social Media
- Technology Global Impacts – Power and Water
- World Development Report 2016 - “Internet for Development”
- European Union and Germany’s Rise in Economic Power
- Concepts of Mobility
- Intellectual Property and Export Controls
- Global Socio-Economic Drivers
- Regulations and Logistics of International Travel
- Global / Cultural Awareness Assessment Instruments – KOZAI Report
- World Food Security
KEEP IN MIND TODAY’S STUDENTS

Maslow's hierarchy of needs 2.0

Facebook Post by 9GAG
KEEP IN MIND TODAY’S STUDENTS

http://neisgovau.blogspot.com/2013_05_01_archive.html
KEEP IN MIND TODAY’S STUDENTS

Infographic: Maslow’s Hierarchy of Needs & the Social Media that Fulfill ‘Em

http://www.dontwasteyourtime.co.uk/social-network/infographic-maslows-hierarchy-of-needs-the-social-media-that-fulfill-em-infographic/#sthash.u3KMaP1k.dpuf

David Hopkins - August 16, 2010
Table 4.14. CM vs ENG Student Learning Styles

<table>
<thead>
<tr>
<th></th>
<th>Entry Channel (LSD1)</th>
<th>Processing (LSD2)</th>
<th>Perception (LSD3)</th>
<th>Understanding (LSD4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Visual</td>
<td>Verbal</td>
<td>Active</td>
<td>Reflective</td>
</tr>
<tr>
<td>This Study CM</td>
<td>93%</td>
<td>7%</td>
<td>72%</td>
<td>28%</td>
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<tr>
<td>n=1069</td>
<td>(998)</td>
<td>(71)</td>
<td>(769)</td>
<td>(300)</td>
</tr>
<tr>
<td>Felder &amp; Brent (2005)</td>
<td>82%</td>
<td>18%</td>
<td>64%</td>
<td>36%</td>
</tr>
<tr>
<td>ENG n=2506</td>
<td>(2055)</td>
<td>(451)</td>
<td>(1604)</td>
<td>(902)</td>
</tr>
</tbody>
</table>
*Analysis of Learning Styles in US (Holt, 2015)*

*1,313 responses from CM programs at 36 different schools across the nation.*

**Visual** - Easy for them to remember what they see: images, diagrams, time tables, films, etc.

**Active** - Learn by working in groups and handling stuff.

**Sensing** - Rather deal with facts, raw data and experiments, they’re patient with details, but don’t like complications. They want connection to the real world.

**Sequential** - Follow a lineal reasoning process when solving problems and can work with a specific material once they’ve comprehended it partially or superficially

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Increasing Global / Cultural Awareness
How does this picture reflect culture?
Cultural Impacts on Operations

• **History** – prohibited multinational team members
• **Gender Roles** – women in the workforce
• **Etiquette** – proper and accepted behaviors
• **Doing business** – contracts and business practices
• **Language and communications** – multiple languages
• **Ethnic Issues** – accepted wardrobes and dress
• **Spirituality and Religion** – work hours and prayer times
• **Economic Concerns** – use of local currency requirements
• **Traditions** – holidays, meals and work breaks
• **Education** – capacity level of your workforce
How is our 7.2 B + population dispersed?

Mumbai has 77,000 people per square mile...that’s 3 times more densely populated than New York City. India is one third the area of the US and 10 times more densely populated while China is almost same size as US and 4 times more dense.
THE WORLD’S POPULATION, CONCENTRATED

If the world’s 6.9 billion people lived in one city, how large would that city be if it were as dense as...

PARIS
- 3.5 million people
- 11.2 square miles
- 325,000 square kilometers

SAN FRANCISCO
- 8.5 million people
- 12.3 square miles
- 40,000 square kilometers

NEW YORK
- 10.4 million people
- 38.7 square miles
- 100,000 square kilometers

LONDON
- 8.6 million people
- 60.7 square miles
- 155,000 square kilometers

SINGAPORE
- 5.5 million people
- 69 square miles
- 180,000 square kilometers

HOUSTON
- 6.8 million people
- 145 square miles
- 375,000 square kilometers
Engineering Technologist must:

Embracing your Customer’s needs ...
Timing is everything...
Economies

Number of people living under less than $1.25 US per day
Compare your personal score on Hofstede’s model to a country of your choice — take the new cultural survey (http://geert-hofstede.com/cultural-survey.html)
Technology S-Curve (Wardley, 2012)
The Leap of Faith

Technology Development

Time

A: technology

B: new technology
"The brick" weighed 2 pounds, offered just a half-hour of talk time for every 10 hours recharging and sold for $3,995.
Mobile (cell) phone use (Per 100 people)
Global Student Experiences

- Short term Abroad Activities
- Full Semester Activities
- Collaborative Global Capstone Projects (Industry Sponsored)
Georgetown Study findings*: To what extent do traditional “immersion” practices foster intercultural learning?

Take steps to improve language proficiency: Little impact
Maximize contact with host nationals: No impact
Enrollment in host school classes: No impact
Carry out internships, service learning: No impact
Be housed in home stays: No impact
Send away for longer periods: Yes—some impact
Pre departure cultural orientation: Yes—some impact
Home stays: Yes—when students engaged with host family
Cultural mentoring at sites abroad: Yes—by far the highest impact practice in the study

Increasing the Effectiveness of Global Experiences

Learning through faculty-led formal reflection
Another model offering insights into “the structure of the knower”: Challenge & support*

An important model describing “the structure of the knower”: The Intercultural Development Continuum (IDC)

- Denial
- Polarization
- Minimization
- Acceptance
- Adaptation

Deeply Comprehends Difference
De-emphasizes Difference
Judges Difference
Misses Difference
Monocultural Mindset

Bridges across Difference
Intercultural Mindset

Modified from the Developmental Model of Intercultural Sensitivity (DMIS), M. Bennett, 1986

COPYRIGHT, 1998-2013, MITCHELL R. HAMMER, PH.D., IDI, LLC, USED WITH PERMISSION
Measuring Impacts of our Efforts

- Purdue University Intercultural Awareness Task Force
  - Intercultural Development Continuum Training
- Impact Assessments on ALL Study Abroad Activities
- TECH 330 – Use of Kozai Report
Kozai Group Reports

The Intercultural Effectiveness Scale

Feedback Report

Results for: Robert Cox
ID: rfcox@purdue.edu
<table>
<thead>
<tr>
<th>Continuous Learning</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
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<tbody>
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<td></td>
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<tr>
<td>Self-Awareness</td>
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<td>Exploration</td>
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<td>Interpersonal Engagement</td>
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<td>Global Mindset</td>
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<td>Relationship Interest</td>
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<td>Hardiness</td>
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<td>Positive Regard</td>
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<tr>
<td>Emotional Resilience</td>
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<tr>
<td>Overall IES Score</td>
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</tbody>
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Remember this earlier slide?
Technology – *The Internet for Development*

But the internet is yet to reach most of the world’s poor

- Global population (7.3 billion)
- Access to digital signal (6.8 billion)
- Mobile phone (5.3 billion)
- Low speed internet (3.3 billion)
- High speed internet (1.1 billion)

Source: WDR team calculations based on data from WB, ITU and McKinsey (2014)
How the internet affects development

- Internet
  - Overcomes information barriers
    - Inclusion
  - Lowers transaction costs
    - Efficiency
  - Generates economies of scale
    - Innovation
Some tentative findings

The internet ...

• ... brings significant growth opportunities for developing countries, most of which remain unrealized.

• ... improves welfare and helps reduce poverty, but can also worsen inequality.

• ... has empowered governments, but often not their citizens.
Electricity

v/s.

Internet

Top figure -- NASA Earth Observatory; Bottom figure -- Jason Koebler, motherboard.vice.com
Challenge our Students to turn this into motivation for helping others
Managing our TIME...

And NOT exhausting our HUMAN RESOURCES
Technology Enablers?
The 24 Hour Working World

Skype

INFORMATION TECHNOLOGY

INTERNET-BASED COLLABORATIVE PLATFORMS

Adobe Connect

Face Time
Increased Working Hours

- Europe: +5-6 hours
- Asia: +8-9 hours
- Middle East: +12 hours
- USA: +5-6 hours

Robert F. Cox, Ph.D. - ETIC Conference August 10-11, 2015 - Bali, Indonesia
Transforming the College of Technology

THE Purdue Polytechnic Institute
The Result: The T-shaped Professional

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Polytechnic (1795)

from Greek polytekhnos "skilled in many arts," from polys "many" (see poly- ) + tekhne "art" (see techno- )

Normally associated with technical arts - industrial age

A New Polytechnic (2013 - )

Expanded to strive for a balanced, whole person - thinking age

Transdisciplinary
Purdue Polytechnic Transdisciplinary Degree based on 8 Primary Competencies

- Communicate Effectively
- Envision & Execute Independently
- Innovate & Create
- Apply Systems Thinking
- Socially Interact on a Team
- Apply Disciplinary Knowledge
- Apply Ethical Reasoning
- Design

A Whole Person can proficiently ...
• Combined learning experience in
  • Design Thinking, Problem Solving (TECH 120)
    • Information Literacy (TECH 120, ENGL 106)
    • Effective Professional Communication (ENGL 106, COM 114)

  - Required Senior Capstone Projects (1 year)
  - REQUIRED Global Experiences for ALL students???
Closing Comments

What about the new professions

.... the future professions that have not been created

Engineering technologists must be dynamic and adaptable to changing needs of society
Thank you!

For such a wonderful opportunity to share my thoughts... on

*Developing Outstanding Engineering Technologists to Serve the Global Society*

Any questions or comments?

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