

Global Engineering Education
Exchange Conference

Clemson University/Georgia Tech
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Rensselaer

SCHOOL OF
ENGINEERING



Globalization of Engineering Education-A Status Report

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The Current Reality

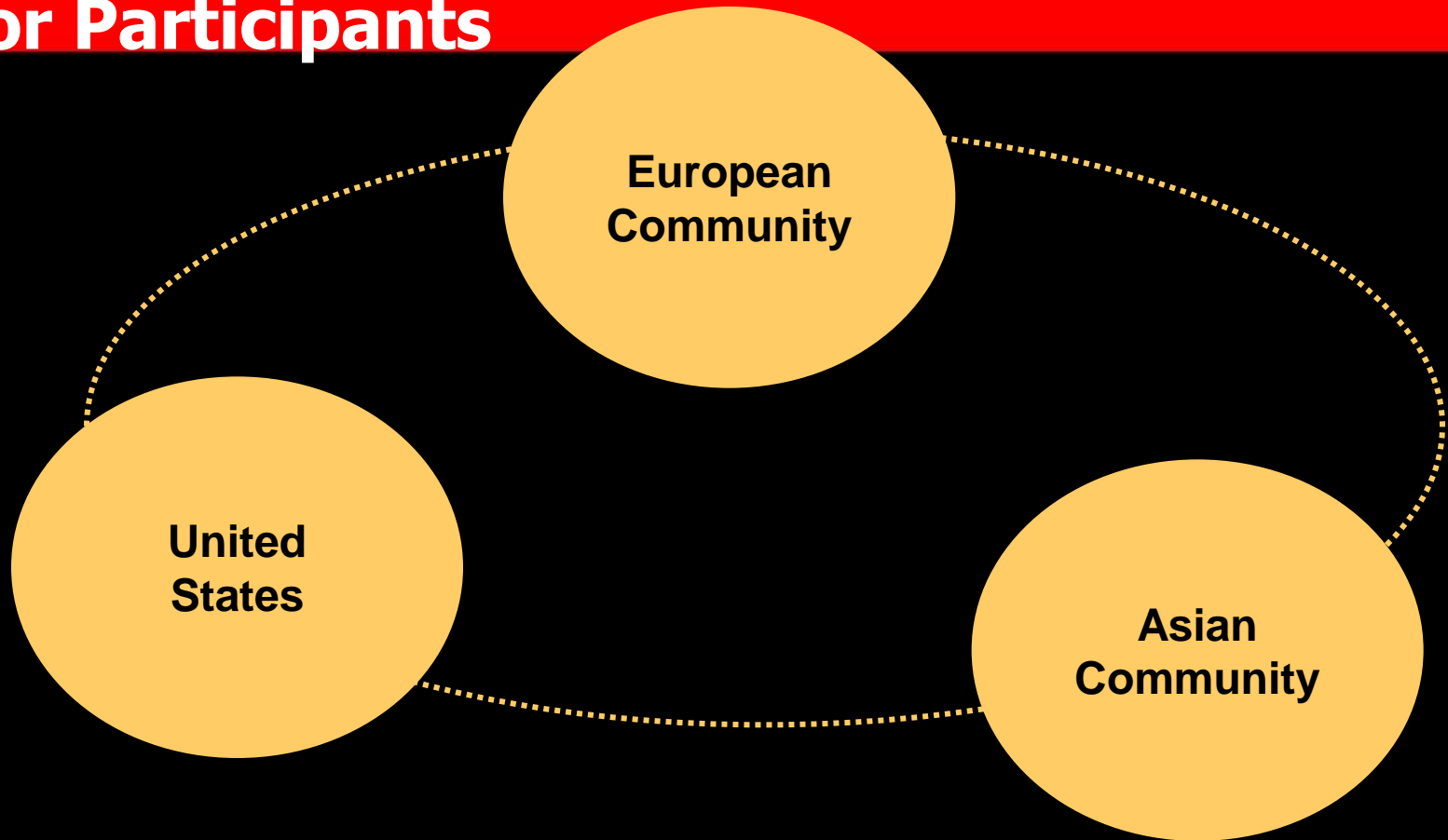
- A Technologically Borderless Planet
- A Globally Interactive Economy, Environment & Culture
- A Distributed Educational System
- An Educational Trend to Process Homogeneity Yet the Desire to Maintain Heterogeneity of the Product
(Recent Mergers-e.g. Denmark-25 to 8, Finland-Nokia/Aalto U. and HUT, France, Wales, Xian-Jiaotong Liverpool in China, Yale/NUS, MIT/NTU)
- An Educated 'Global Citizen' is Needed
- A Need to Balance Cooperation and Competitive Position



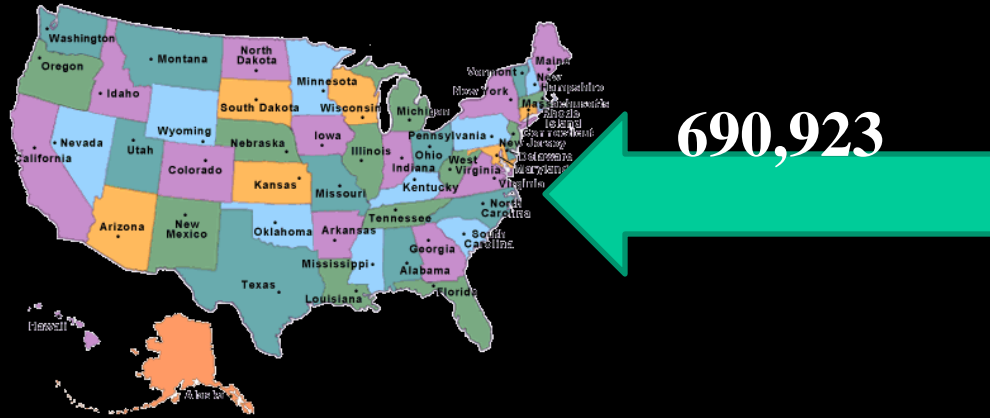
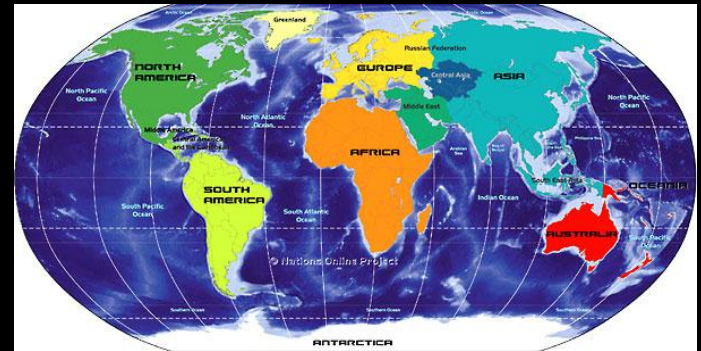
Presentation Outline and Thrust

- A Current Look at Global Aspects of Higher Education
- A Focus on
 - The USA
 - Engineering

Major Participants



U.S. Students Studying Abroad & International Students Studying in the U.S.



*Open Doors Report, 2010, IIE

A US Balance Sheet Summary- Students Studying Abroad*

OUTGOING

260,327 (19.562M-1.3%)

15%

Europe @ 50%

(of top 25 destin., UK #1)

China now #5

65%

Soc Sci; Bus/Mgt;

Hum; Arts;

Phys/Life Sci

(Engrg/CS-#9/10; above Agricul.)

Generally Inadequate

In STEM Fields

Shorter Term

Total

UG

Countries

Women

Fields

Language

Length

INCOMING

690,923

44%

China (18.5%), India, S. Korea

Collectively @ 44.1%

China #1; up 29.9% over '09

45%

STEM above 50%;

Bus/Mgt; Engrg &

Phys/Life Sci &

Math & CS (up 14.2% over '09)

Multilingual; Quality

Varies by Country

Longer Term



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*Open Doors Report, 2009/10, IIE

China's Rise-Some Indicators

- Of All International Students in US-2009/10
 - China 18.5%; India 15.2%; South Korea 10.4%
 - China Became #1- The First Time Since 2000/01 (Up 30% Over '09)
- Grad Student Offers-2009/10
 - Offers to Int. Students up 3%
 - Offers to Chinese Students up 16% (Up in Double Digits in EACH of the Last 5 Yrs.)
 - Applications From China up 20%
 - Top 10 Universities (in Int. Enrollments) Admitted 30% More Chinese Students
 - Offers to India Down 4%; South Korea Down 7%
 - Offers to American Students Down 1%
- China Now 2nd Largest Economically
 - Passed Japan in 2010
- China's National Supercomputer Center-Tianjin, Was #1 of the World's 500 Fastest Computers-11/14/10
- China First in Wind Energy Capacity @ 41,800 Megawatts-1/25/11



China's Rise-The Latest Indicator

- China 'To Overtake US on Science' in Two Years

- BBC News; 3/28/2011

- Conclusion of a New Study 'Knowledge, Networks and Nations' by the Royal Academy

- China Displaced UK as the World's 2nd Leading Research Producer

- Chinese Spending Has Increased 20%/yr. Since 1999

- In 2006, Chinese Universities Graduated 1.5 Million S & E Students



Sources of Funding*

- Personal & Family-61.9%
 - US College/University-24.1%
 - Current Employment-5.2%
 - Home Gv't/University-4.6%
-
- International Students Added \$17.7 Billion to the US Economy in 2008-09

*Open Doors Report, 2010, IIE

Hosting Incoming Int. Students*

- 10 States Hosted 61%
 - Cal, NY, Texas, Mass, Ill, Fla., Penn, Mich., Ohio, Indiana
- NYC Hosted 9%
- Top 25 (20) Universities Hosted 20% (16%)
 - About 2/3 Public, 1/3 Private
- 2001 to 2008 Comparison for Host Country
 - US-From 28% to 21% (a 25% Drop)
 - China-From Negligible to 6% Overall; # 5 of Destinations for US Students in 2010

*Open Doors Report, 2009/10, IIE



Small Numbers of US Students Abroad in Critical Fields-Inconsistencies

GIVEN

- S & E Workforce in the US Comprises About **5%** of the Workforce and Is Said to Account for Over **50%** of the GNP
- Large Exports/Imports, Global Economy, Global Issues (Energy, Environment, Famine, Disease)
- Abundance of Multinational Companies
- The US Built on Immigration and Diversity
- **96%** of Humanity Lives Outside the US

YET

- Only **20%** of Americans Have Passports
- Less Than **1.3%** of Students Have an International Experience at any Given Time, and Less Than 10% Study Abroad At Any Time as Part of Their UG Education



An International Experience in 3-D

- Academic
- Culture
- Language

In Pursuit of Broadening Language Capability-An Admirable Objective But Currently An Uphill Battle

- In Global Engineering Education Exchange Program, Those Universities Teaching in English Attract the Most Students
- Teaching in English IS Becoming More Prevalent Worldwide
- In the US, the Teaching of Foreign Language is Declining
 - SUNYA, As One Example, Terminated (10/10) Programs in French, Italian and Russian in Addition to Classics and Theater. Only Spanish is Retained.
 - My University, As Many Others, No Longer Has 'Faculty Lines' in Language
 - Many Other Universities Teach Language Using Adjuncts Only
- The Popular Press Summarizes Language Capability in the US.

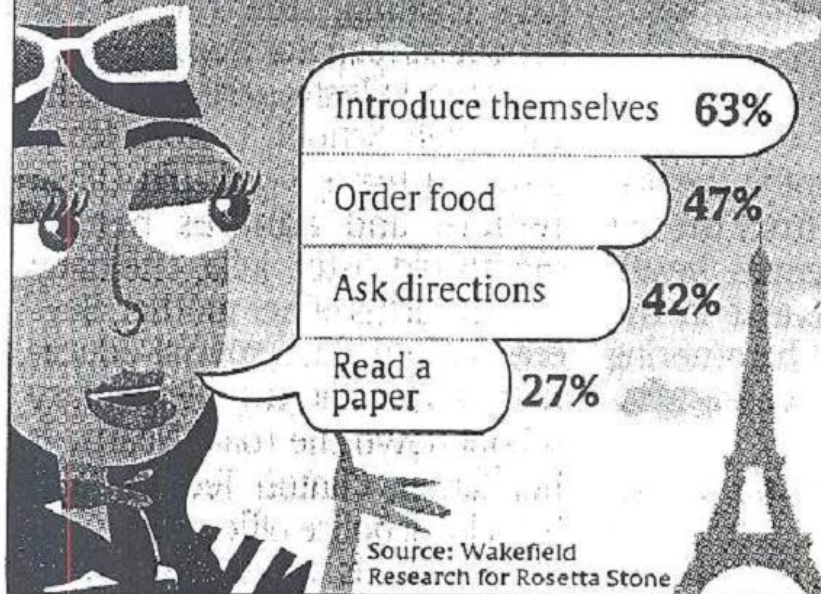


US Foreign Language Capability as Summarized in the Popular Press

USA TODAY Snapshots® 10/4/10

Speaking a foreign tongue

What Americans say they can do in a language they studied in school.



By Anne R. Carey and Veronica Salazar, USA TODAY



Taxonomy of Approaches

- School Centric, Consortia Centric, Agency Centric, Industry Centric, Country Centric, Hybrid(Int. Partnerships-Univ/Univ, Univ/Gvt)
- Voluntary, Mandatory
- Undergraduate, Graduate
- On Campus, Off Campus (Offshore)
- Enabler, Manager, Leader
- Implementation, Sustainability, Scalability



Taxonomy of Approaches-Global E3 & GE4

- School Centric, **Consortia Centric**, Agency Centric, Industry Centric, Country Centric, Hybrid(Int. Partnerships-Univ/Univ, Univ/Gvt)
- **Voluntary**, Mandatory
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Experience-The Best Teacher

- **Global Engineering Education Exchange Program**
 - Consortia Centric; 15 Years Old; 90+ Academic Partners; 23 Countries (Co-Founder & Chair of the Executive Board)
- **FIPSE Sponsored Curriculum Grant (Director)**
 - 4 years; 7 Countries and the US; Compatibility of 7 Curricula
- **Rensselaer Across Cultural Horizons (REACH)**
 - University Centric; Announced 2008; First Semester Spring, 2009; To Seek Required International Experience for all UGs (Originator and Developer)
- **Aqincum Institute of Technology (AIT)**
 - New Institute in Budapest, Hungary; Pilot Program in summer, 2010. First Semester in Spring, 2011; Harvard, Columbia, Princeton, Rensselaer, Swarthmore, Williams, Northeastern, Olin, Harvey Mudd; Erno Rubik (2010 Medal of Science) and Laszlo Lovasz (2010 Kyoto Prize) Among Professors (Curriculum Development and Member of the Board)





Rensselaer

Presidential Colloquy

Friday, April 11, 2008 at 1:30 p.m.

Center for Biotechnology and
Interdisciplinary Studies Auditorium

"A Global REACH in a Shrinking World"



Examples of Offshore US Campuses

- 197 Offshore Campuses of US Universities
 - 25% in Abu Dhabi-UAE
- NYU-60% of Their Students Study Abroad
 - UAE and Most Recently in Shanghai
- NYIT-Multiple International Campuses (E.G. China, UAE, Jordan, Bahrain)
- CMU, Texas A&M in Doha, Qatar
- Singapore University of Technology and Design (With MIT and China)-2012
- + Many Others



Diversify/Extend US Global Educational Markets Beyond Europe & Asia

- Africa
 - Greatest Need-Ubuntu
- Latin America
 - #2 Host Region for US Students
- South America
 - South of Texas?-Too Little Done
- Middle East
 - Most Offshore Campuses of US Univ.
- Other



Diversify International Options

- Semester of Study at Partner University
 - One or Two Semesters
- Summer Experience
- Internships
- Semester @ Sea
- Specialty-Peace Corps, EWB, ESW, etc.
- Shorter Term Options
- Dual Degree Programs
- On Campus Options
- Other



Barriers to Global Education- Perceived or Real?

- Curriculum Reform
 - Ours in Need For Years; Theirs Generally More Recently Changed; Newer and More Modern Facilities
- Rigidity
 - Real Flexibility >> Perceived
- Cost
 - Tuition Swap is Cost Neutral Except for Travel
 - Loss of Tuition Income, if Paid Partially Elsewhere Generally Not True
- Quality
 - Whose?
 - International Students in Ever Increasing Numbers Do Very Well in Our Best Universities. Why Do We Think Our Students Wouldn't Do Well in the Best Int. Universities? Where Were Many of Our Faculty Educated?
 - Cambridge, Imperial College, Oxford, Tsinghua, Technion, ETH Zurich, Tokyo, Kyoto, NUS, Hong Kong (Chinese, S&T), Ecole Polytechnique, Monash, Seoul U., Peking, Leiden, Lund, Nanyang (NTU), Adelaide, Delft, KAIST, Tohoku, DTU, IITs, etc.- All and More are in the Top 100 Worldwide.
- Pebbles, Rocks, Boulders



Barriers to Global Education- Preceived or Real?

- Language

 - A Robust Base of Courses Taught in English Needed to Attract US Students Internationally

- Time Zone

 - Remember the Around the Clock, Around the World, Design of the 777

- 'Brain Drain'

 - Many Students Return to Home Country

 - Benefits of Cooperation >> Risk of Competition

Challenges?-YES

Unresolvable Issues?-NO



Milestone Global Upheavals-Social and Natural - 'Local' Issues With Global Impact

- The People Speak
 - Middle Eastern Countries
 - AUC Admitted to Global EEE
 - Technion Admitted to Global EEE
- Natural Disasters
 - Japan, Haiti
 - Member Partners Respond

Our Global Educational Goals Must Not Be Diverted or Otherwise Undermined by Petty Politics, or Devious Dictators

- Recovery From Such Natural Disasters Requires Global Action
- We Must Help Others to be Safe and Enjoy the Freedom They Both Desire and Deserve
- Global Education of Global Citizens is the Light at the End of a Long, Dark Tunnel of Hostility/Conflict



Some Steps Forward

- Eleven New Members With Five New Countries (Egypt, China, India, Indonesia, Israel) This Year
- Three New International Sessions at the American Society for Engineering Education (ASEE)
 - A New Track; A Session/Day
 - Beginning at the 2011 ASEE Conference in Vancouver, B.C.
 - Plenary; Call for Papers Session; Panel Discussion
- What is Global Engineering For?-The Making of International Educators
 - Morgan and Claypool Publishers –March, 2011
 - By Gary Downey and Kacey Beddoes
- Developing a Successful International Exchange Program-The Global Engineering Education Exchange Program; A Case Study (In Progress)



The Need for A Centralized National Organization

- Best Practices
- New Startups
- Basis for Consortia
- Leveraged Impact



Recommendations/Conclusions

- Regard Intellect as a Global Resource to be Used to Solve Global Problems
- Recognize the Obligation of Those Countries More Highly Developed to Those Less Developed-Ubuntu
- Regard Global Education as a Necessity Not a Luxury
- Value Trust, Respect, Confidence (TRC)
- Let's Have Pride in the Past; But Let's Not Live in It
- Let's Have Faith in the Future; But Recognize Hope Alone is Not a Strategy
- Just Do It!



Let's Remember that the Future of All Our Countries Resides in the Proper Education of Our Youth-We Must Do It Right Together

