

11th Annual Colloquium on
International Engineering Education

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Rensselaer

SCHOOL OF
ENGINEERING



***Building Consortia Centric
and School Centric
Strategic Partnerships for
Global Education***

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Some Characteristics of an Evolving International Education

- A Global Trend to:
 - A Bachelor, Master, & PhD Model
 - Teaching in English
 - Seeking Diverse Student Body
- 3 Year Bachelor Degree in Europe
- Body of Knowledge Approach to PhD
- International Exchanges as an Integral Part of the Process



Homogeneity of the Process & Heterogeneity of the Product

- **A Trend to Uniformity of the Educational Process**
 - More Common Educational Models
 - ECTS
 - Bologna Accords
 - Language
 - Distance Learning Technology
 - Joint Degrees & Joint Research
 - ABET Inc.
- **A Trend to Diversity of the Student Body**
 - Global Citizen/Engineer/Scientist
 - Multinational Companies
 - University Global Consortia
 - Ease of Travel
 - Language
 - Exchange Programs



TRC

- **Trust**
- **Respect**
- **Confidence**



How to Build TRC?

- Reputation by Virtue of Experience
- Time
- Money?

**TRC is Not a Commodity to be Bought
Be Wary of Those That Say it Can
Time and Money are NOT Fungible**





" . . . dear old RPI "

- Founded 1824
- 5300 undergraduates
- 2000 graduates
- School of Engineering
 - 3200 undergraduates
 - 7 academic departments
 - 12 B.S. degree programs
 - 145 Tenure faculty
- Class of 2012
 - 780 engineering students
 - 30% women; 10% minority



Consortium Centric Program

- **Global Engineering Education Exchange Program**





Educating Engineers for a Global Marketplace

- Study abroad for credit
- Improve foreign language skills
- Explore internship opportunities

- Administered by Institute of International Education
- 34 American member universities
- Consortium of universities in 17 countries
- Approximately 200-250 students per year





Global Engineering Education Exchange Program Characteristics

- Tuition Paid at Home Institution
- Room & Board Paid at Host Institution
- Zero Net Flow of Student Semesters
 - Geographically and Temporally Integrated
- Full Credit Transfer of Courses
 - Policy on Courses & Grades Determined by Individual University Members
 - Course Data Bank
- **Voluntary**
- Began in 1995-96



Global Engineering Education Exchange Program Characteristics

- Centrally Administered by IIE
 - Matchmaking
 - Special Scholarships Available
 - In Europe by GE4
- Executive Committee
 - Policy and Procedures (Bylaws)
 - New Members
 - Future Planning
 - Program Quality



Global Engineering Education Exchange Program Characteristics

- Course Taught in Native Language and English
- One and Two Semester Stays May be Accompanied by Industrial Internship
- Local Control by Member Universities
 - Admissions
 - Mentor Assignments
 - Course Matching
 - Grading Policy



Program Benefits

- Significant Component of National Initiatives for U.S. Undergraduate Engineering Students
- Campus-Level
 - Demonstrates Value of Consortium Based Program Rather Than Multiple MoUs
 - Centralized Administratively Minimizes Need for on Campus Staff



Program Benefits

- Faculty-Level
 - Utilize Central Administrative Hub
 - Maintain Academic Oversight
 - Annual Meeting Venue for Meeting International Colleagues and Exchange of Ideas
 - Opportunities for Establishing International Contacts for International Curriculum Development
 - 'Seeding' for International Research Collaboration



Program Benefits

- Student-Level
 - Global Academic Experience
 - Global Industrial Internship
 - Special Scholarships
 - Freeman Awards for Study in Asia
 - Gilman Scholarships
 - National Security Education Scholarships
 - Establish Global Contacts at Student Level



Program Benefits

- Consortia-Level
 - Annual Membership Costs Kept To a Minimum
 - Coordinated Process to Seek External Funding (Industry, NSF)
 - Flexibility
 - Usually No Delay in Progress Towards Degree
 - Visibility (ABET, Industry, G'vt, Academe)





Global Engineering Education Exchange Program Characteristics

- Global E³ Web Site:
<http://www.iie.org/programs/global-e3/>
- Online Student Application
- Course Equivalents
- Linkages to Academic Partners
- Fellowships/Scholarships Available

Observations from Global E3 Experience

- Participation in **voluntary** bilateral and consortium international academic experiences remains very small, especially in engineering
- Reports from students: 'the experience was life-changing'
- Evidence continues to mount that global opportunities, understanding, and communications are critical to the future success of our graduates
- Make an international experience an expectation for our students, rather than an isolated luxury



School Centric Program

- **Rensselaer's Education Across Cultural Horizons-REACH**



REACH

Rensselaer Engineering Education
Across Cultural Horizons

Ensure that all undergraduates will have an opportunity to spend time in another country as part of their undergraduate engineering educational experience



REACH-Rensselaer's Education Across Cultural Horizons-

A New International Initiative

- A **Mandatory** International Experience Beginning With Engineering Undergraduates
- First of its Kind
- 12-15 Academic Partners (50 Students Exchanged/Partner)
- Junior Year Emphasis
- Bi-Lateral Exchanges
- Rensselaer Centric
- Tuition Paid at Home; Room/Board at Host



REACH

- **Course Template Matching by Curricula and Partner**
- **Semester Abroad as Initial Focus**
- **Expansion Modes Planned**
- **Scalable**
- **Rensselaer Centric Administration and Operation**
- **To Begin in Spring, 2009 With at Least 100 Juniors Outgoing and 100 International Students Incoming**



Development of Curriculum Templates

Example from RPI EE Curriculum

Rensselaer "Term 6" template for ELEC

EC2100 Fields and Waves 1

ECSE 2210 Microelectronics
Technology

Multidisciplinary engineering
elective

H&SS or Free Elective

Equivalent DTU Course

31400 Electromagnetics

33253 Solid-state Electronics and
Microtechnology

Several applicable courses exist

Several applicable courses exist



Types of International Experiences

- Semester of Study at Partner University
- Academic Study and Internship
- Summer Experience
- Semester @ Sea
- EWB, ESW, Peace Corps, etc.
- On Campus Options
- Other



Some Key Factors to Address

- **Agreements**
- **Academic Programs**
- **Housing**
- **Liability**
- **Costs & Budgets**
- **Staffing & Organization**
- **Incoming & Outgoing Student Issues & Logistics**
- **Expansion**
 - To Full SoE Junior Class**
 - To Entire Campus**
- **A Change of Campus Culture**



Challenges

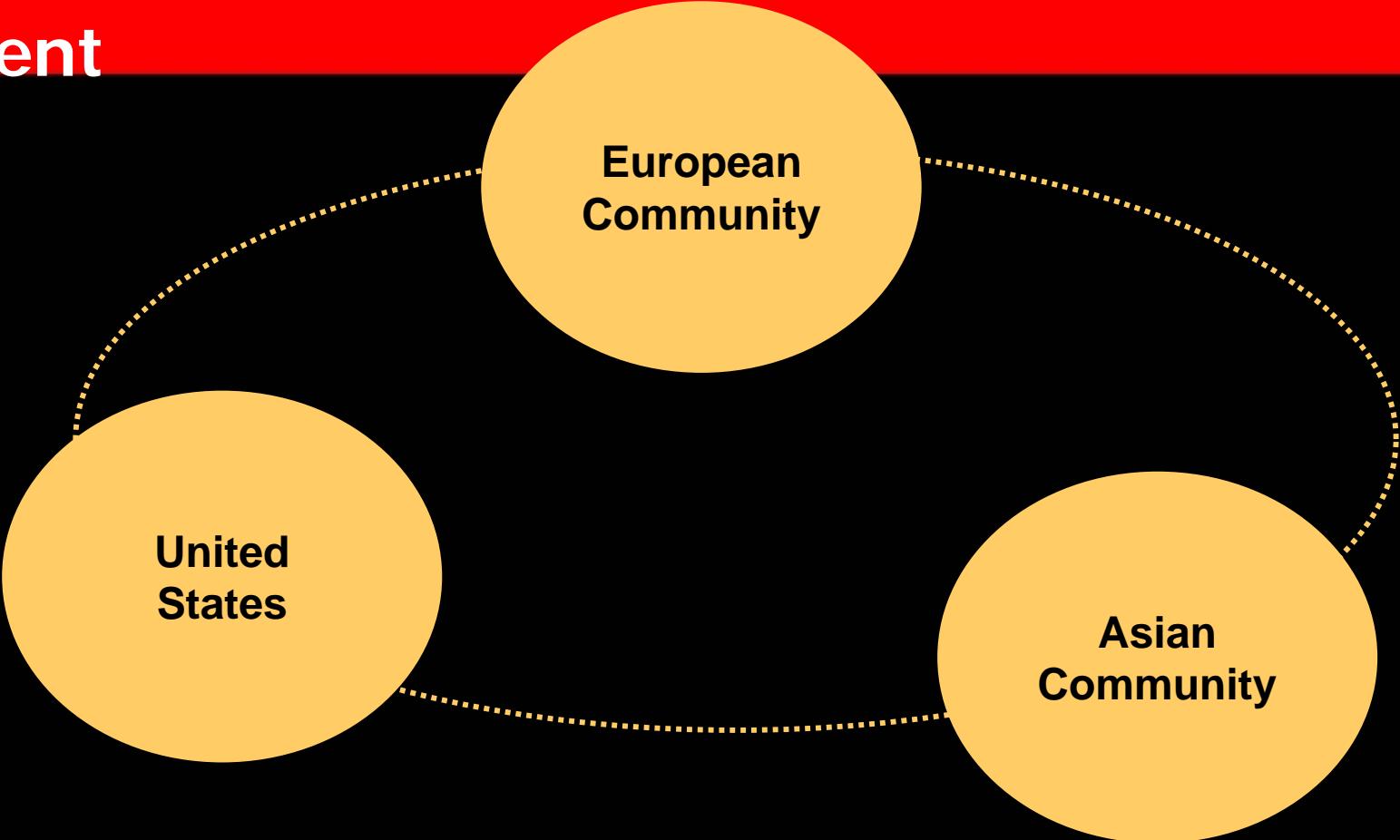
- **Housing (On vs. Off Campus; Housing Grants; Stress Integration)**
- **Semester @ Sea (Tuition Payment)**
- **Unique Course Offerings (e.g. Biomed)**
- **Special Circumstances (e.g. ROTC, Sports)**
- **Match Student Mix for Each Partner or Overall**
- **Early Parallel Participation of Other Schools at Rensselaer**
- **Adding New Academic Partners**
- **'Deemed Export' Issue Impact**
- **Economic Impact if Dollar Weakens**

Initial Guidelines for Academic Partners

- **Quality (People, Program, Platforms)**
- **Diversified and Matching Curricula**
- **Large Base of International Students**
- **Location (Safe and Desirable)**
- **Language**
- **Availability of Internships & Dorm Facilities**
- **Planned Expansion to Developing Countries;
Needs to be Matched With Selective Curricula**



Major Partners- Current



Extending Global Markets Beyond Europe & Asia

- Africa
- Latin America
- Middle East
- Other

Timeline Highlights

- **Task Force Formed – 1/07**
- **Subcommittees Established- 2/07**
 - Academic Curriculum
 - Housing
 - Student Services
 - Health and Safety
 - Administration
- **Initial SoE Budget Established – 3/07**
- **Visits to Potential University Partners – 5/07-12/07**
- **Began Staff Hiring – 10/07**
- **Announce Program to Students – Fall, 2007**
- **Presidential Level Event and Colloquy-April 11, 2008**
- **First Semester Abroad – Spring, 2009**
 - 25% of Rensselaer Juniors; Class of '10
 - Similar Number of Incoming International Students
- **Build to 100% of Juniors in 2015**





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"



Consortia Centric to School Centric- Similarities

- **Local Academic Control**
- **Tuition Paid @ Home Univ. and Room/Board @ Host Univ.**
- **Junior Year Emphasis for Outgoing**
- **Bilateral Exchange Stressed**



Consortia Centric to School Centric- Differences

- **Consortia Based-Voluntary**
School Based-Required
- **Consortia Based-Centralized Admin.-IIE**
School Based-University Admin.
- **Consortia Based-Grades Transferred**
School Based-Credit Transferred
- **Consortia Based-Integrated Over Time & Space**
School Based-Replacement wrt Course, Student Mix & Housing
- **Consortia Based-Course Flexibility Subject to Advisor's Approval**
School Based-Template Based by Curriculum and Partner School
- **Consortia Based-Student Selects Host School**
School Based-Rensselaer Selects Host School
- **Scalability**



Scaling Issues

DIFFERENCES BETWEEN GLOBAL E³ AND REACH

| Issue | Global E ³ | REACH |
|-----------------------------|-------------------------------|-------------------------------------|
| Annual Student Going Abroad | 10-15 | >100 (ultimately >600) |
| Focus | Individual Student | Cohort |
| Student motivation | Voluntary | Required (ultimately, with caveats) |
| Distribution | No particular mix restriction | Mix issues are critical |
| Academic | Individual course selection | Course Templates |
| Organization | Consortium | School Centric |
| Administration | Centralized (IIE) | Within the University |
| Finances | Minimal impact | Increased impact |
| Housing | Minimal impact | Major Resource impacts |



Lessons Learned From Global EEE

- **An International Experience is a VERY Good Thing**
- **A Key Point of Contact at an Academic Partner is 'Priceless'**
- **Teaching in English REALLY DOES Serve as a Draw for US Students**
- **Total Immersion May be Preferable, But is Not Currently Practical in Large Numbers**
- **Faculty Status Increases Credibility on the Home & Host Campuses; Administrative Status Doesn't Hurt Either (Especially in Start Up)**
- **Voluntary Programs are Self Limiting**



Lessons Learned From Global EEE

- **Sustainability Implies Continuing Leadership and Support**
- **High Level Administrative Support is Critical**
- **State & Private Univ. Have Different Constraints in Implementation of Exchanges**
- **Buy-in By Academic Partners is Best Achieved by Annual Fees Regardless of Other Support**
- **Annual Conferences are a Necessity for Networking and Go Forward Initiatives**
- **Students Are the Best Ambassadors**
- **Cost is an Excessively Exaggerated Issue For Tuition Swap Based Programs**



Lessons Learned From Global EEE

- **The Need For Globalizing Engineering Education is Increasing**
 - Due to Growth of the Quality, Size, & Interest of Educational Systems Abroad
 - Due to the Erosion of US Dominance, Quality and Interest at Home
- **Educators, Government, & Industry Need to See a Global Experience as Essential & as a Responsibility, Not as an Enrichment Elective**
- **TRC**



Lessons Learned From Global EEE

- **The Importance of Administration is Always Underestimated by Those Not Doing It**
- **Bylaws Work**
- **Friends in High Places Help in New Starts**
- **Sustainability is Harder Than New Starts & Is Subject to 'Friendship Evaporation'**
- **Success Begets Spinoffs**



Recommendations-Philosophical

- **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**
- **Think & Act Globally & Visionary; Not Locally & Incrementally**
- **Remember: 96%-19%-1.5% (and 0.04%)**
- **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!**



Recommendations-Pragmatic

- **Establish/Expand a Center/Division for Global Initiatives at NSF to Assist in University Program Development Via Best Practices, Workshops, and Financial Support (e.g. EEC Division, IOSE)**
- **Establish Guidelines for Incorporating an International Component in Research Proposals at NSF and Other Agencies**
- **Establish a Cooperative Network of Responsible S&E G't Agencies (NSF, Ireland NSF, JSPS, etc.) Globally to Promote & Assure Bi-Lateral Funding of Such Joint Initiatives**
- **Establish a Vice Provost of International Programs**
 - Properly Staffed
 - Centrally Located on Campus
 - Sufficiently Budgeted
- **Broaden and Intensify Industrial Incentives for Domestic New Hires With an International Experience**



THANK YOU

THANK YOU FOR ALL YOUR PAST WORK IN PROMOTING GLOBAL EDUCATION.

LET US ALL STEP FORWARD TOGETHER TO CONTINUE TO BUILD THESE IMPORTANT MUTUALLY BENEFICIAL BRIDGES TO SPAN THE OCEANS THAT ONCE SEPARATED US, FOR ALL TO CROSS SAFELY AND BE WELCOMED WITH OPEN ARMS AT THE OTHER SIDE

LET'S REMEMBER THAT THE FUTURE OF ALL OUR COUNTRIES LIES IN THE PROPER EDUCATION OF OUR YOUTH. WE MUST AND WE WILL DO IT RIGHT TOGETHER.



The World is Flat

