College of Engineering: Part 2
State of the College

Engineering Advisory Council: October 12, 2012
Leah H. Jamieson
The John A. Edwardson Dean of Engineering
The College of Engineering Today

• 11 Schools and 3 interdisciplinary divisions
  • Newest school is Engineering Education
  • Newest degree is BS in Environmental and Ecological Engineering

• 14 ABET-accredited undergraduate degree programs; next ABET review in F2013

• Graduate degree programs in 12 disciplines, including a multidisciplinary engineering degree

• 10,533 students: 7,615 undergrads, 2918 graduate students
  • A record 470 women in the entering first-year class, 27%

• 84,771 living alums

• 362 faculty

• FY11-12 sponsored research expenditures of $158M

• 1,068,476 asf in 45 buildings
CoE in Context

Total Student Population Distribution: Fall 2012

- Eng'g 26%
- HHS 12%
- Sci 12%
- CLA 12%
- Tech 9%
- Ag 8%
- Mgmt 8%
- Pharm 4%
- USP/ISP/Tem p 4%
- Edu 3%
- Vet Med 2%
Strategic Plan

1 Vision

We will be known for our impact on the world.

3 Goals

Graduates Effective in a Global Context
Research of Global Significance
Empowering Our People; Enriching Our Culture

4 Stories

Always@PurdueEngineering
ChangeTheWorld@PurdueEngineering
Innovate@PurdueEngineering
OurPeopleOurCulture@PurdueEngineering
16 Strategic Initiatives

- **Always@PurdueEngineering**
  - Engineer of 2020 / Experiencing Engineering
  - Innovation Design Center / Student Projects Building
  - Leadership Minor
  - Professional MS
  - Global Scholars / CPIASR

- **ChangeTheWorld@PurdueEngineering**
  - Purdue Systems Institute
  - Next Generation Manufacturing
  - Research Galaxies and Post-Award Processing

- **Innovate@PurdueEngineering**
  - Innovation Ecosystem

- **OurPeopleOurCulture@PurdueEngineering**
  - New Faculty Learning Communities
  - Promotion and Tenure Evolution
  - Staff of 2020
  - Diversity Certificate
  - Influencers in Residence
  - Purdue Enterprise Company, LLC

- **Foundational**
  - HUB-Empowered CyberReach
The Numbers
CoE Students - Fall 2012

10,533 students

- 7,352 undergraduates +263ABE = 7,615

<table>
<thead>
<tr>
<th></th>
<th>% women</th>
<th>% URM</th>
<th>% resident</th>
<th>% int’l</th>
<th>Avg SAT</th>
<th>Avg GPA</th>
<th>Top 10%</th>
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<tbody>
<tr>
<td>Engineering</td>
<td>22.2%</td>
<td>6.1%</td>
<td>37.0%</td>
<td>24.5%</td>
<td>1294</td>
<td>3.82</td>
<td>60.3%</td>
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<tr>
<td>Purdue</td>
<td>42.6%</td>
<td>8.2%</td>
<td>57.5%</td>
<td>16.5%</td>
<td>1186</td>
<td>3.66</td>
<td>40.8%</td>
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<td>18.8%</td>
<td>16.2%</td>
<td>n/a</td>
<td>7.2%</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
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</table>

- 2,821 graduate students + 97ABE = 2,918
  1,558PhD (53%); 1,264Masters (43%); 96 Other (3%)

<table>
<thead>
<tr>
<th></th>
<th>% women</th>
<th>% URM</th>
<th>% resident</th>
<th>% int’l</th>
<th>GRE quant</th>
<th>PhDs awarded per fac/year</th>
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<td>Engineering</td>
<td>19.9%</td>
<td>4.9%</td>
<td>11.5%</td>
<td>52.5%</td>
<td>158→740</td>
<td>0.61</td>
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<td>Purdue</td>
<td>37.3%</td>
<td>6.7%</td>
<td>20.1%</td>
<td>43.6%</td>
<td>156→720</td>
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<td>45.3%</td>
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Undergraduate Enrollment

Undergraduate Enrollment
2007-2012

<table>
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<tr>
<th>Year</th>
<th>Enrollment</th>
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<tr>
<td>F2007</td>
<td>5800</td>
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<tr>
<td>F2008</td>
<td>6200</td>
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<tr>
<td>F2009</td>
<td>6600</td>
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<tr>
<td>F2010</td>
<td>7000</td>
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<tr>
<td>F2011</td>
<td>7400</td>
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<tr>
<td>F2012</td>
<td>7800</td>
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Graduate Enrollment

Graduate Enrollment
2007-2012

Named/Distinguished Faculty

Named/Distinguished Faculty
2007-2012

Diversity: Women 2007-2012

**Women: Undergraduate Enrollment**

**Women: Graduate Enrollment**

**Women: Faculty**

**Women: Named/Distinguished Faculty**
Undergraduate Education Highlights: Women

Enrollment Results, Fall 2012

- Female applications up 57% over past 7 years
- Female admits down 4.5% from last year, but still up compared to 2 years ago
- Female yield was up 6.2% compared to last year
- First-year class is 27% female with a headcount of 477 – another all time high in Purdue’s history
- Overall female undergraduate enrollment in engineering is 1687 – an all time high in Purdue’s history
- Overall female undergraduate enrollment in engineering is up 55% over Fall 2007.
Diversity: Underrepresented Minorities

**URM: Undergraduate Enrollment 2007-2012**

**URM: Graduate Enrollment 2007-2012**

**URM: Faculty 2007-2012**

**URM: Named/Distinguished Faculty 2007-2012**
## Diversity: International Students

<table>
<thead>
<tr>
<th></th>
<th>F2012</th>
<th>F2011</th>
<th>F2007</th>
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<tr>
<td>Undergrad</td>
<td>1865</td>
<td>24.5%</td>
<td>22.0%</td>
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<tr>
<td>Graduate</td>
<td>1533</td>
<td>52.5%</td>
<td>51.0%</td>
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</tbody>
</table>

From 2007 to 2012, undergraduate international student enrollment in engineering grew from 927 to 1865.

International Student Advisors – One additional international advisor added in each of the past two years.
International Student Advisors – One additional international advisor added in each of the past two years.
Reputation and Rankings
CoE Reputation & Rankings:

- #2 among recruiters in the aerospace and defense industries – Aviation Week August 2012 workforce study
- #2 in preparing students for the workforce – Wall Street Journal, September 2010 recruiter ranking
- #2 place for graduate study of engineering – National Hispanic Business Magazine, in top 5 since 2006
- #10 in USN&WR undergrad rankings, #5 among public universities
  - #1 Agricultural & Biological Engineering
  - #4 Aeronautics & Astronautics
  - #4 Industrial Engineering
- #10 in USN&WR graduate rankings, #6 among public universities
  - #1 Agricultural & Biological Engineering
- #10 in Shanghai Jiao Tong Academic Ranking of World Universities in the field of Engineering
Program Highlights
Undergraduate Education Highlights

Purdue hosted Workshop on “Pedagogy and Diversity” at the 2012 American Society for Engineering Education (ASEE) Annual Conference, June 2012, San Antonio, Texas

- Preconference survey
  - Where does instruction on diversity and inclusion occur on campus and in what type of courses?
  - Education of faculty about diversity and inclusion

- Workshop focused on pedagogical approaches sensitive to:
  - Gender (Professor Elizabeth Jessup, Univ of Colorado, Boulder)
    - Computer programming example, task-centered design
  - Multiculturalism (Professor Pamala Morris, College of Ag, Purdue)
    - Multiculturalism class example
  - Global Competencies (Professor Brent Jesiek, Eng Ed, Purdue)
    - Engineering design context example

- Intent was to provide examples that could be modified for a diverse classroom.
Undergraduate Education Highlights

Presentation at the 2012 ASEE Annual Conference to the Undergraduate Experience Committee

- Panel presentation titled: “Defining Undergraduate Student Success: Examining the Continuum of Recruiting, Admissions, Retention, and Graduation”
  - Discussion of success modeling and using success factors to change admissions criteria
  - Discussion of retention research and efforts on the sophomore year

Webinar presentation through WEPAN, Sept. 2012

- Presentation titled: “You Can’t Graduate Them If You Don’t Admit Them: Using Modeling Techniques to Inform Admissions Policy”
- Approximately 150 people were logged into the webinar system.
- Conversation with the White House Office of Science and Technology Policy followed.
Research Informing Admissions & Awarding of Scholarships

Distribution of GPA’s for Admitted Students 2006, 2007 and 2008 Cohorts

Boxplot of Overall GPA’s for Men and Women
All Admits to Engineering

Factors for 1-Year Retention 2004 Cohort

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<tr>
<th>Factor</th>
<th>SAT_V</th>
<th>SAT_M</th>
<th>SEM_ENGL</th>
<th>SEM_MATH</th>
<th>SEM_SCI</th>
<th>AVG_ENGL</th>
<th>AVG_MATH</th>
<th>AVG_SCI</th>
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</table>

Women
N=3829

Men
N=12,790

Women
N=289

Men
N=1219
Undergraduate Education Highlights

Inaugural First-Year Picnic and College Open House

- Capstone event of BGR week - Co-hosted with PESC
- Hosted 1300 First-Year Engineering students
- Students won a T-shirt after visiting 6 of 7 scavenger hunt locations
- Fun and exciting atmosphere with music, food, mini “Taste of West Lafayette,” pictures with Neil, inflatables, staff, faculty, and a trivia quiz with the Dean.
Graduate Education and Interdisciplinary Programs

○ Building Grad Student Communities
  • Advisory Committee – 2012-13
    – Focus on cultural awareness/competency
  • Grad student organizations (GSOs)
    – Establish committees, develop leaders
  • Grad Student Events Committee
    – New, at request of GSOs
  • Professional development initiatives
    – Ph.D. grants for travel to conferences
Professional Master’s Degrees

Two established in the College to date

• Engineering, Management and Professional Practice
  - One semester on campus – 2 engineering courses, 2 management courses
  - One-year professional practice with industry – take 3 engineering courses via distance ed
  - One semester on campus – 2 engineering courses, 2 management courses

• Professional Master’s in Engineering
  - One year on campus – 7 engineering courses, 4 management courses
Faculty Hiring During 2011-12

- 15 T/TT starts
- 2 research faculty
- 3 women (17.6%)
- 6 additional acceptances to start in the coming year (3 men, 3 women)
- 5 offers in progress
- 362 T/TT faculty (up from 359 in 2011)
- 57 women (15.7%) and 25 URM (6.9%) faculty
- 30 Faculty searches in 2012-2013
Academic Affairs Highlights

- Faculty of Engineering Practice (FEP) approved by Provost and ready to roll out
- Launched successful New Faculty Community program in 2011-12. Continuing program for 2012-13 new faculty
- Providing on-boarding for new ELT members
- Teaching and mentoring workshops presented by nationally recognized Richard Felder. Workshops being offered again on Oct. 16 & 17.
Academic Affairs Highlights

- Diversity & Inclusion Education
  - New generation diversity workshop for faculty and staff will be presented by Mark Chesler & Diana Kardia, associated with U of Michigan, on Oct. 30
  - Diversity Catalysts (Purdue ADVANCE)
- Purdue P&T Task Force
- CoE P&T Strategic Plan Team
- New faculty development/leadership opportunities – ELATE at Drexel. 1 female CoE faculty member in its inaugural class
## Research Highlights

### Sponsored Research Activity

<table>
<thead>
<tr>
<th></th>
<th>FY2012</th>
<th>FY2011</th>
<th>FY2007</th>
<th>FY2007 to FY2012 Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditures</td>
<td>$158.1</td>
<td>$150.3</td>
<td>$88.9</td>
<td>78%</td>
</tr>
<tr>
<td>Proposals</td>
<td>$553.4</td>
<td>$606.0</td>
<td>$458.8</td>
<td>21%</td>
</tr>
<tr>
<td>Awards</td>
<td>$141.0</td>
<td>$143.1</td>
<td>$89.7</td>
<td>57%</td>
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</tbody>
</table>

*Includes ABE and CoE research in Discovery Park. Expenditures include sponsored research and cost sharing. Dollar amounts are in millions; years are fiscal years.*
Research Growth

*Includes ABE and CoE research in Discovery Park.
Expenditures include sponsored research and cost sharing.
Dollar amounts are in millions; years are fiscal years.
FY12 Awards
$345.5M
West Lafayette Campus

Note: Areas of pie charts are proportional to award amounts
Major Research Awards

- NSF Network for Computational Nanotechnology
  - NCN Cyber Platform (Klimeck, ECE). 2012-2017 renewable, $14.5M

- FAA Center of Excellence for General Aviation
  - Partnership to Enhance General Aviation Safety, Accessibility, and Sustainability – PEGASAS (Crossley, AAE). Multi-university/industry collaboration, 2012-2022, $5M base funding

- Sustainability
  - NSF IGERT: Sustainable Electronics (Handwerker, MSE). 2012-2017, $3.2M

- Infrastructure
  - USDOC NEXTRANS (Peeta, CE). 2012-2013, $3.5M

- Healthcare
  - NSF EFRI – Emerging Frontiers in Research and Innovation: Purdue/Harvard-MIT/Tufts award in tissue engineering, flexible sensors, actuators, and electronics for chronic wound management (Ziaie, ECE). 2012-2016, $2M
Next Generation Manufacturing

- ManufacturingHUB.org (G. Adams, ManufacturingHUB) – Midwest Project to provide simulation and analysis tools to SMEs
- TAP (Technical Assistance Program) and ManufacturingHUB are a part of the National Digital Engineering & Manufacturing Consortium (NDEMC), which is part of the first funded National Network for Manufacturing Innovation (NNMI) Center of Excellence
- Faculty roadmapping for Next Generation Manufacturing Research (Deshmukh, IE and Sutherland, EEE)
- IN-MaC: Indiana Next Generation Manufacturing Competitiveness Center
  - Creation of a statewide center proposed to the State as part of Purdue’s 2014-2016 budget
  - College of Engineering, College of Technology, Krannert, Pharmacy
  - Ivy Tech, Vincennes, Purdue-Calumet as workforce development partners
  - University-Industry-State partnership in
    - education, training, and workforce development
    - Innovation via technology transfer
    - research and emerging clusters
Global Interactions – Highlights

❖ Early researcher program started with U Queensland.
❖ Number of 1st-year Engineering students the in Global Learning Community ~doubled from 30 in 2011 to 55 in 2012
❖ Brazil: Over 50 students traveled in four courses; workshops in remote sensing and bio-products in Nov.
❖ 30% increase in GEARE students (to 160)
❖ First cohort of 14 PhD students from Colombia, under the Colombia-Purdue Institute for Advanced Scientific Research (CPIASR) initiative
Global Interactions – Highlights

Upcoming initiatives and projects include:

• Ghana: Transforming Lives, Building Global Communities - EPICS/MEP/NSBE project
• New Global Design Teams in in Tanzania and Ecuador
• New model for Transdisciplinary Service Learning and Research with Nelson Mandela Institute in Tanzania
• New Global Strategic Partners emphasize integration of education, research and service; partnerships in Europe
Purdue Enterprise Company LLC (PEC)

- Launched as Purdue Engineering Consulting, LLC in December 2010.
- Office in the Purdue Research Park; Bob Davis is Director.
- Links faculty, acting as consultants, with industrial clients.
- By Sept 2012, >800 companies contacted, resulting in >300 leads for potential faculty consulting.
- Creates independent business people among the faculty and is a path of engagement for Purdue. It will be a funding source for Purdue after reaching breakeven. The company is on a steep growth curve with second year revenues nearly 10x first year’s.
Space

S-BRITE

Wing - II
(4 Stories)

IN-MaC

GRISSOM

Wing - I
(4 Stories)

Herrick

KNOY

Wang

Innovation Design Center
Extraordinary People, Global Impact

INDIANA NEXT GENERATION MANUFACTURING COMPETITIVENESS CENTER

Significant progress, but …
College of Engineering: Part 3
An Unprecedented Opportunity for Strategic Growth

Engineering Advisory Council: October 12, 2012
Leah H. Jamieson
The John A. Edwardson Dean of Engineering
Over the Past Several Years

Decentralized Activity  Centralized Resources

Increases in enrollment and research incur increased effort on the part of faculty and CoE/school staff

Increases in enrollment and research generate increased revenue, which is held centrally
The Key Challenge*

Percent Growth: Fall 2006 to Fall 2011

CoE Undergrads
CoE Grad Students
CoE Research Expend
F&A from CoE Grants
CoE Undergrad Tuition & Fees
CoE Budget
CoE Faculty
CoE Staff

0% 20% 40% 60% 80% 100%

* Based on presentation to the Board of Trustees, September 29, 2011; updated August 2012 with FY12 year-end tuition/fee and F&A numbers
“Resourcing for Success” Proposal

Fall 2011: CoE proposal to Provost Sands to:

a. Allow continued modest growth in enrollment
   - National call to graduate 10,000 more engineers/year
   - CoE contributes to Purdue’s budget and student quality

b. Connect CoE budget with enrollment

c. Achieve parity in undergrad-to-faculty ratio + instructional support budget with nearest peer (Georgia Tech)

d. Enable greater research productivity and innovation in education by supporting undergraduate education at a level competitive with our peers

Undergrad-to-Faculty Ratio (low is good)
“Resourcing for Success”

- “Resourcing for Success” proposal advanced by the Provost to become part of the FY2013 budget planning discussions
- Endorsed by the Board of Trustees in April 2012
- FY 2013 funding is in our budget allocation for this year
- FY 2014 and 2015 funding is included in the planning budget for the next biennium
- Annual reporting to the Provost
Parameters of the Endorsed 2012-2016 Strategic Growth Plan – People

- Undergrad enrollment (w/out ABE) grows from 7087 to 7778 – 691 undergrads
- Faculty grows from 358 to 465 – up to 107 faculty
- Undergrad-to-faculty ratio goes from 21.2 to 17.6 (GA Tech)
- TAs increase by 44 FTE, 88 half-time TAs
- Instructional staff increases by 13
- Support staff increases by 92
- Total staff increase of 105

+9.75% compared to F11
+30%

Modeled as a function of # undergrads

Modeled as a function of faculty size

+28%
CoE Strategic Growth Plan – *Impact this Year*

- $6.2M new allocation for FY13
- From the $6.2M, $3.2M has been distributed by formula as new money to the Schools/Divisions for instructional support
  - More than offsets the $1.1M budget reductions absorbed by the Schools in FY12 and FY13
- $600K allocated to meet short-term critical instructional needs
- 30 faculty hiring searches authorized to meet immediate needs and realize immediate opportunities
Implications

- Faculty Size

- 2001 to 2011: Faculty grew from 277 to 358
- 2012 to 2016: Faculty grows from 358 to 465

Plus 50-60 faculty replacements
Implications (cont.)

- **Faculty**
  - Composition of the Faculty: rank, track, diversity, ...
  - **Criteria for allocation/distribution:** by school, research area, nature of research, alignment w/ strategic plan/strategic goals, ...
  - Recruiting processes – can we improve the efficiency???
  - Climate issues for the entire college
  - Resources

- **Space**
  - We estimate a need for at least 150K ASF in new space, modeled as a function of faculty size
  - Medium/long term: Wang, Herrick, planning underway for Innovation Design Center, MJIS expansion, new IE/CoT/Manufacturing/Systems building, reclaim library space in POTR, ARMS expansion
  - Short term: reassignment by the Provost, efficiencies w/in the College, leased space
  - Short term: temporary buildings? new models for space utilization?

- **Research growth**
Implications (cont.)

- Students
  - Trends that will change the nature of teaching and learning
  - Undergrad quality & diversity; FYE capacity; capacity in Schools/Divisions; pressure points in teaching, advising, recruiting ...
  - Graduate student growth as a function of faculty growth, research growth, and resources
  - Matching student growth to opportunities: internships and coop, undergrad research, EPICS, study abroad, employment
  - Facilities and labs – both size/capacity and type
  - Continuing to build a positive climate for all students
Implications (cont.)

- Staff growth
- Reputation
  - Potential temporary dip in research $/faculty for College rankings?
  - Growth should increase reputation for discipline & College rankings
  - Sharpening the focus on what Purdue Engineering is known for
- Communications/PR
- Development needs estimated at ≥ $135M
  - New scholarship endowments $34M
  - New Professorship endowments $21M
  - Rising Star Faculty endowments $8M
  - Grad student fellowships $8M
  - New capital projects $52M
  - R&R projects $13M
Big Picture:
*Transformational for Engineering and Purdue*

- Moves us past the recent budget cuts
- Purdue will play a major role in the national call to increase engineering graduates by 10,000/year
- Opens the door to significant faculty hiring
- Improves our undergrad-to-faculty ratio
- Enhances Engineering’s reputation, and Purdue’s
- Creates an opportunity to shape our education future
- Creates an opportunity to shape our research future
- Creates an opportunity to magnify our impact
Principles

1. Strive for transformational change
2. Plan for the long-term future
3. Use growth as an opportunity to broaden our diversity
4. Respect the relationship between activity and resources
5. Inform decisions by data
6. Not compromise quality for the sake of speed
7. Generate creative opportunities, not constrained by exact timelines and dollars
8. Support decisions by resource feasibility to ensure sustainability
9. Have a positive impact on the climate for the whole College
10. Ensure that student differential fees directly benefit our students
11. Leverage this growth to generate significant gift funding
12. Be inclusive in our discussions and decision making
Planning for Strategic Growth

- Widespread engagement of faculty, alums, staff, students
- Distinguished seminars: trends that will shape the future
  - The land grant promise in the global era
  - The public university of the future
  - The role of engineering in education and in society
  - Game changers in technology, research, and education
  - Critical partnerships for the future
- Working groups and workshops around key topics
  - Faculty hiring
  - Mentoring, promotion & tenure
  - New models for flexible space use
- Goal: An implementation plan by June 2013
The problem has been stated in terms of undergrad-to-faculty ratio ...
... but everything is connected
Big Questions

How do we make the most of this opportunity?

What are the blue ocean opportunities?

What are critical polarities and how do we manage them?

What are critical processes, metrics, targets, milestones?

How can we engage the collective creativity and brilliance of the College in planning for strategic growth?
Huge Questions

How will this shape *how we educate, how we influence, who we are*?

*Where could the College of Engineering be in 15-20 years if we are successful in developing and implementing bold plans for growth?*
EXTRAORDINARY PEOPLE
GLOBAL IMPACT

You must be the change you want to see in the world.

Mahatma Gandhi

EXTRAORDINARY
PEOPLE GROWTH IMPACT
Discussion: Big Picture Contexts

- Where is higher education in the US heading?
  - Land grant institutions
  - Large public research universities

- Disruptive trends – in technologies, education, research – that will shape that future and propel some universities to a leadership position

- 10:30-11:15
Lunch with Students; Report Out and Discussion

Guiding question: What are your aspirations for the College of Engineering and Purdue University

East Faculty Lounge, PMU, 11:30-12:30

Stakeholder aspirations for the College and Purdue – students, EAC members, ELT members – themes and differences

1:00-2:00
Aggressive Growth Case Studies

- EAC members share experiences with and observations of aggressive growth
  - Positive and negative lessons
  - How to maintain morale, identify and support emergent leaders, warning signs of trouble, looking for unexpected opportunities

- 2:00-3:00
Synthesis and Recommendations

3:00-3:45