Re-Engineering For a Sustainable Future

2/23/16

Dean Peter E. Crouch
UH Manoa
Why the Title? – meeting the Challenges Hawaii faces

Is the College positioned to contribute to building the fourth Technology Pillar for Hawaii’s economy?

10 ways in which the College is meeting Hawaii’s Challenges in Pictures and Graphs
We **enjoy** a very fragile way of life in Hawai‘i!

Is our way of life sustainable? Can we improve our way of life?

Enormous sums of money are spent on sustaining this quality of life in the middle of the Pacific, over and above the US mainland cost!

And

- We have not been hit by a major Hurricane in many years (global warming makes this more likely)

And

- We have avoided the impact of closure of US West Coast ports for prolonged periods (while narrowly)
Six challenges in maintaining and possibly improving the quality of life in Hawaii....

I. Water (many communities continue to suffer droughts)
II. Energy (at least we have made a commitment to become partially self sufficient by 2045)
III. Food (we hardly grow anything relative to our needs!)
IV. Goods (we hardly make anything!)
V. Infrastructure (while we have a few new shiny buildings, a lot of our infrastructure is decaying – e.g. sewers, schools & UH Mānoa)
VI. Educated tech savvy workforce (to help build the knowledge/innovation economy here in Hawai‘i)
Hawai‘i **MUST** become more self-sustainable in all these aspects

We have clearly **Engineered** our way into the current precarious (and probably unsustainable) status-quo

We must **Re-Engineer** our way to a more sustainable future
Re-Engineering For a Sustainable Future

Hawaii’s three Economic Pillars - Today

**Military/Security Presence**
College is a major supplier of engineers
College continues to develop relations with many components of the Military/Security Presence in Hawaii

**Tourism** (Hotel room nights)
Professional Conferences – brings direct economic benefits, ensures Hawaii does not lose touch with technological innovation, and ensures access to important national/international professional leaders
UH and College of Engineering play a very significant role in bringing these conferences to Hawaii

**Construction** – Building and Maintaining the built Infrastructure
Need for engineers - College is a major supplier
Need for Hawaii informed research - College is a supplier – how to build more capacity?
Is the College positioned to contribute to building the fourth **Technology Pillar** for Hawaii’s economy?

- Engineering is clearly a driver for building a technology based economy – proven all over the nation and the world!
- In Hawaii we have developed Science as a driver to take advantage of the Natural Laboratory that Hawaii affords
- Is this enough?
- Is UH/UH Manoa moving to provide the necessary STEM/Engineering workforce?
What is the profession that is **key** to meeting all six challenges AND developing a fourth technology pillar for the Hawai‘i economy?

**ENGINEERING**

How is the University in Hawaii at Mānoa meeting this imperative?

- Only 13.5% of funding to STEM academic units goes to the College of Engineering (rest to science & agriculture)
- “Only 43% of degree programs are reasonably vocational” - Crouch
## College Student/Faculty Ratios

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<tbody>
<tr>
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<td>58</td>
<td>57</td>
<td>57</td>
<td>55</td>
<td>53</td>
<td>54</td>
<td>57</td>
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<tr>
<td>Undergrad Enrollment</td>
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<td>751</td>
<td>746</td>
<td>753</td>
<td>816</td>
<td>912</td>
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<td>Graduate Enrollment</td>
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<td>Pre Engineering Enrollment</td>
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<td>116</td>
<td>203</td>
<td>227</td>
<td>255</td>
<td>300</td>
<td>306</td>
<td>288</td>
<td>288</td>
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</tbody>
</table>

**Student/Faculty Ratios**

- **UnderGrad:Fac Ratio**
- **Undergrad+Grad:Fac Ratio**
- **Undergrad+ PreEng: Fac Ratio**
- **Total Students:Fac Ratio**
10 ways in which the College is meeting Hawaii’s Challenges in Pictures and Graphs

1. Growing the number of students it educates
2. Ensuring that the College is Hawaii’s College of Engineering – not just East Hawaii
3. Targeting education & research on the 6 major challenges
4. Helping students gain leadership experiences
5. Helping students get hands on project experience
6. Ramping up focus on Innovation and Entrepreneurship
7. Responding to growing technological needs – i.e. security and big data
8. Pursuing pro-actively K-12 STEM outreach
9. Constantly meeting and partnering with the Hawaii community
10. Fund raising to help students obtain more opportunities than state funding and tuition provides
1. Growing Student Enrollment
2. Ensuring that the College is Hawaii’s College of Engineering – not just East Hawaii

- College has presence on all islands by maintaining relationships with the UH community colleges (and 4 year Colleges)
- Support and applaud the important role played by the Community Colleges in contributing to STEM workforce needs
- Developed MOUs with Kapiolani and Leward CCs to assist articulation and transfer of CCs students to the College of Engineering
- About to sign MOU with all CCs
- Coming out of Major federal 5 year grant studying what it means to help students transfer from CCs to 4 year institutions
- Acknowledge and leverage the fact that many minority and disadvantaged students join CCs after high school – in particular Native Hawaiian students
Graduates & Transfer Graduates

College Graduates & Transfer Graduates

% of Transfer Graduates

Total College Graduates
College Graduates who transferred


250
200
150
100
50
0


0%  10%  20%  30%  40%  50%  60%
3. Targeting education & research on the 6 major challenges

I. **Water** – Ensure that Hawai‘i has water into the future – in the face of rising sea levels – Solve challenges of moving & extracting water from where it occurs naturally to where it is needed - Re-engineer the water and waste systems as they age

II. **Energy** – Help develop homegrown technologies that enable Hawai‘i reach the 2045 target for renewable energy supplied by the grid - Help educate the ensuing workforce – Help develop a sustainable system for transportation (not specifically in the 2045 law)

III. **Food** – be of assistance in moving to a much more efficient agricultural systems, re-engineering the systems needed to supply the needs of agricultural lands (maybe for Biofuels to meet the 2045 goal), & engineering intensive food growing systems
3. Targeting education & research on the 6 major challenges

IV. Goods – Help Hawai‘i move toward a vision where goods are recycled or (re-)manufactured here in Hawai‘i to significantly decrease the reliance on importing everything - Assist the Chamber of Commerce develop manufacturing in Hawaii – Developing (Re-)manufacturing capability in the College

V. Infrastructure – Supplying workforce to Hawaii state agencies, engineering and construction companies – Developing internal R&D strengths e.g. disaster mitigation, coastal, water resources

VI. Educated tech savvy work force - Maintaining an ABET accredited program in four disciplines (Mechanical, Electrical, Civil and Computer Engineering) - College made Innovation & Entrepreneurship a new focus - Help train a new generation of engineers for small and nimble technology enabled companies
Student Research to be featured in this year’s College Banquet

Develop hydrologic model to identify causes of erosion around Kaho‘olawe’s Pōkāneloa monolith

Develop a demand-response platform and client network for residential grid solutions aimed at reducing costs for residential customers of electric utility.

Design/build a drone that can attain, sustain, and land in a safe manner, independent of the mission systems: entered in the Seafarer Student UAV competition.
4. Helping students gain leadership experience:
   • Encourage many student organizations
   • Student chapters of professional societies
   • Participate in national student competitions
   • Honor societies

5. Helping students get hands on project experience:
   • Participate in national student competitions
   • Participate in national consortiums pursuing innovation in project work
   • Raising funds for 3 platforms for extra-curricula student projects – and making public exhibitions of these
   • Enhancing Capstone Design Projects within the curriculum
IEEE Student Branch

ASME Student Branch
SWE Student Branch

ASCE Student Branch
SAE Formula Competition
SAE Mini Baja Competition

Human Powered Vehicle
Concrete Canoe Competition

Steel Bridge Competition
Eta Kappa Nu Native Hawaiian Science and Engineering Mentoring Program
ECUH

Engineering Student Ambassadors
6. Ramping up focus on Innovation and Entrepreneurship
   • College Maker Space – FabLab
   • Taking lead in developing the UH Manoa Innovation Space – UH iLab
   • Clear University leader on a research proportional basis of Tech Transfer Activity
   • Community Available – Start-Up 101 course (free to undergraduates)
   • Member of “Pathways to Innovation” National Consortium Managed by Stanford/Venture/Well

7. Responding to growing technological needs – i.e. security and big data
   • Developed new degree program in computer engineering
   • Members of the faculty consortium that obtained the NSA research designation for UH
   • Members of the faculty consortium that are seeking the NSA teaching designation for UH
   • Member of National NSF sponsored Information/Big Data Center
8. Pursuing pro-actively K-12 STEM outreach
   • Faculty volunteer at K-12 STEM tournaments
   • Faculty/Student Ambassador’s visit schools
   • Schools and families visit the College at > 4 events during the year
9. Constantly meeting and partnering with the Hawaii community
   • Career fair; Dean’s Advisory Council; department Industrial Advisory Boards;
     partnering in research; adjunct professors; outreach events; students and faculty
     volunteers……..
10. Fund raising to help students access more opportunities than state funding and
     tuition provides
    • College Annual Banquet where students display their projects – This Year April 21\textsuperscript{st}
    Hawaii Convention Center – Proceeds funds student projects and STEM Outreach
    • Many companies and organizations give scholarships for our students
    • Many faculty attract grants focused on improving the College’s education in
      particular niches – e.g. native Hawaiian engineers
ECUH at VEX Competition

Student & Family Orientation
Junior Expo
Annual Banquet
## Summary Statistics

### Enrollment Statistics

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<th>Fall 2015</th>
<th>Fall 2014</th>
<th>Fall 2013</th>
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<td>FR</td>
<td>158</td>
<td>162</td>
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<td>SO</td>
<td>157</td>
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<td>14.1%</td>
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<td>22.0%</td>
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<td>SR</td>
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<td>47.9%</td>
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<tr>
<td>Pre-Engr</td>
<td>289</td>
<td>288</td>
<td>303</td>
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<td><strong>Total UG</strong></td>
<td><strong>1,336</strong></td>
<td><strong>1,292</strong></td>
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<td>GR</td>
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<td>9.4%</td>
<td>11.6%</td>
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<td><strong>Total CoE</strong></td>
<td><strong>1,474</strong></td>
<td><strong>1,462</strong></td>
<td><strong>1,450</strong></td>
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<td>New Transfers</td>
<td>145</td>
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<tr>
<td>Women</td>
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<tr>
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<td>21.1%</td>
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<td>Hawaiians</td>
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<td>13.3%</td>
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### Graduation Statistics

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<td>BS</td>
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<tr>
<td>MS, PhD</td>
<td>49</td>
<td>42</td>
<td>62</td>
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Time to graduation (entered as freshmen, graduated 2010-2015) Ave. 5.02 years
Time to graduation (entered as transfer, graduated 2012-2015) Ave. 3.76 years