2018 RED Meeting: Lightning Talks

1. USD
2. UNCC
3. Purdue
4. Oregon State
5. ASU
6. CSU
7. Virginia Tech
8. UTEP
9. Rowan
10. New Mexico
11. Iowa State
12. UIUC
13. Boise State
14. Texas A&M
15. Seattle
16. NC A&T
17. Georgia Tech
18. East Carolina
19. Clemson

2 Min!

University of San Diego

Developing Changemaking Engineers

Changemaker HUB
UNIVERSITY OF SAN DIEGO
www.sandiego.edu/changemaker

University of San Diego®
Developing Global Changemakers
Forging Paths That Change the World

Leading Change™
THE CAMPAIGN FOR USD

ENVISIONING 2024
Because the world needs Changemakers

Liberal Arts for 21st Century
Care for Common Home
Access/ Inclusion
Practice Changemaking
Engaged Scholarship
Anchor Institution

ENVISIONING 2024

Because the world needs **Changemakers**

New

Course Modules

Revised Courses

Liberal Arts for 21st Century

Care for Common Home

Access/ Inclusion

Practice Changemaking

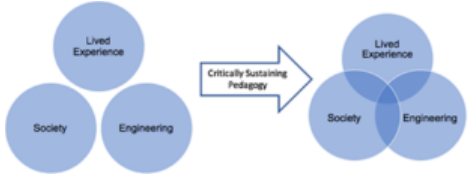
Engaged Scholarship

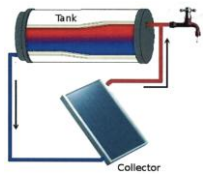
Anchor Institution

Industry Scholars

Engineering Exchange

Discovering the Engineer





University of San Diego®
SHILEY-MARCOS SCHOOL OF ENGINEERING

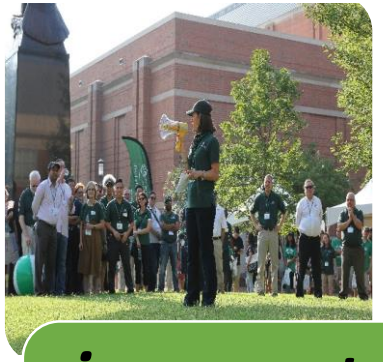
DEVELOPING CHANGEMAKING ENGINEERS

context

our students

value

engaged pedagogy



impact

new alignment

An Engineering Education Skunkworks to Spark Departmental Revolution

Project context—norms or values

1. Across data sources, department members say they care about student outcomes.
2. Students, staff, and faculty report being incredibly busy, but have a strong drive for productivity and excellence.
3. (2) emphasizes efficiency, and places limits on a person's ability to 'think big' about (1).

Project context—structural component

What do you think faculty think their job is?

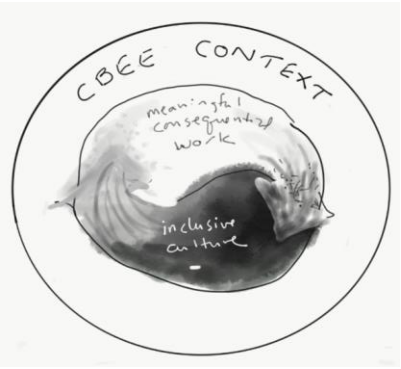
Table 2: Yes and no percentages by question (Q1-Q20)

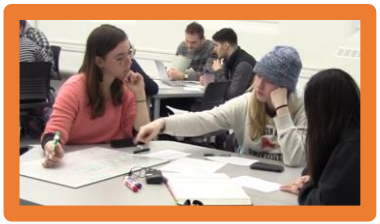
	What I think		What most ME faculty think	
Statement	Yes	No	Yes	No
Faculty members really should take a stronger leadership role in departmental issues.	83.0	17.0	68.6	31.4
Leadership does a good job of fixing all the things that are wrong around here.	40.7	59.3	34.6	65.4
The workload assignments (membership on committees, teaching load) around here are distributed equitably.	66.7	33.3	69.2	30.8
Committee meetings in this department are usually very inefficient uses of faculty time.	44.4	55.6	57.7	42.3
Collaboration is encouraged and rewarded at Purdue.	81.5	18.5	79.2	20.8
Faculty need to be careful when collaborating across Schools or Colleges.	24.1	75.9	34.6	65.4
Faculty spend too much time doing things that could be done by others (i.e., doing things that you don't need to be a faculty member to do).	61.1	38.9	71.2	28.8
Faculty are most effective when they are focused on their own research program.	66.7	33.3	80.8	19.2
Faculty are empowered to change things they don't like about this department.	40.7	59.3	42.3	57.7

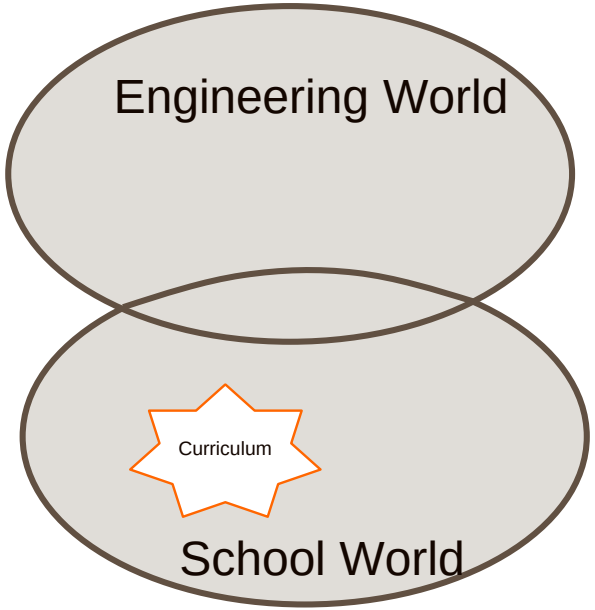
Shifting Department Culture to Re-Situate Learning & Instruction

Oregon State University

UNIVERSITY of WASHINGTON







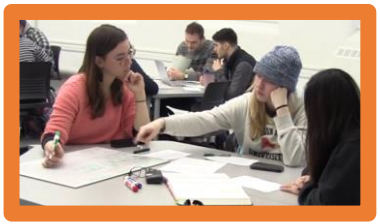
Re-situate the curriculum

- Thinking & acting like engineers (PDE) is more likely if students are immersed in professional contexts (engineering world) rather than thinking like engineering students (school world)
- Studio "2.0" reform in ten core courses from “work

Shifting Department Culture to Re-Situate Learning & Instruction

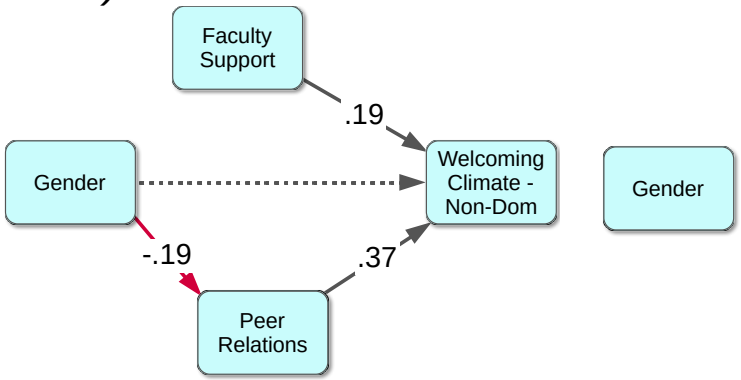
Oregon State University

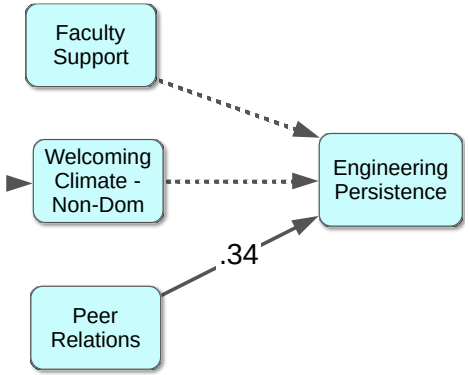
UNIVERSITY of WASHINGTON



Our work is centered on the creation of a holistic, inclusive, and professionally based learning environment for our students.

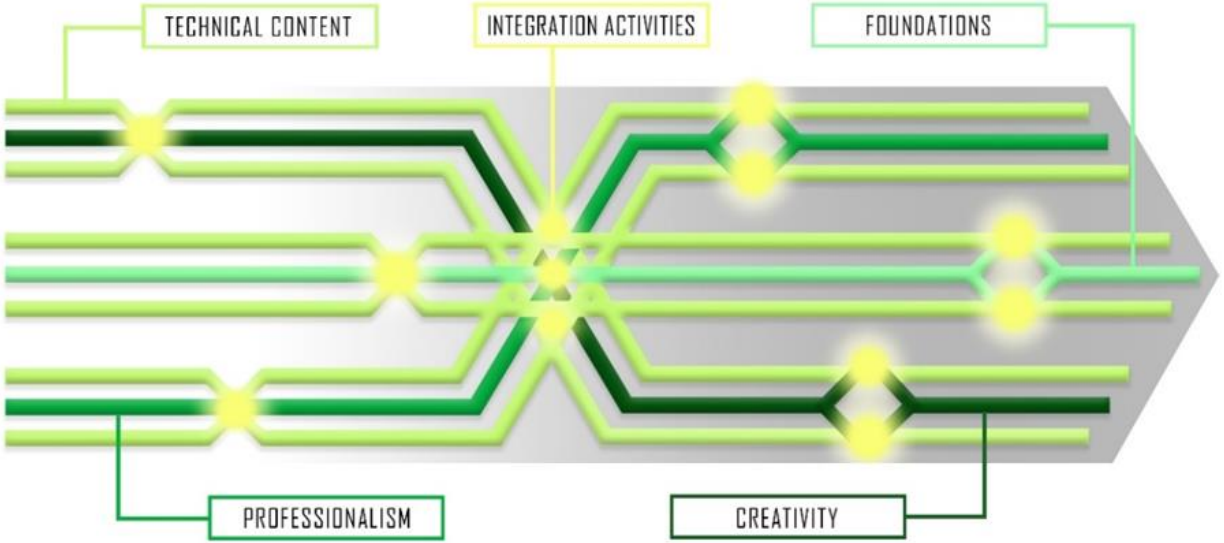
- *Faculty Development* - 14 of 29 faculty have participated in a 60-hour development opportunity directly addressing power, difference and discrimination (DPD) in the classroom and in STEM academic culture.
- *Undergraduate Student Climate Survey (N=277) and Focus Groups (N=56)*





NSF RED Revolutionizing Engineering and Computer Science Departments

Holistic Approach Moves Away from Course-Centric Organizational Structure



Impacts of RED

Faculty Norms

- Faculty are working collaboratively instead of in silos
- Course-centric mindset is shifting

Professional Formation

- Our work has reshaped professional formation throughout the college
- Engineer in Residence program and virtual internships are standout successes

Faculty as change agents

Pedagogical risk-taking

ASU
Ira A. Fulton Schools of Engineering
Arizona State University

Sharing across ecosystems by “Additive Innovation”

Ira A. Fulton Schools of Engineering

Arizona State University

VIRGINIA TECH™

is Radically Expanding Pathways

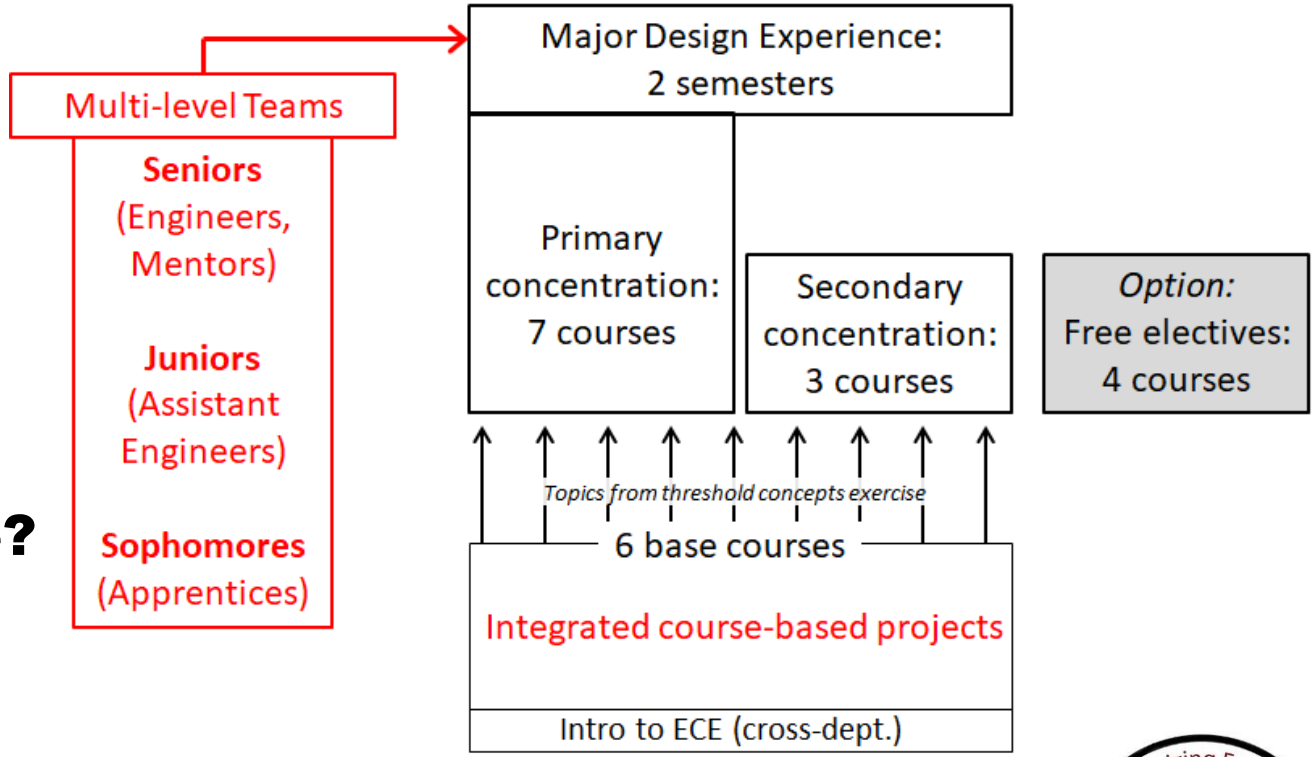
- **Make ECE more interesting to more students**
  - **Multiple technical pathways to becoming an ECE professional.**
  - **Engaging and motivating faculty in new ways.**
  - **Using *Personas*, threshold concepts and project-based learning to drive a move towards student success.**

NSF

RED Revolutionizing Engineering and Computer Science Departments

VIRGINIA TECH™

- **We always ask is this change:**
  - **Scalable?**
  - **Transferable?**
  - **Student-focused?**



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RED Revolutionizing Engineering and Computer Science Departments

Grant # 1623190

A Model of Change for Preparing a New Generation for Professional Practice in Computer Science

Computer Science Department

PROJECT GOAL: to cultivate socially conscious connectedness among students, faculty, and industry by expanding curriculum driven by an understanding and appreciation for the cultural contributions of diverse students in a globalized world.

Norm: Student Success through Asset-Based Thinking

- UTEP Edge Initiative
  - Enriched students experiences
  - Life-long success
  - Asset-based workshops
- Climate Surveys
  - Students' feedback
  - Faculty role in inclusion and equity
- Student Advocates
  - Creating a student-centered climate
  - Engaging students through PickX

Web Magazine
By Students
For Students
PickX

Re-imagining what it means to learn, whose knowledge counts, and what counts as knowledge

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PROJECT GOAL: to cultivate socially conscious connectedness among students, faculty, and industry by expanding curriculum driven by an understanding and appreciation for the cultural contributions of diverse students in a globalized world.

Organizational Aspect

- Structured flexibility & depth of knowledge through:
  - One-credit hour courses
  - Concentrations
  - Hands-on workshops
  - Professional conferences
- Collaboration with industry
  - Faculty in residence
  - Domestic exchange
  - Googler in residence

ARL Google National Security Agency NM State University California State University Dominguez Hills 1960 Microsoft CAHSI

CROSS-INSTITUTIONAL COLLABORATIONS

Re-imagining what it means to learn, whose knowledge counts, and what counts as knowledge

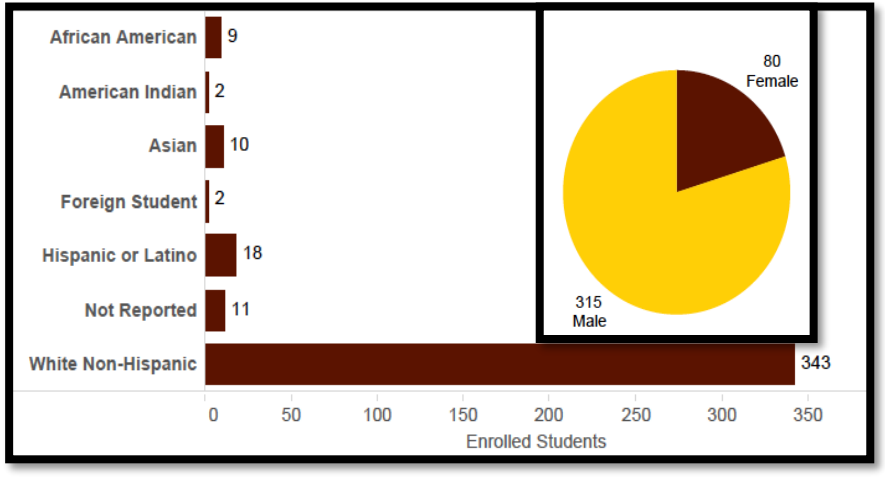
Revolutionizing Engineering Diversity (RevED)

More details at http://reved.rowan.edu

Beena Sukumaran, PI & Professor, Civil & Environmental Engineering

Institutional Context

Lack of Diversity



Innovative Curriculum

Fall Courses	Spring Courses
First Year	
Freshman Engineering Clinic I (2)	***Freshman Engineering Clinic II (2)***
Composition I (3) Programming (3)	Introduction to Scientific
Calculus I (4)	Calculus II (4)
General Education Course (3) Infrastructure (3)	Introduction to
Chemistry I (4)	Physics I (4)
Hours = 16	Hours = 16
Second Year	
Sophomore Engineering Clinic I (4)	***Sophomore Engineering Clinic II (4)***
Calculus III (4) Analysis I (4)	Math for Eng.
College Chemistry II or Physics II (4) (4)	Surveying & Engineering Graphics
Statics (2)	Dynamics (2)
Civil Engineering Systems (3)	Solid Mechanics (2)
Hours = 17	Hours = 16

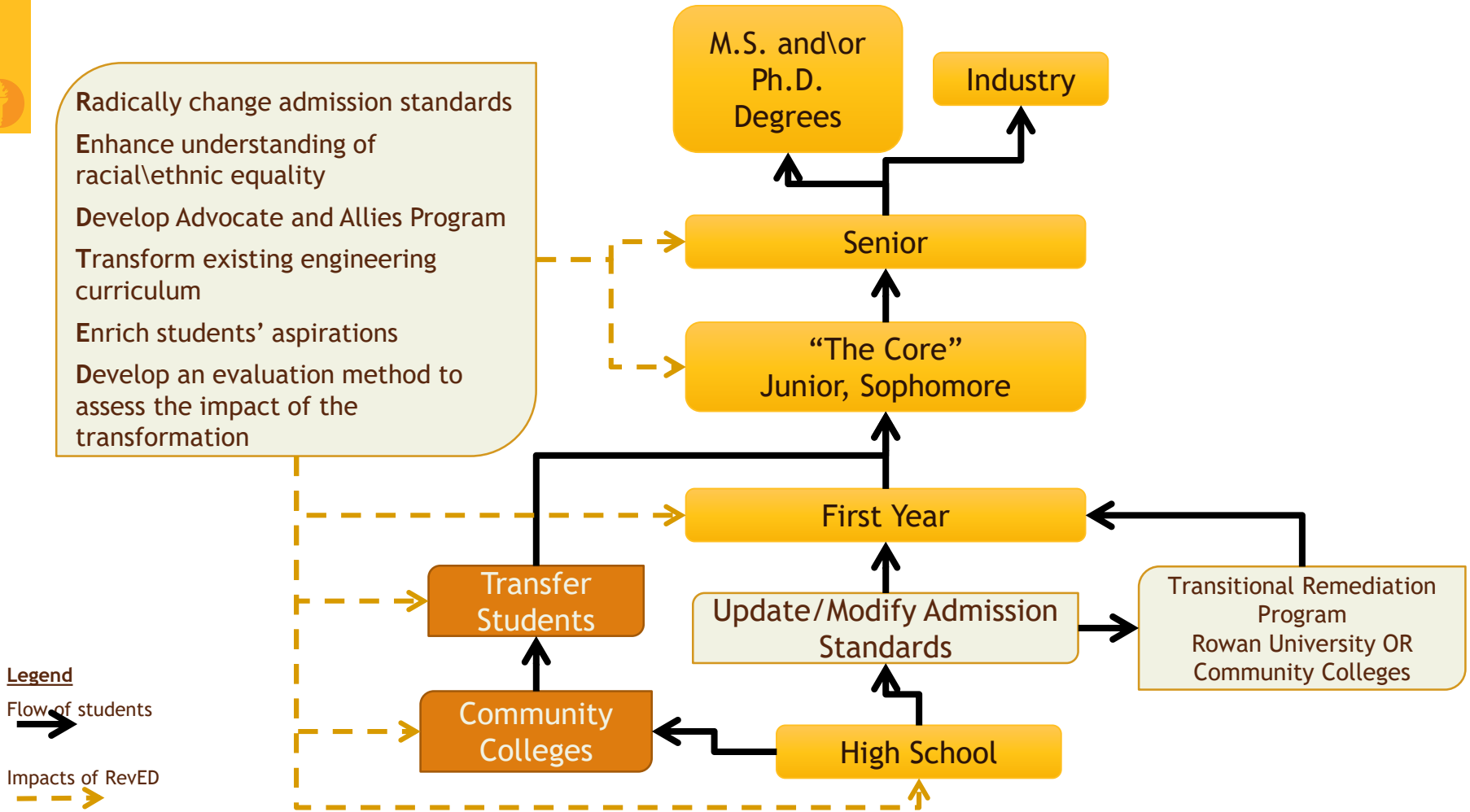
What do we mean by Diversity?

Underrepresented minorities

- Racial/Ethnic
- Religious
- LGBTQ+
- Gender

Underserved groups

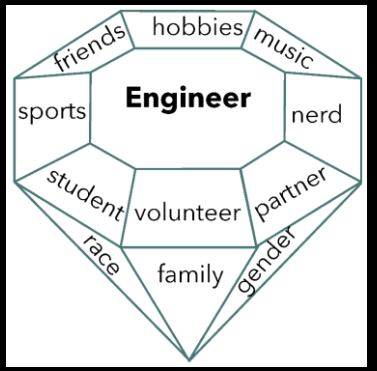
- Low SES
- First Generation
- Students with Disabilities
- Veterans
- Transfers/Non-



More details at http://reved.rowan.edu

FACETS: **F**ormation of **A**ccomplished **C**hemical **E**ngineers for **T**ransforming **S**ociety

Discover the attributes, skills, and beliefs that students hold



Connect these to professional engineering practices and identities

THE UNIVERSITY OF NEW MEXICO

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Value: Change faculty mindset so they can uncover the interests, skills & beliefs our diverse students hold that are relevant for engineering

Organization: A faculty ready to support diverse students - who bring myriad assets - to become chemical engineers uniquely capable of empathizing with and addressing human needs and grand challenges

The FACETS Project (facets.unm.edu)

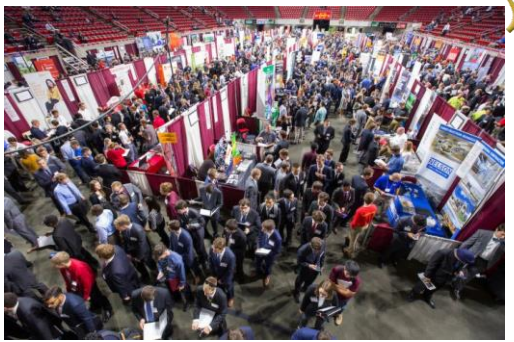
CIRE: **C**ommunity, **I**ndustry, **R**esearch & **E**ntrepreneurship

IOWA STATE UNIVERSITY

ride.ece.iastate.edu

Something valued:

- Experiential, hands-on learning and student work-ethic



This impacts us:

- Authentic engineering problem-solving
- Highly structured lab experiences and less flexibility

RIDE

RED

This material is based upon work supported by NSF under award EEC-1623125.

IOWA STATE UNIVERSITY

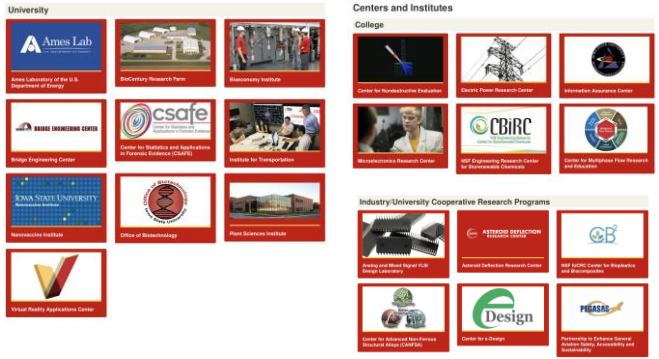
ride.ece.iastate.edu

Something built:

- Innovation in teaching/learning
- Collaboration in research
- Department areas and metrics

This impacts us:

- Respect for education research
- Area-centric education in dept.
- Limited shared vision about student learning experience

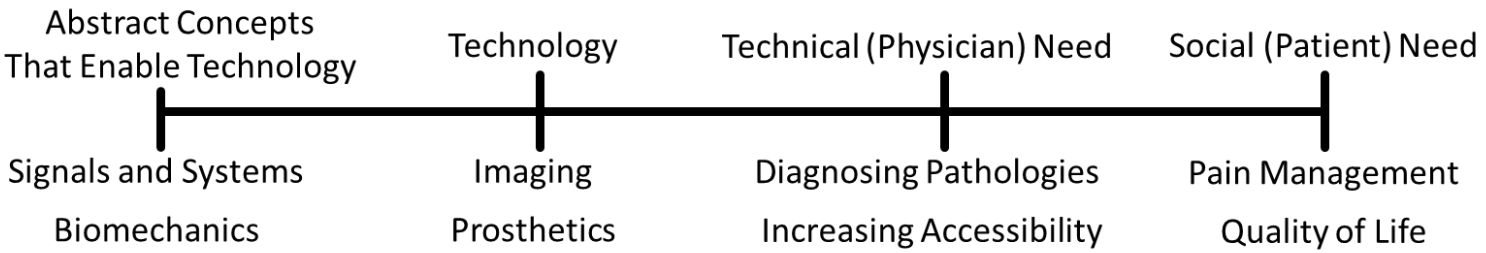


- Bioengineering (Group chair: Jaeyoun Kim)
- Communications and signal processing (Group chair: Namrata Vaswani)
- Computing and networking systems (Group chair: Phillip Jones)
- Electric power and energy systems (Group chair: Ian Dob
- Electromagnetics, microwave, and nondestructive evaluat
- Microelectronics and photonics (Group chair: Santosh Pa
- Secure and reliable computing (information assurance) (G
- Software systems (Group chair: Manimaran Govindarasu)
- Systems and controls (Group chair: Umesh Vaidya)
- VLSI (Group chair: Degang Chen)

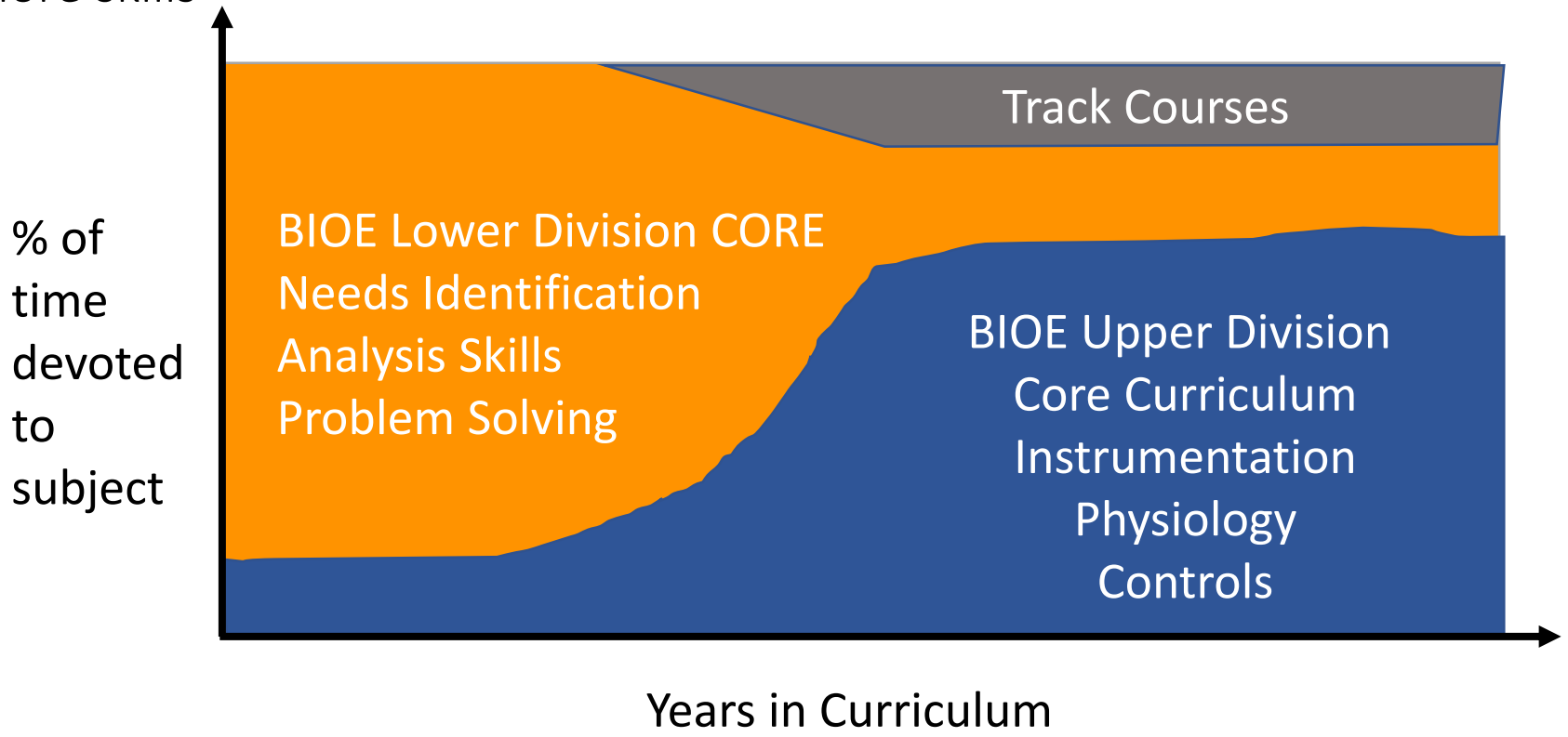
This material is based upon work supported by NSF under award EEC-1623125.

Defining the Frontiers of Bioengineering Education at Illinois and Beyond – University of Illinois at Urbana-Champaign

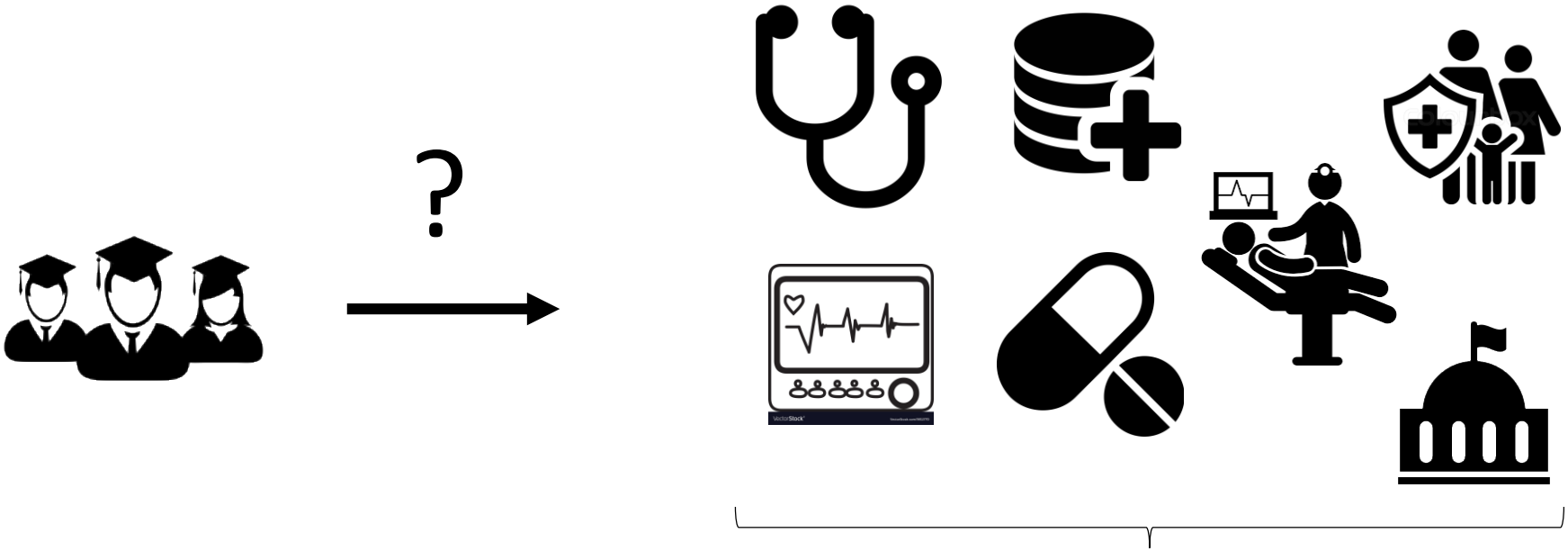
In a needs focused curriculum faculty are challenged to focus courses based on the needs that drove the creation of the technology or concepts.

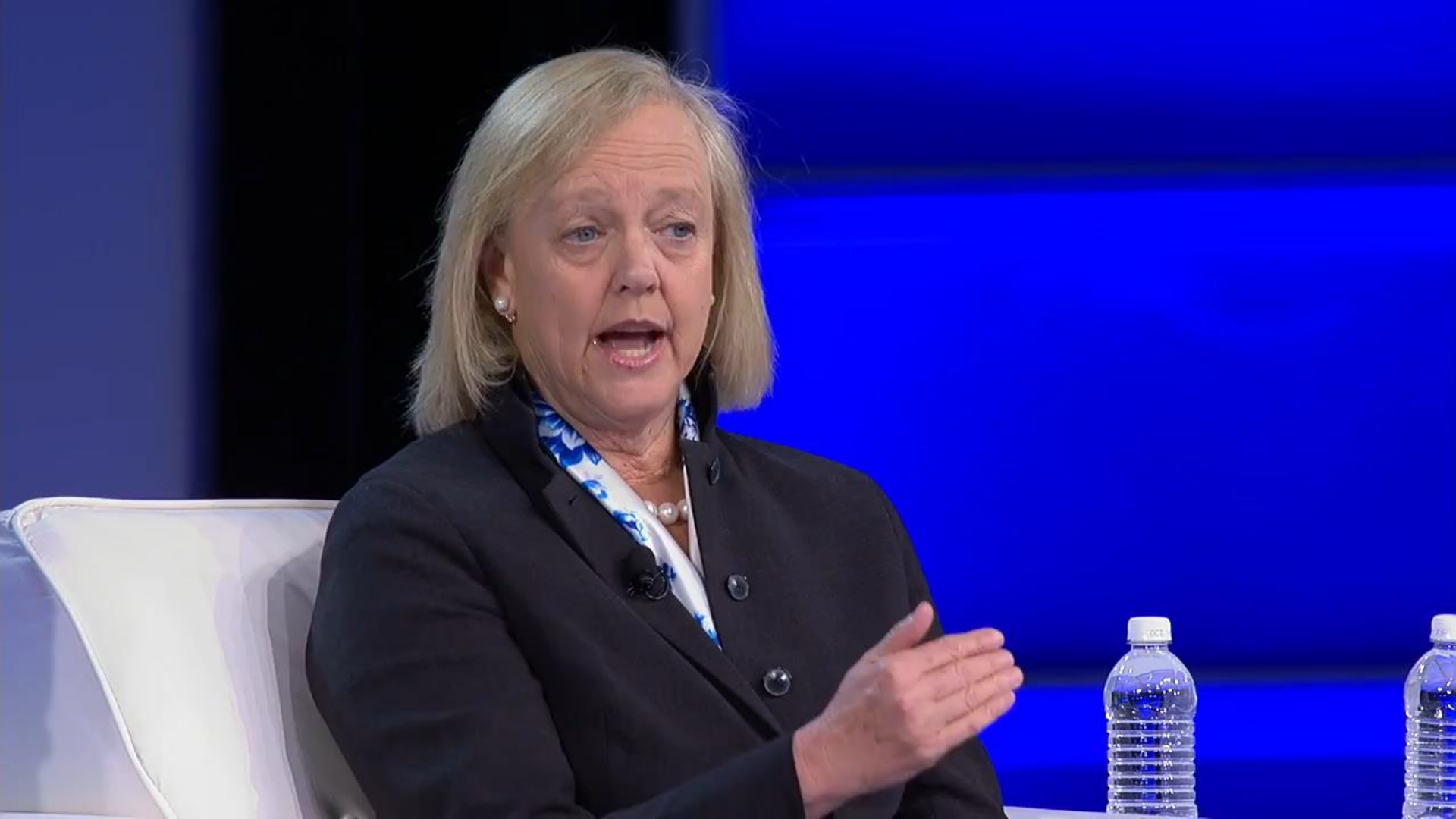


We vary the curriculum to focus on clinical needs, problem solving, and analysis earlier and more of the solution space as they develop more skills



To enhance conceptualization of the impact of curriculum on career choices, we are adding a Bioengineering Ecosystems course that focuses on informed academic and professional decision-making.

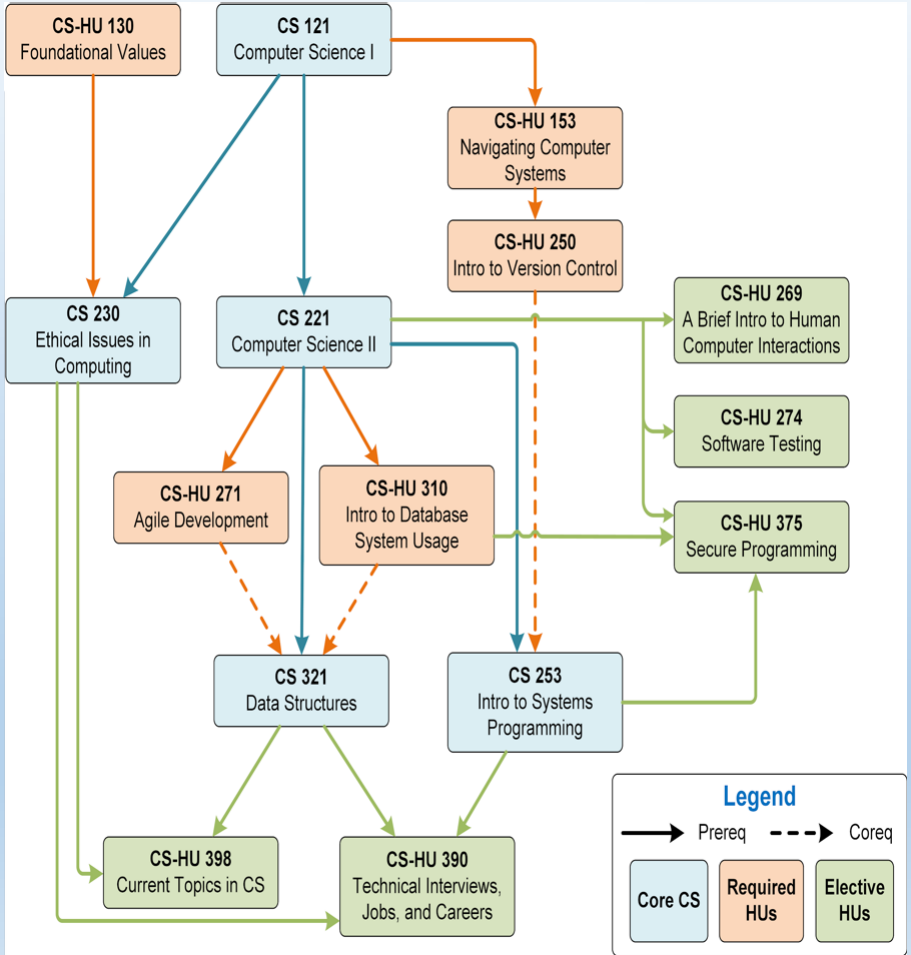




Portable concept: Hatchery Unit

General Idea:

- Small, Short (1 credit, 5-7 weeks)
- Industry Inspired
- Key skills & core concepts
- Threaded
- Quality/Reputation
- Industry participation
- Teaching/Research



REvolutionizing Diversity Of Engineering (REDO-E)

TEXAS A&M UNIVERSITY
Rodney Bowersox, Lead PI; Kristi Shryock, CoPI; Ed White, CoPI; Jeffrey Froyd, Engineering Education Researcher; Isaac Sabat, Social Scientist

Project Goal: Increase diversity in aerospace engineering through introduction of a broader, diverse set of applications.

Norm: Developing strong fundamentals in traditional core areas of aerospace engineering.

Impact of Norm: Students not interested in traditional core areas are more likely to leave or never enter.

Survey: Reasons for Leaving AERO

"Other majors…"

38% - had more diverse career options

36% - had more interesting/better fit

6% - emphasize helping others more

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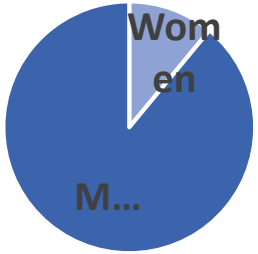
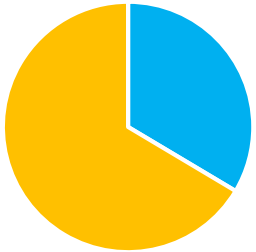
Project Goal: Increase diversity in aerospace engineering through introduction of a broader, diverse set of applications.

Context: Low Diversity

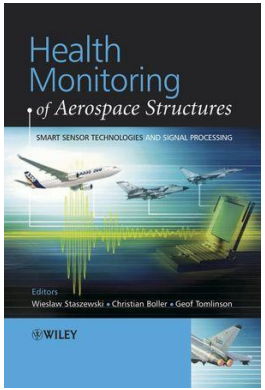
- 11% - Women
- 26% - Ethnic Minorities
- Not representative of in-state population





Impact of Context:

- Diverse groups have different interests.
- Introducing broader applications might attract more diverse students.



Survey: Interest in Engineering Applications (1-5)

Improve healthcare technology: 2.7 (white) vs 4.1 (minority)

Provide energy for the future: 4.1 (white) vs. 4.6 (minority)

Getting to Engineering with Engineers:

A story of curriculum change

Creating a vertically integrated class

Sept Oct Nov Dec

One Norm:
Commitment to inclusion of faculty

One Structural or Org Context:
Commitment to keeping the overall curriculum within the same footprints

Getting to Engineering with Engineers:

A story of curriculum change

Creating a vertically integrated class

Sept Oct Nov Dec Jan Feb Mar Apr May

One Norm:
Commitment to inclusion of faculty

One Structural or Org Context:
Commitment to keeping the overall curriculum within the same footprints

Getting unstuck: Working with the students

IUSE/PFE:RED: A Revolution in Engineering Education Motivated by Needs and Designs

North Carolina Agricultural & Technical State University
Department of Chemical, Biological and Bioengineering

First Project Goal

Reformulate the Department's 3 undergraduate engineering programs, beginning with the Bioengineering program, to create in students *engineering identity, ability,* and *value* as motivators for learning in design, mathematics, biological and physical sciences and engineering sciences courses.

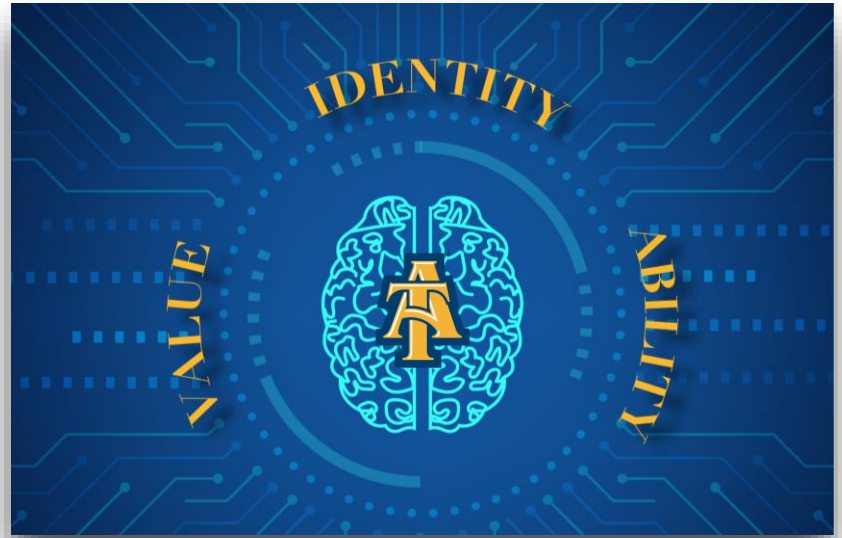
Norm: We want to motivate learning by creating *engineering identity, ability,* and *value* (Motivation theory)

Developing the ***Motivated Learner*** through:

Engineering Identity – The students' vision for their future as an engineer.

Ability – Students' confidence in problem-solving through skills and knowledge (self-efficacy).

Value – Exposure to engineering design each semester reinforces personal investments in creating valuable solutions.



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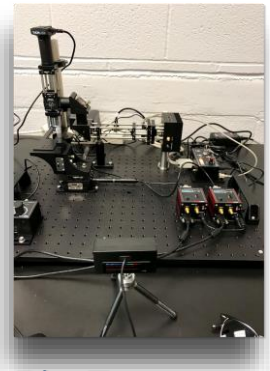
Structure: New design labs and industry partner collaborations reinforce our norm across the 4 year curriculum.

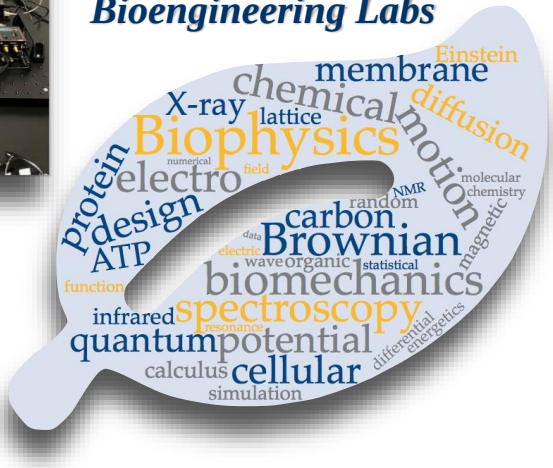
12 new Bioengineering courses created:

- ✧ Increased exposure to design, advanced scientific principles, and increased mathematical rigor across all 4 years.
- ✧ Introduce state-of-the-art laboratory equipment and research intensive methodologies for cross-disciplinary study.
- ✧ Students' ability to connect sciences directly to designed solutions builds the students'engineering "toolbox"



Bio-Energy Interactions & Biochemical Design Labs

Biophysics Design & Molecular Bioengineering Labs



CREATING SEEDS FOR CHANGE

IUSE/PFE:RED: Transforming for inclusion: fostering belonging and uniqueness in engineering education and practice (Award #1730262)

Engineering needs greater diversity and inclusion to better identify and solve the complex problems of the 21st century

Georgia Tech's BME department seeks to develop inclusive leaders who are equipped with the **knowledge**, **skills**, and **dispositions** to seed change in their places of study and work

CULTIVATING INCLUSIVE SKILLSETS AND MINDSETS AT MULTIPLE SOCIAL SCALES

INCLUSION

Optimally Distinct

Sense of Belonging — Authentic Self

MULTISCALE

Dyads | Teams | Demes | Macrodemes

COLLECTIVE

PPSE -- Programmers to Professional Software Engineers

East Carolina University
Department of Computer Science

Project Goal: Transforming programming-centric approach to Computer Science education to a design-centric and systems-oriented approach.

Impact on Students:

Exemplar curriculum that is not course-centric.

Inclusive pedagogical strategies and personalization.

FOSS to impart advanced technical and professional skills.

Professional skills development across the entire curriculum.

Maximizing success of transfer students from community colleges.

Increasing the participation of underrepresented groups.

Cross-institutional Collaborations:

SERVE Center, University of North Carolina – Greensboro

Case Western Reserve University

Western New England University

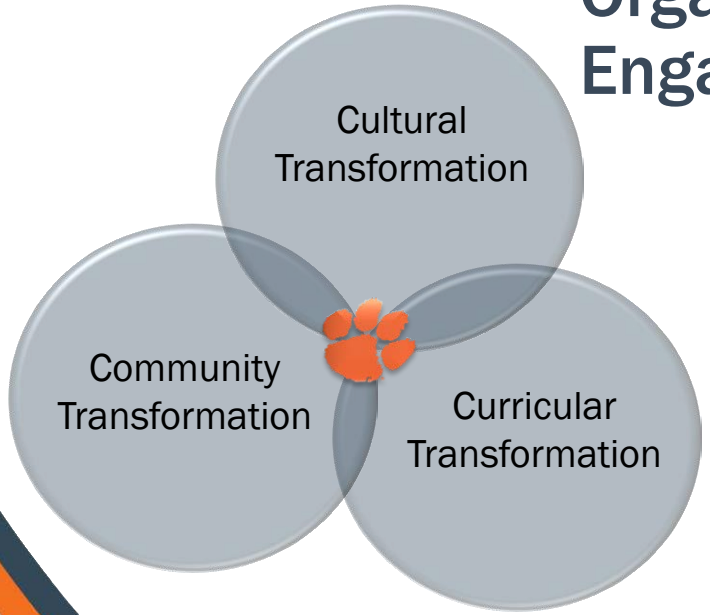
Muhlenberg College

Pitt Community College

Pitt County Early College High School

SAS, Red Hat, IBM, ABB, Nvidia, McGraw-Hill Education

Organizational Context = Engaging Informal Leadership (CLT)



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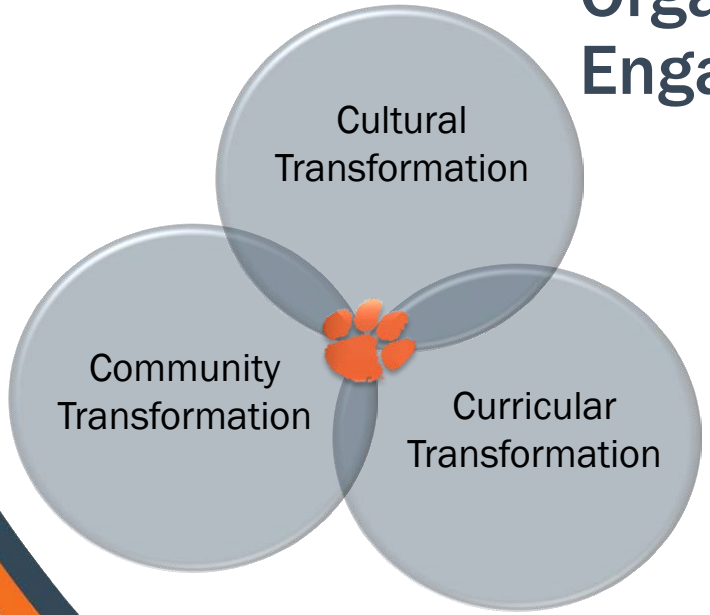
GLENN DEPARTMENT OF CIVIL ENGINEERING
CLEMSON UNIVERSITY

RED

Organizational Context = Engaging Informal Leadership (CLT)



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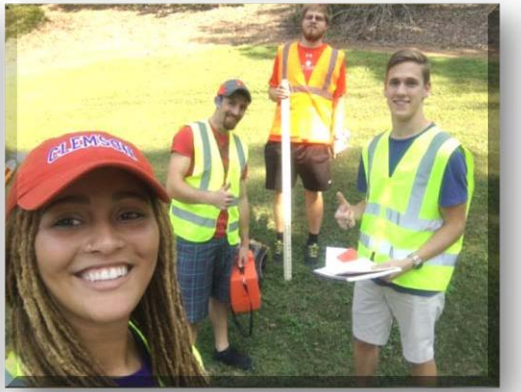
GLENN DEPARTMENT OF CIVIL ENGINEERING
CLEMSON UNIVERSITY

RED

Community [illegible]



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