



Revolutionizing the Culture of Computer Science

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Today's presentation

- Need for cultural change in computer science
- Overview of the National Science Foundation's REvolutionizing engineering and computer science Departments (RED) program
- Brief Presentations from the four current Computer Science RED Projects and their perspectives on cultural change
 - University of Texas, El Paso
 - University of North Carolina, Charlotte
 - East Carolina University
 - Boise State University
- Questions and group discussion

Need for Cultural Change in CS

- Diversity - need to create a culture more welcoming of women and underrepresented minorities
- Transform workplace culture
 - Recent high profile incidents at Uber, Google, etc.
- Prepare ethical and just CS practitioners
 - Not only for justice in the profession, but also to better represent diversity in products of computer science work

Overview of NSF's REvolutionizing engineering and computer science Departments (RED) initiative

Two Goals:

1. Generate new knowledge for **holistic professional formation** across the four years of UG studies
 - Address oft-neglected “professional skill” ABET outcomes
 - Form coherent professional threads through the UG experiences, including the curriculum
2. Generate new knowledge on how to **incentivize faculty development and build department cultures** that support the holistic professional formation of engineers and computer scientists.

What Informed the Design of the RED Solicitation?

- Past success in first year and senior year – need now to focus on middle years and technical core courses
 - Attrition is high especially in sophomore year
 - Critical entry point for transfer students
 - Need to integrate professional skills holistically across undergrad experience
- Prior research points to the following needs:
 - Faculty development
 - Faculty reward systems
 - Cultures that support faculty engagement
- Department Head leadership as a lever for change

Why Revolution?

“The system needs to change, but the status quo steadfastly resists effective transformation, and change efforts to date have been inadequate, ineffective, or both.”

Dave Goldberg, BigBeacon.org

University of Texas El Paso

Focus of UTEP RED is to Understand & Practice Asset-Based Approaches

NEEDS-BASED	ASSET-BASED
Focuses on an imposed standard and deficits	Focuses on existing capacity and resources
Views community members as having things done to them	Views community members as assets and contributors
Sees community as in need of external experts	Sees community as <i>expert</i>
Source: <u>Kretzmann</u> & McKnight (1993). <i>Building Communities from the Inside Out: A Path Toward Finding and Mobilizing a Community's Assets</i>	

University of Texas El Paso

Gauge student climate

- Classroom culture; access to resources
- Departmental experiences; involvement in opportunities
- Sense of community, identity and belonging; life demands
- Preparation for success

Engage faculty in survey development & climate analysis

- Collaborate on development of student survey
- Analyze climate results through small group discussions
- Define actions to improvement

Conduct workshops

- Audience: TAs, IAs, peer leaders, students, outreach leads
- Culture and identity
- Celebration of assets
- Relate curricular and co-curricular experiences to advantages

University of North Carolina at Charlotte

Connected Learner Project

Goal: **Connecting students** to peers, profession and community

Through:

- Focus on **social learning** practices/active learning
- Pedagogical **design patterns** as project outputs
- Regular **climate monitoring** in college
- **Center for Education Innovation** WITHIN college
 - **Community building** focus: lunches, workshops, etc.
 - Promote / support **research on pedagogical innovation**
- **Org-Sci** specialist & **Assessment** specialist as Co-PIs

University of North Carolina at Charlotte

Hiring

- Deploy hiring approaches/job descriptions that focus on innovation in teaching

Orienting, Training, and Professional Development

- Offer faculty workshops and teaching retreats on Connected Learner practices

Resources

- Create repositories of teaching aids and materials as best practices; design patterns to facilitate innovation

Mentoring

- Certify black belt instructors to mentor novice teachers for extra pay

Incentives

- Provide incentives and rewards for advancing along the certification system

Feedback

- Use peer observations to develop faculty teaching

East Carolina University

- **Transform programmers to professional software engineers.**
 - Infuse professional skills development process into the entire curriculum.
 - Personalizing teaching and learning for both formal and informal settings.
 - Implement non-course-centric curriculum.

East Carolina University (2)

- **Dramatically increase retention, persistence, and 4-year and 6-year graduation rates**
 - Recruit significantly more students from underrepresented groups.
 - Work with community colleges and early college high schools in the region to increase the number of transfer students.
 - Improve participation of women in ECU computing programs.



The Computer Science Professionals (CSP) Hatchery

Boise State University

- Three principal goals:
 - a. Provide responsive support for students to learn new skills required by local industry
 - Partnership with local industry leaders to identify and offer 1-credit `Hatchery Unit` courses at strategic points in the curriculum
 - b. Foster a community of practice through a vertically-integrated curriculum
 - Follow *spiral-curriculum* and threading ideas through the degree
 - Lower-division students mentored by upper-division students & faculty
 - c. Influence development of a *new breed of computer scientists* engaged in creating inclusive, diverse and socially just workplaces, products and society



BOISE STATE UNIVERSITY

COLLEGE OF ENGINEERING
Department of Computer Science



The Computer Science Professionals (CSP) Hatchery Boise State University

- Foundational Values Hatchery Unit
 - Introduce students to ethics and social justice
 - Build awareness of CS workplace issues
 - Introduce social contracts
- Thread ethics and social justice content through courses
 - Identify connections between ethics and social justice and technical course material
 - Use a common set of tools like teamwork assessments and language



BOISE STATE UNIVERSITY

COLLEGE OF ENGINEERING
Department of Computer Science



Think-Pair-Share #1

- Think about and then discuss with a neighbor

What elements of the culture of your department do you want/need to change?

Think-Pair-Share #2

- Think about and then discuss with a neighbor

What are some of the obstacles to change you have encountered or expect to encounter?

Think-Pair-Share #3

- Think about and then discuss with a neighbor

What are strategies that you could use for overcoming resistance to cultural change?

Questions for panel members

1. How are you promoting faculty buy-in?
2. How are you promoting student buy-in?
3. Where have you met resistance to cultural transformation, and how have you overcome that resistance?
- 4.

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