What is Revolutionary and Not-so-Revolutionary?

Keynote Speaker: Donna Riley
Virginia Polytechnic Institute and State University

Panelists:
Nadia Kellam, Arizona State University
Milo Koretsky, Oregon State University
Noah Salzman, Boise State University
Elsa Villa, University of Texas at El Paso
RED Webinar Facilitator

Professor Michelle M. Camacho
University of San Diego
Social Scientist
Co-PI NSF RED, 2015 cohort
Overview – panelists today

- Professor Donna Riley
  Professor and Interim Head --
  Department of Engineering
  Education

Virginia Polytechnic Institute and
State University
Overview – panelists today

• Nadia Kellam
  • Associate Professor, Polytechnic School, Ira A. Fulton Schools of Engineering, Arizona State University
  • On RED team at ASU, Dr. Kellam is the Social Scientist
Overview – panelists today

• Milo Koretsky
  • Professor of Chemical Engineering in the School of Chemical, Biological and Environmental Engineering at Oregon State University
  • On the RED team at OSU, Dr. Koretsky is one of the Engineering Education Researchers
Overview – panelists today

• Noah Salzman
  • Assistant Professor of Electrical and Computer Engineering at Boise State University
  • Dr. Salzman is the Engineering Education Researcher for Boise State University’s RED Team
Overview – panelists today

• Elsa Q. Villa
  • Assistant Research Professor at The University of Texas at El Paso (UTEP)
  • On RED team at UTEP, Dr. Villa is the Engineering Education researcher
Logistics for the webinar and Q&A

• Enter questions in the Q&A panel
• We will prioritize questions that are broadly applicable
• Specific questions about the RFP should be addressed to the cognizant program officers

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<tr>
<th>Name</th>
<th>Email</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamau Bobb</td>
<td><a href="mailto:kbobb@nsf.gov">kbobb@nsf.gov</a></td>
<td>(703) 292-4291</td>
</tr>
<tr>
<td>Elliot Douglas</td>
<td><a href="mailto:edouglas@nsf.gov">edouglas@nsf.gov</a></td>
<td>(703) 292-7051</td>
</tr>
<tr>
<td>Olga Pierrakos</td>
<td><a href="mailto:olpierra@nsf.gov">olpierra@nsf.gov</a></td>
<td>(703) 292-7936</td>
</tr>
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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Outcome

• Participants will be able to conceptualize revolutionary change in engineering and computer science departments.

In this presentation, our use of “engineering” contains both engineering and computer science.
Outline

• What is Revolution?
• Paradigm shifts
• Three examples from current RED projects
• Two hypothetical cases
• Tips for Revolution
• Summary
What is revolutionary?

• Curriculum that shifts fundamental ways of what learning means and the content, practices, and structures of education

• Includes a systems level approach that addresses social, contextual and organizational processes in addition to curriculum
  • Needs to address core entrenched historical and cultural norms
  • Needs to address core beliefs and values of faculty, students, and others in the community
Paradigm Shift: Re-situating Learning

Traditional

Revolutionary

Koretsky, MD, Meaningful, Consequential Learning Using Studios in Large Enrollment Classes, 2016
Paradigm Shift: Re-situating Learning

Traditional
Engineering involves Technical Work

Engineering involves Social Work

Revolutionary
Paradigm Shift: Re-situating Learning

**Traditional**

Engineering involves Technical Work

Engineering involves Social Work

**Revolutionary**

Engineering involves Social Work

Engineering involves Technical Work

Koretsky, MD, *Meaningful, Consequential Learning Using Studios in Large Enrollment Classes*, 2016c
Paradigm Shift: Re-situating Learning

Traditional
Engineering involves Technical Work

Engineering involves Social Work

Learn principles before doing

Revolutionary

Engineering involves Social Work

Engineering involves Technical Work

learn principles by doing

Koretsky, MD, Meaningful, Consequential Learning Using Studios in Large Enrollment Classes, 2016
Paradigm Shift: Re-situating Learning

**Traditional**

Engineering involves Technical Work

Engineering involves Social Work

Learn principles before doing

Engineering problems have a correct answer

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**Revolutionary**

Engineering involves Social Work

Engineering involves Technical Work

Learn principles by doing

Engineering problems have multiple solution paths

Paradigm Shift: Re-situating Learning

**Traditional**

Certainty

**Revolutionary**

Incomplete knowledge

Paradigm Shift: Re-situating Learning

Traditional

Certainty

There is one way to be smart

Revolutionary

Incomplete knowledge

There are multiple ways to contribute productively to a team

Koretsky, MD, Meaningful, Consequential Learning Using Studios in Large Enrollment Classes, 2016
Paradigm Shift: Re-situating Learning

Traditional

Certainty

There is one way to be smart

“How many points do I get for this?”

Revolutionary

Incomplete knowledge

There are multiple ways to contribute productively to a team

“How does this prepare me for practice?”

Koretsky, MD, Meaningful, Consequential Learning Using Studios in Large Enrollment Classes, 2016
Poll
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<th>Paradigm Shift: Renovating Structures</th>
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<tr>
<td><strong>Traditional</strong></td>
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<tr>
<td>Student Likert rating of teaching</td>
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<td>Buying out of Teaching</td>
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<td>One sizes fits all faculty evaluation</td>
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<td>Evaluation of teaching that reflects learning and practice</td>
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<td>Buying into Teaching</td>
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<td>Context-based individualized evaluation</td>
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Paradigm Shift: Renovating Structures

Traditional

How many URMs do we have?

Educational process is a pipeline

Revolutionary

How do we create an inclusive, equitable, and welcoming community

Educational process is a tributary


Paradigm Shift: Renovating Structures

Traditional

Industrial Advisory Board

Unfunded mandates for change

Change is directed

Revolutionary

Innovative partnerships with industry

Revolutions need support

Change is emergent
Computer Science Professionals Hatchery

The Computer Science Professionals Hatchery will replicate elements of the corporate environment, weaving moral, ethical, and social threads with entrepreneurship and professional skills, and producing graduates who are not only technically adept and effective team members, but also empowered as agents of revolutionary and positive change in the environments where computer science is practiced.

- Faculty members invested in the major elements of the curriculum across all 4 years.
- Build a strong sense of community amongst students, faculty, and industry partners.
- Overcome barriers and implement sustainable drivers for innovation.

- Increase relevance of the student educational experience.
- Fuse professional and entrepreneurial skills throughout the curriculum.

- Implement best practices supporting diversity and ethical, moral, and professional development.
- Develop and teach approaches for inseparably infusing ethical/moral elements into the practice of software engineering to train students as positive agents of change in their workplaces.

Create a culture of engagement across the entire curriculum
Create a Vertically Integrated Teaching and Learning (VITaL) experience
Create a diversity-promoting revolution
Re-Situating Student Learning in CBEE - A Revolution at OSU

有意义的, 重要的学习

学生PODS

结构, 政策和实践

包容, 公平和公正的文化

可持续的变革

俄勒冈州立大学化学生物和环境工程（CBEE）
Revolutionizing Roles to Reimagine Integrated Systems of Engineering Formation

- Holistic structure approaches degree as integrated system
- Throwing away courses to facilitate knowledge integration and weave threads throughout the curriculum
- Reimagined faculty roles
  - Thread Champions
  - Integration Specialists
Two Hypothetical Cases
Meet Dr. Taylor and listen to his plans for a revolution.
Poll
Is Dr. Taylor’s Plan Revolutionary?

- Focus is on the curriculum only
- Focus is on technology
- Research plan is focused narrowly
- Involves having students learn the principles before doing them.
- No consideration of existing cultural norms
- Does not address core beliefs and values of faculty
- Team is not cohesive
- Top-down approach to a revolution
- No buy-in
- Not sustainable
Flipped Classroom: Revolutionary?

Meet Dr. Samara and listen to her plans for a revolution.
Poll
Is Dr. Samara’s Plan Revolutionary?

- Systems level approach
- RED team is collaborative
- Faculty and advisory buy-in
- Focus is on the broader social system of teaching & learning
- Research plan is focused on faculty beliefs and values, and emergent communities of practice
- Research plan is participatory and encourages reflection
- Approach allows for faculty autonomy
- Change theory is identified and adapted
- Concise and well-articulated vision
Tips for Revolution

• Think about “flipped classroom” and other curricular approaches as a tool; not as the revolution!

• Students respond to systems – let’s change the system not blame the student. (This applies to faculty too)

• Every proposal team needs a Che!

• Some revolutions lead to change for the better; some just lead to change.

• The team responsibilities and budget should align with the proposed work

• This RFP is not for reformists; it’s for revolutionaries
Summary

• “Revolution is radically, suddenly, or completely new; producing fundamental, structural change; going outside of or beyond existing norms and principles.”*

• Focus on significant, systemic departmental change*
  • Will change(s) remain if the department chair leaves?
  • How will these changes affect student learning and engagement in pre-professional skill development?
  • Is it process-driven or activity-driven?
  • Is change anchored in culture?

* NSF RED RFP
Thank you! Questions?

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Name               Email                    Phone
Kamau Bobb        kbobb@nsf.gov          (703) 292-4291
Elliot Douglas    edouglas@nsf.gov       (703) 292-7051
Olga Pierrakos    olpierra@nsf.gov       (703) 292-7936

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