# *Assembling a winning RED team:*
# *Who is needed to start a revolution? What is the Role of the PI, Social Scientist, Engineering Education Researcher, & Evaluator?*

Geoffrey Herman, University of Illinois, Urbana-Champaign

Jeremi London, Arizona State University

Susan Lord, University of San Diego

# RED Webinar Facilitator

Professor Michelle M. Camacho

University of San Diego

Social Scientist

Co-PI NSF RED, 2015 cohort

NSF RED CONFERENCE

# Overview – panelists today

- Jeremi London
  - Assistant Professor of Engineering at Arizona State University
  - On RED team at ASU, Dr. London is one of the Engineering Education researchers

# Overview-panelists today

- Susan Lord
  - Professor and Chair of Electrical Engineering, University of San Diego (USD)
  - On RED team at USD, Dr. Lord is the engineering education researcher and one of engineering co-PIs (Dean is PI)

# Overview – panelists today

- Geoffrey Herman
  - Teaching Assistant Professor in Department of Computer Science
  - Research Assistant Professor in Department of Curriculum and Instruction at University of Illinois Urbana-Champaign
  - On RED team at UIUC he serves as the CS 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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# Overview of Today

| | |
|---|---|
| Welcome and Introduction | *Michelle Camacho* |
| Who needs to be on the RED team? | *Susan Lord* |
| Why a social scientist? | *Susan Lord* |
| Why a CS/engineering education researcher? | *Geoffrey Herman* |
| Why an evaluator? | *Jeremi London* |
| Advice on building RED teams | *Susan, Geoffrey, Jeremi* |
| Wrap up/Transition to Q&A | |
| Questions and Answers (30 min) | |

# How do you normally write an NSF proposal?

a) I write proposals as a sole PI
b) I write the whole proposal and then pull in colleagues to add their names
c) I have a few key collaborators that I always develop proposals with

# How do you normally write a NSF proposal?

a) I write proposals as a sole PI
b) I write the whole proposal and then pull in colleagues to add their names
c) I have a few key collaborators that I always develop proposals with
d) I carefully read the call and strategically decide who should be on the proposal
e) I brainstorm the ideas for the proposal with a team before iteratively writing the proposal narrative

# Example from Rowan University


REDTED – Revolutionizing Engineering Diversity, Transforming Engineering Diversity

# Who needs to be on the RED team?

*From NSF RED RFP*

The Principal Investigator must be a **department chair/head** (or equivalent) to establish institutional accountability. There must be a RED team that includes (at a minimum) an **expert in engineering education or computer science education research** who can ground the research plan in the literature, and a **social science expert** who can advise on strategies for developing a culture of change and on strategies for creating meaningful collective ownership of the effort among faculty, students, and staff. The social scientist must have the expertise to evaluate departmental dynamics and monitor change processes.

# Who needs to be on the RED team?

*From NSF RED RFP*

Principal Investigator: department chair/head

to establish institutional accountability

# Who must be on the RED team?

*From NSF RED RFP*

RED team includes (at a minimum)

- Expert in engineering education or computer science education research
  - can ground research plan in literature
- Social science expert
  - advise on strategies for
    - developing a culture of change
    - creating meaningful collective ownership of effort among faculty, students, & staff.
  - evaluate departmental dynamics & monitor change processes

# Who else might be on RED team?

- External Advisory Board (for Dept or College)
  - Required by NSF to be involved
  - Industry Partners
  - Community Partners
- Evaluator
  - Single individual, team, or Board
- Other Faculty as coPI
  - Engineering, Computer Science, Education
  - Allies

# Budget allocations must match workload distributions

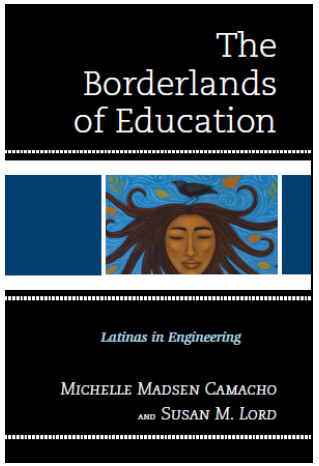
- Don’t budget all $2 million for implementation, there need to be research and evaluation components too!
- Don’t expect the engineering education researcher or social scientist to do all of the work without giving them the resources to do so.
- Reviewers expect to see 10-20% of the budget allocated to evaluation

# Why a Social Scientist?

- Social science expert
  - advise on strategies for
    - developing a culture of change
    - creating meaningful collective ownership of effort among faculty, students, & staff.
  - evaluate departmental dynamics & monitor change processes

# Example: University of San Diego


## Developing Changemaking Engineers



# How to find a social scientist

- Consider project needs
- Areas of expertise key words: culture, organizational change, theories of change, collective ownership, departmental dynamics, monitoring change processes, social and behavioral change, co-creation of change processes, negotiation, leadership, change management

# How to find a social scientist?

- Sociology
- Education, especially educational psychology, possibly educational leadership
- Psychology, especially organizational / industrial psychology, social psychology
- Business, Advertising / Marketing
- Ethnic studies
- Science & technology studies (STS), including history / philosophy of science
- Human Resource Development (HRD)
- Organizational Development (OD)
- Organizational learning
- Faculty development/Center for teaching and learning
- Social cultural anthropology

# Where are RED teams' social scientists from?

| |
|---|
| Education (x2) |
| Sociology (x2) |
| Anthropology |
| Business |
| Computing and Informatics |
| Engineering Education |
| Information and Learning Sciences |
| Organizational Performance and Workplace Learning, College of Engr |
| Political Science |
| Psychology |
| Science Technology Studies (STS) |

# Inviting a social scientist to be on your team

*So the solicitation says we need a social scientist. Are you one? Can we list you?*

Do:

- Get a recommendation
- Ask if / how the solicitation could fit their research program
- Help them understand the project
- Bring the entire team together for discussion
- Work toward shared ownership and understanding
- Find someone that fits your team culture
- Build rapport/relationship early
- Iterate on project idea with the social scientist

# Role of the CS/Engineering Education Researcher: Define professional formation

- IUSE/**Professional Formation of Engineers**: REvolutionizing engineering and computer science Departments (IUSE/PFE: RED)
- The term "Professional Formation" is dense and meaning-laden
  - Technical content is important but not enough
  - Competing perspectives
    - Engineering Studies
    - Anthropology
    - Education
    - Industry
- Broad research literature on teaching/assessing professional skills

# Possible Role of the CS/Engineering Education Researcher: First external reviewer

- Original idea must come from the department
- Engineering education researcher vets the idea
  - Knows what might be considered revolutionary
  - More connected to NSF Eng Ed funding patterns
  - Can validate the promise of the idea
- “Window Dressing”

# Example: University of Illinois


Defining the Frontiers of Bioengineering Education at Illinois and Beyond

# Possible Role of the CS/Engineering Education Researcher: Faculty development

- Most revolutions will require changes in teaching and learning practices.
  - How do you identify what might work? How do you convince reviewers?
  - How will your team recruit appropriate advisory board members?
  - How will your department learn how to make these changes?

# Role of the CS/Engineering Education Researcher: Research plan

- Research – What knowledge is being generated by your revolution?
  - Review the literature
  - Define research question
  - Identify and execute research methods
  - Publish results
- It is not: “we tried this and our students like it ☺!”

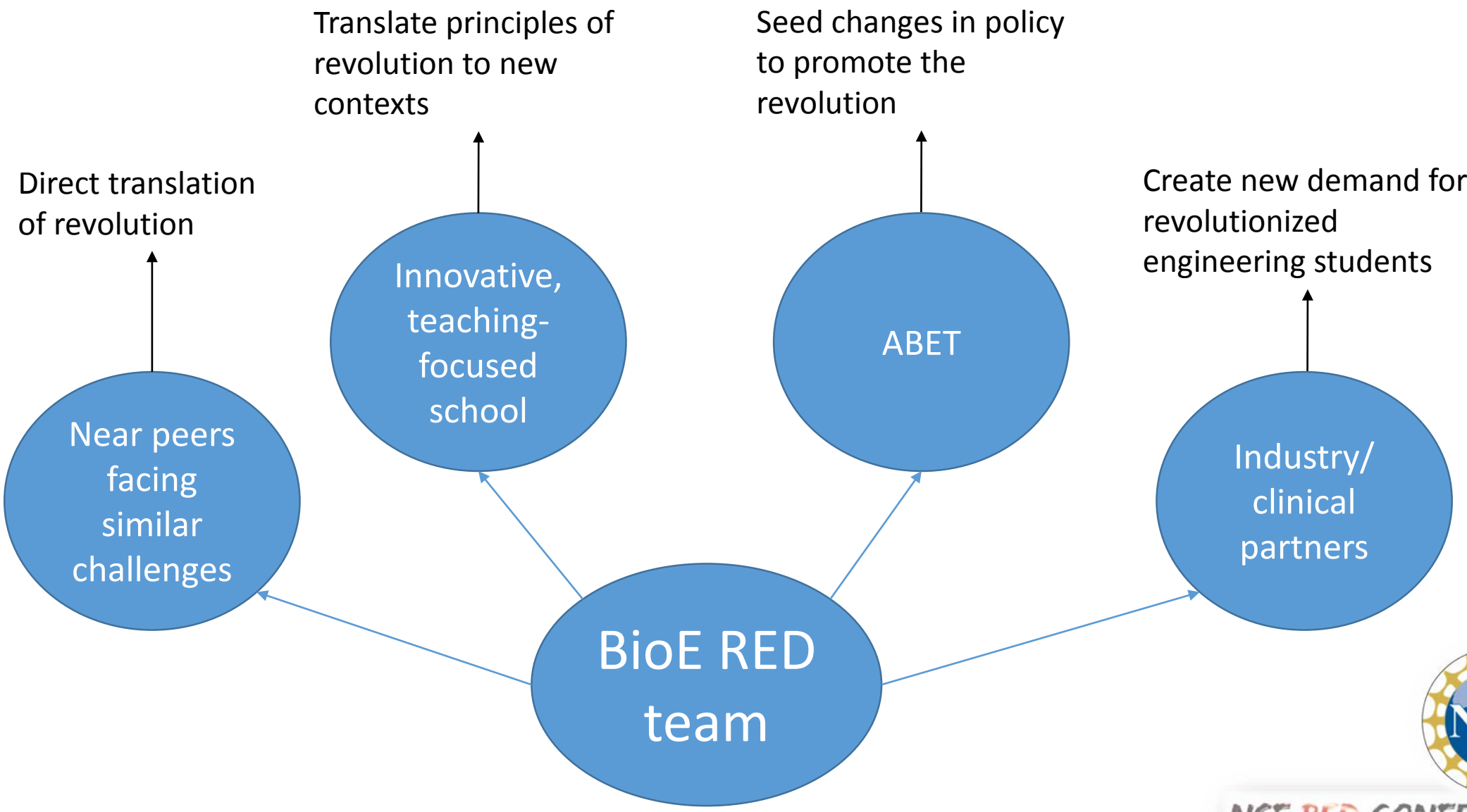
# Example of a research plan: Illinois RED

- Illinois is creating a health-need-centric curriculum
  - Traditional – Organize courses by technology/science (mechanics, signal processing, physiology)
  - Health-need-centric – Organizes courses by problems (mobility, diagnosing pathologies, cancer)
- Does this needs focus improve professional formation and recruitment of women and minorities?

# Role of the CS/Engineering Education Researcher: Dissemination

- Critical to NSF
- Research plan feeds publications and publicity
- Engineering education researchers are connected across disciplines, facilitating dissemination beyond the original discipline

# Build dissemination with advisory board



# How to find an CS/engineering education researcher

- Consider project needs
- Departments of STEM education, curriculum & instruction, educational psychology
- Alumni of engineering education PhD programs (e.g., Purdue, Virginia Tech, Clemson, Utah State)
- Engineering colleagues who are awardees of NSF Division of Undergraduate Education grants or regularly attend American Society of Engineering Education (ASEE) conferences.
- Centers for teaching and learning

# Where are RED teams' CS/engineering education researchers from?

| |
|---|
| Center for Education Research & Policy Studies, Office of Research & Sponsored Projects |
| Chemical/Bio/Environmental Engineering |
| CS Education |
| ECE (PhD in Engr Ed) |
| ECE, Industrial Design, Education |
| EE |
| Engineering Education (x5) |
| Information and Learning Sciences |

# Typical Role of Evaluator

## During Proposal Development

- Help define measurable project goals

## During Project

- Provide external perspective on the project goals and feedback on how to accomplish them
- Document and assess the extent to which the project goals are met
- Generate an evaluation report to supplement the annual report submitted to NSF

## Keep in Mind:

Reviewers expect to see 10-20% of the budget allocated to evaluation

# Innovative Role of Evaluator for RED

- Because RED involves studying culture, an outside perspective can be critical for navigating data collection
- Assist with compiling and preparing data when confidentiality is a concern
- Assist with baseline data collection or initial analysis when project is “top-heavy” and includes minimal graduate students

# Example: Arizona State University

Instigating a Revolution of Additive Innovation: An Educational Ecosystem of Making and Risk Taking

# How to Build the Evaluation Team

- Gather recommendations from others:
  - Your team's social scientist or engineering education researcher
  - Colleagues who have used evaluators for projects
- Explore Resources at Your Institution:
  - Evaluation Unit
  - Unit for Institutional Research
  - Colleagues in the School of Education
  - Colleagues in the Center for Teaching and Learning
- Identify external companies/contractors

Keep in Mind:

Those who operate as evaluators on the project could be a single individual or a team of evaluators; it depends on the project needs.

# Advisory Board vs. External Evaluation

- Evaluation Team cannot be interchangeable with your departmental advisory board, but they both help provide outside perspective
- NSF call specifies that the advisory board for the project must have some overlap with the department advisory board
- Advisory Board should have complementary expertise or networks that might be useful to leverage at various times throughout the project

# Top 10 Tips for building a successful RED team

1. RED is not like most other NSF programs
   - Need for a cohesive, multi-disciplinary teams is more critical for RED than in most programs
   - The PI cannot do it all
   - Will join a national cohort of change leaders (RED teams)
2. Read RFP carefully.
   - Assign someone to make sure you comply to all requirements
   - Consider making a checklist
3. The PI needs to be actively engaged

# Top 10 Tips for building a successful RED team

4. Choose team members strategically
   - Cast a wide net beyond your department. Who else can help you?
   - Include allies on your team in preparation for powerful political opposition.
5. Build a team that enjoys working with each other.
   - Have fun!
   - Find common values and align goals.
6. Build mutual respect, especially for the engineering education researcher and social scientist.

# Top 10 Tips for building a successful RED team

7. Collaborate and Communicate. Don’t divide and conquer.
8. Iterate
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8. Iterate

# Top 10 Tips for building a successful RED team

9. Identify the local factors that can make you a national model for departmental change
   - Leverage past accomplishments related to your change efforts

10. Be sure your change is something that you want to do no matter what
    - Money will help but is not only motivation
    - Align with mission
    - Passion
    - Addresses a real need or challenge

# Transition to Q&A

- Enter questions in the Q&A panel
- We will answer as many questions as possible, but may not get to all of them.
- 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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