

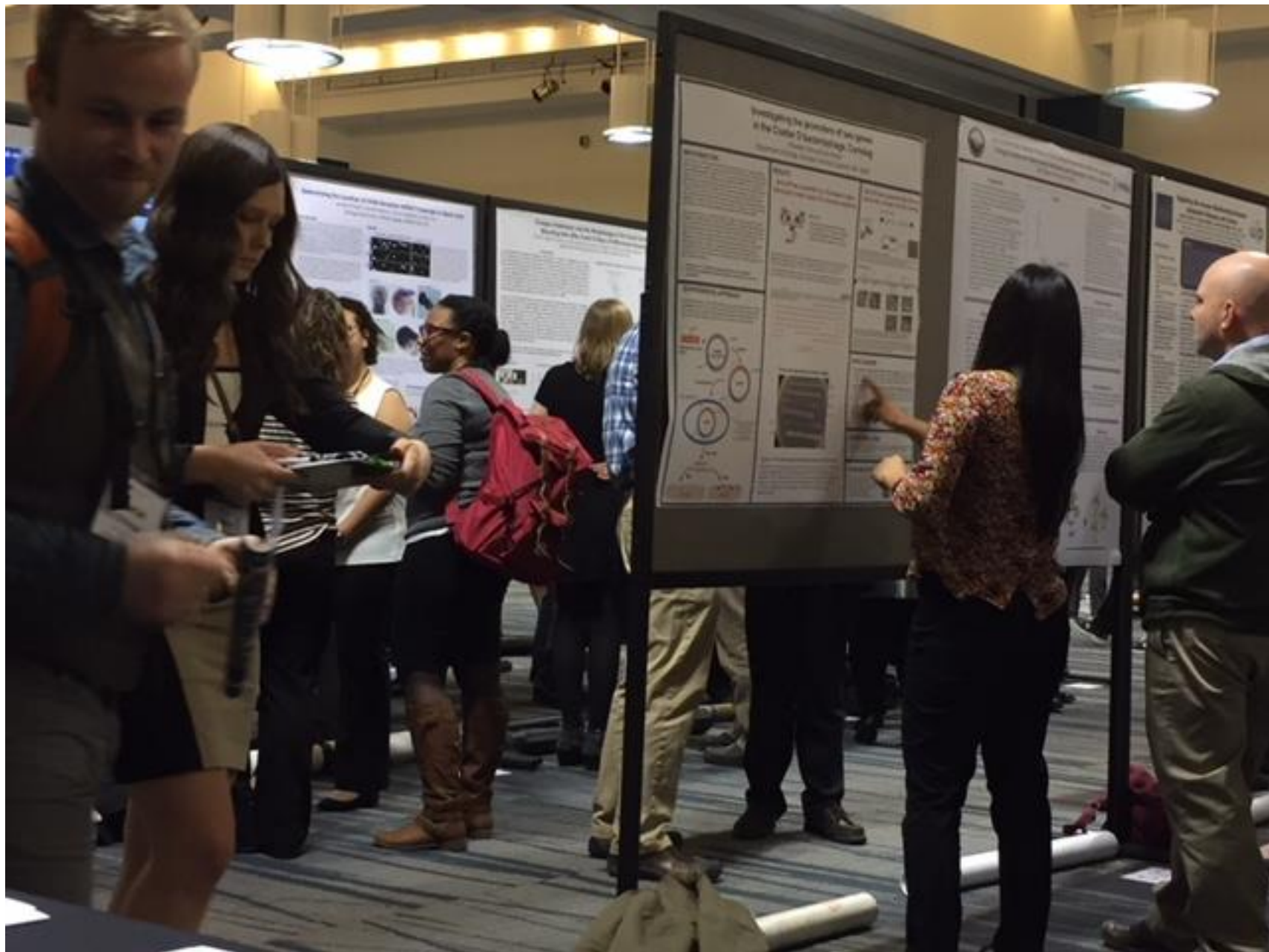


**Council on Undergraduate Research**

# **CUR Perspectives on the Race for CUREs**

**Elizabeth Ambos  
Council on Undergraduate Research**

**Murdock Undergraduate Research Symposium  
November 11, 2017**



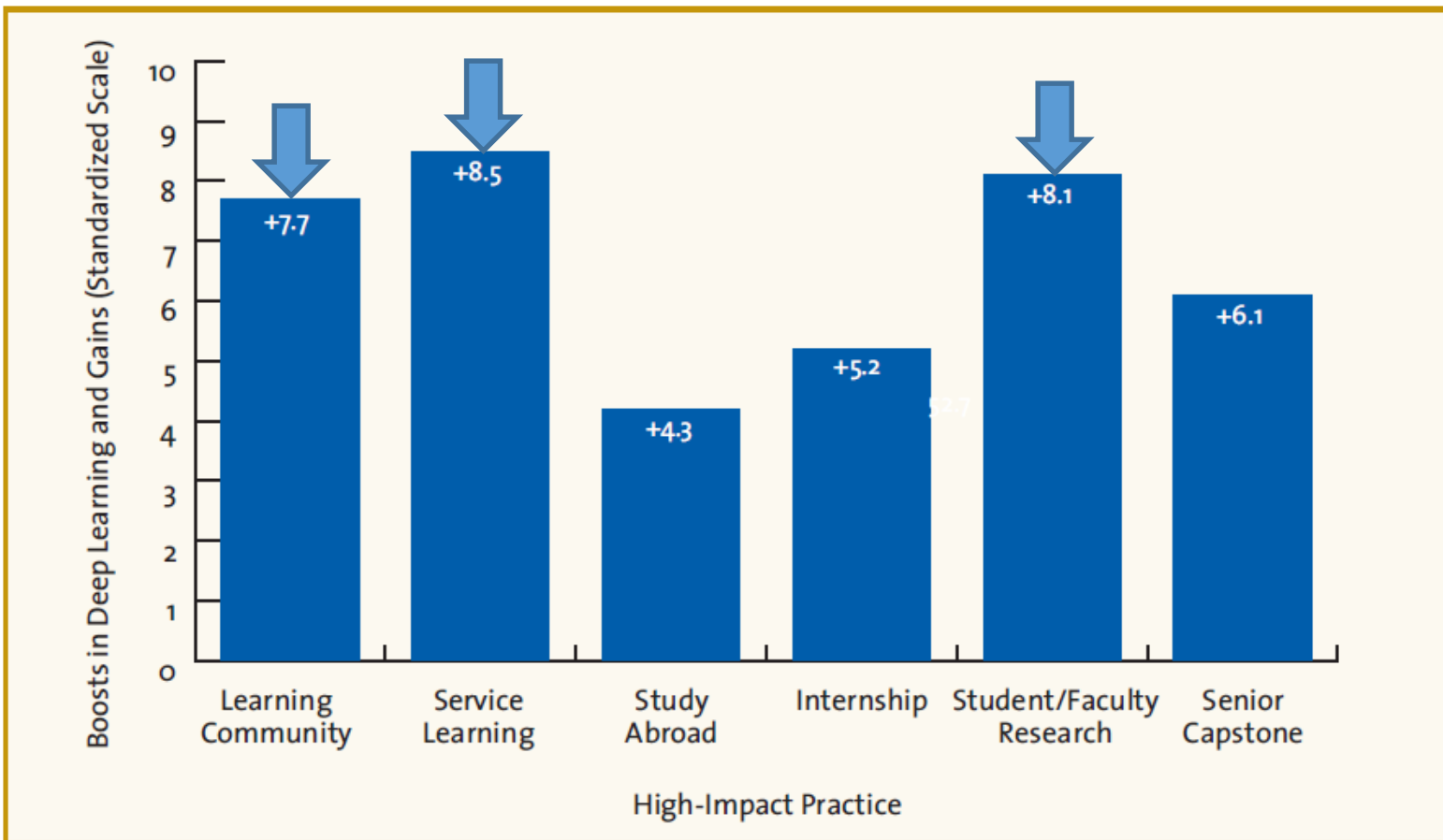


# Course-Based Undergraduate Research Experiences (CUREs)

- Not new...but definitely seeing intense interest right now!
  - historically have been offered at small, predominantly undergraduate institutions (PUIs) principally affiliated with CUR
- Current interest levels due to:
  - ***Education research correlating student success with high-impact practices such as undergraduate research***
  - Federal agency studies of STEM education success support UR expansion

# High Impact Practices (HIPs): Effect on Underserved Undergraduates (Finley & McNair, 2013)

Average Boost to Students' Perceptions of Their Deep Learning and Gains  
by Participation in Specific High-Impact Practices





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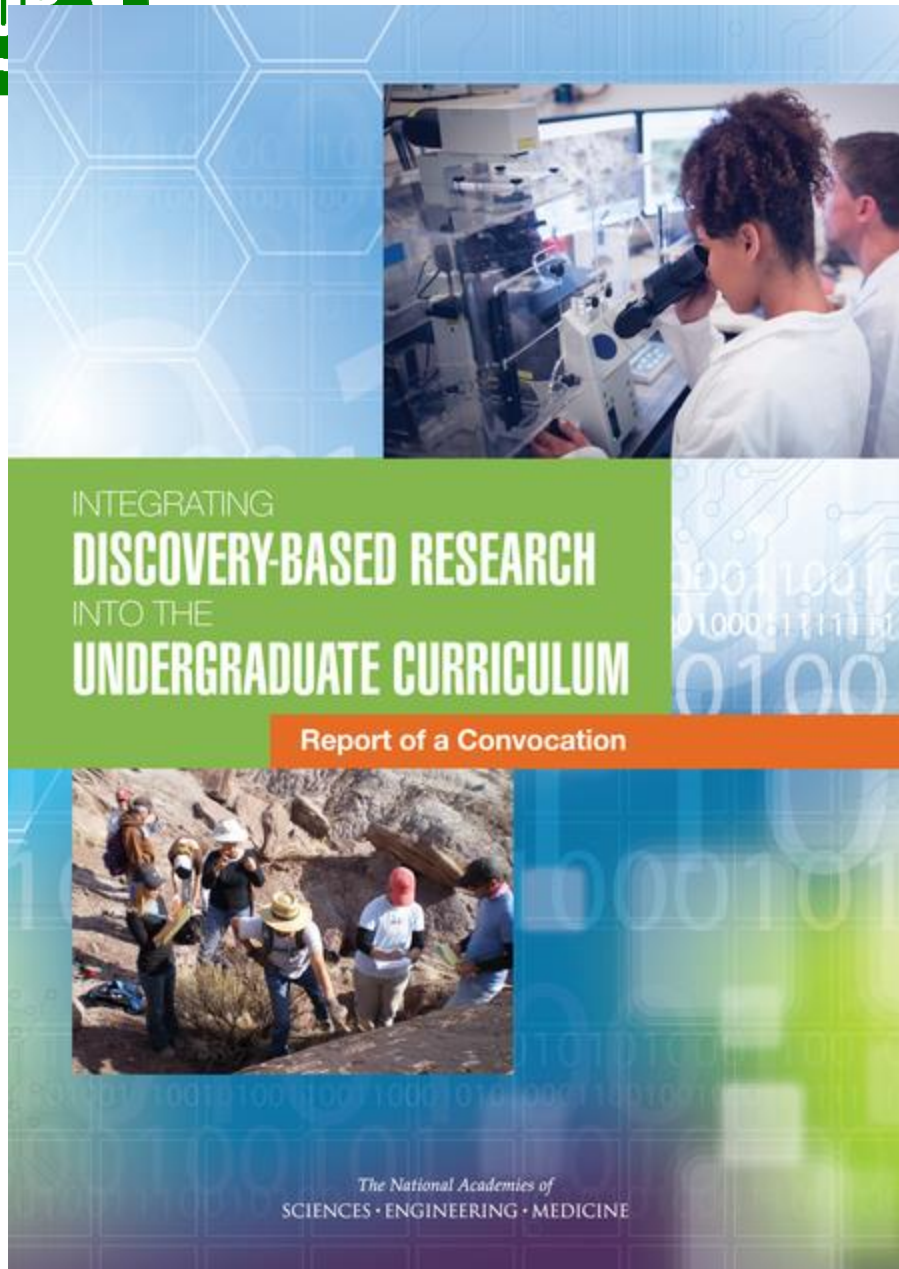


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President's Council of Advisors on Science  
and Technology (PCAST)

*PCAST Recommendation: Advocate and  
provide support for replacing standard  
laboratory courses with discovery-based  
research courses.\**

\*From: PCAST Report: "Engage to Excel", released February 27, 2012



# Integrating Discovery-Based Research into the Undergraduate Curriculum: Report of a Convocation (2015)

Karukstis, 2017



The National Academies of  
SCIENCES • ENGINEERING • MEDICINE

REPORT



# Undergraduate Research Experiences for STEM Students

SUCCESSES, CHALLENGES, AND OPPORTUNITIES



# Undergraduate Research Experiences for STEM Students: Successes, Challenges, and Opportunities (2017)

Karukstis, 2017



Council on  
Undergraduate Research  
*Learning Through Research*

<http://www.cur.org>



# Council on Undergraduate Research

- **A national (with international partners) organization** of individual (>13,000) and institutional (>700) members representing all disciplines and over 900 institutions of all types.
- **Eleven discipline-based divisions:** Arts & Humanities, Biology, Chemistry, Education, Engineering, Geosciences, Health Sciences, Mathematics & Computer Science, Physics & Astronomy, Psychology, Social Sciences.
- **Two multidisciplinary, administrative-based divisions:** At-Large and Undergraduate Research Program Directors.

**The mission of CUR is to support and promote high-quality undergraduate student-faculty collaborative research and scholarship.**

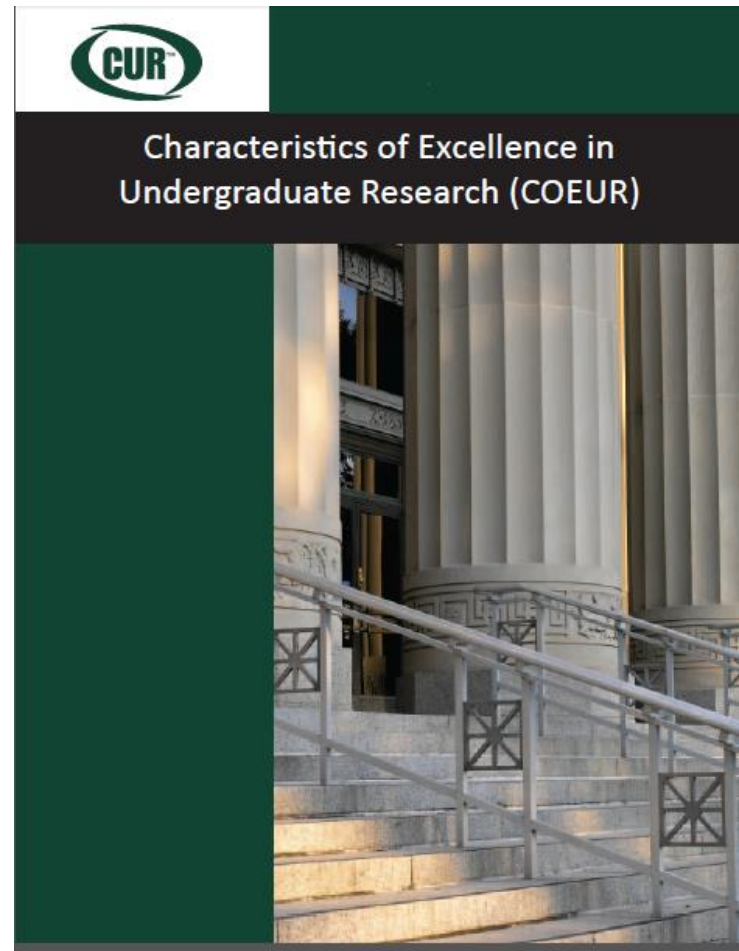


# CUR/CURE Milestones

- 1978: CUR founded with ten (10) chemists at PUIs
- 1980: CUR Quarterly initiated - first newsletter/publication - articles on incorporating research into curriculum - mostly as thesis/capstone
- 1985: Oberlin College (PUI) hosts conference on science in liberal arts colleges - main take-away - importance of undergraduate research to STEM workforce
- 1992: Hope College (PUI) hosts CUR's 4<sup>th</sup> Biennial Conference: "The Research-Friendly Curriculum"
- 2001: CUR Council votes to broaden CUR membership to include all fields and all types of institutions
- 2010: CUR and the National Conference on Undergraduate Research formally merge (faculty plus student programs)
- **2012: CUR publishes Characteristics of Excellence in Undergraduate Research (blueprint for institutional excellence)**
- 2014: CUR formally adopts Strategic Pillar: Integration of Research into the Curriculum

# Why is COEUR so Important?

- ❖ *COEUR - Characteristics of Excellence in Undergraduate Research*
- ❖ *COEUR* is a summary of best practices that support and sustain highly effective undergraduate research environments
- ❖ *COEUR* is a guide to build, evaluate, and maintain robust, productive, meaningful and sustainable undergraduate research programs
- ❖ *COEUR* is used by institutions, programs, academic departments, faculty and administrators as they work to develop and enhance their undergraduate research programs





# The 12 Characteristics of Excellence

- ❖ **Campus mission and culture**
  - ❖ e.g., institutional commitment
- ❖ **Administrative support**
  - ❖ e.g., UR program office
- ❖ **Research infrastructure**
  - ❖ e.g., space, instrumentation and equipment
- ❖ **Professional development opportunities**
  - ❖ e.g., research leaves, mentorship training



# The Characteristics cont.

## ❖ Recognition

- ❖ e.g., UR in promotion and tenure guidelines

## ❖ External funding

- ❖ e.g., institutional funding for research

## ❖ Dissemination

- ❖ e.g., peer-reviewed publication, exhibition, or performance; student research conferences

## ❖ Student-centered issues

- ❖ e.g., community of student scholars



# The Characteristics cont.

## ❖ Curriculum

- ❖ e.g., integration of teaching and research; student course credit for research

## ❖ Summer research program

- ❖ e.g., faculty & student compensation

## ❖ Assessment activities

- ❖ e.g., assessment of student learning

## ❖ Strategic Planning

- ❖ e.g., does UR figure in institution's strategic plan

**CUREs Can't Sustain  
Without ALL COEUR**



# Another CURE Driver: CUR's Institutionalizing UR Workshop Program

- **1996 - present:**

- ❖ Offered 1-2 national-level workshops annually, as well as workshops to groups of institutions and/or to individual campuses upon request.

- **2007 - present:**

- ❖ Offered several series of workshops in targeted programs funded by the National Science Foundation through DUE 06-18721 and DUE 09-20275.

- ❖ For DUE 09-20275 collaborated with 80 institutions from six systems/consortia on assisting them build undergraduate research cultures and programs system-wide.

- ❖ Worked with Oklahoma, Tennessee, and Nevada INBRE/EPSCoR.

- ❖ **Research embedded to curriculum central focus**

- **Served more than 600 institutions to date.**





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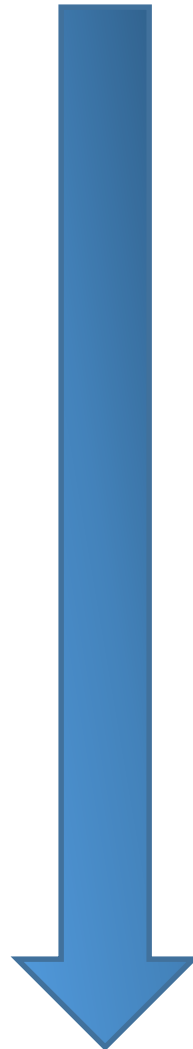
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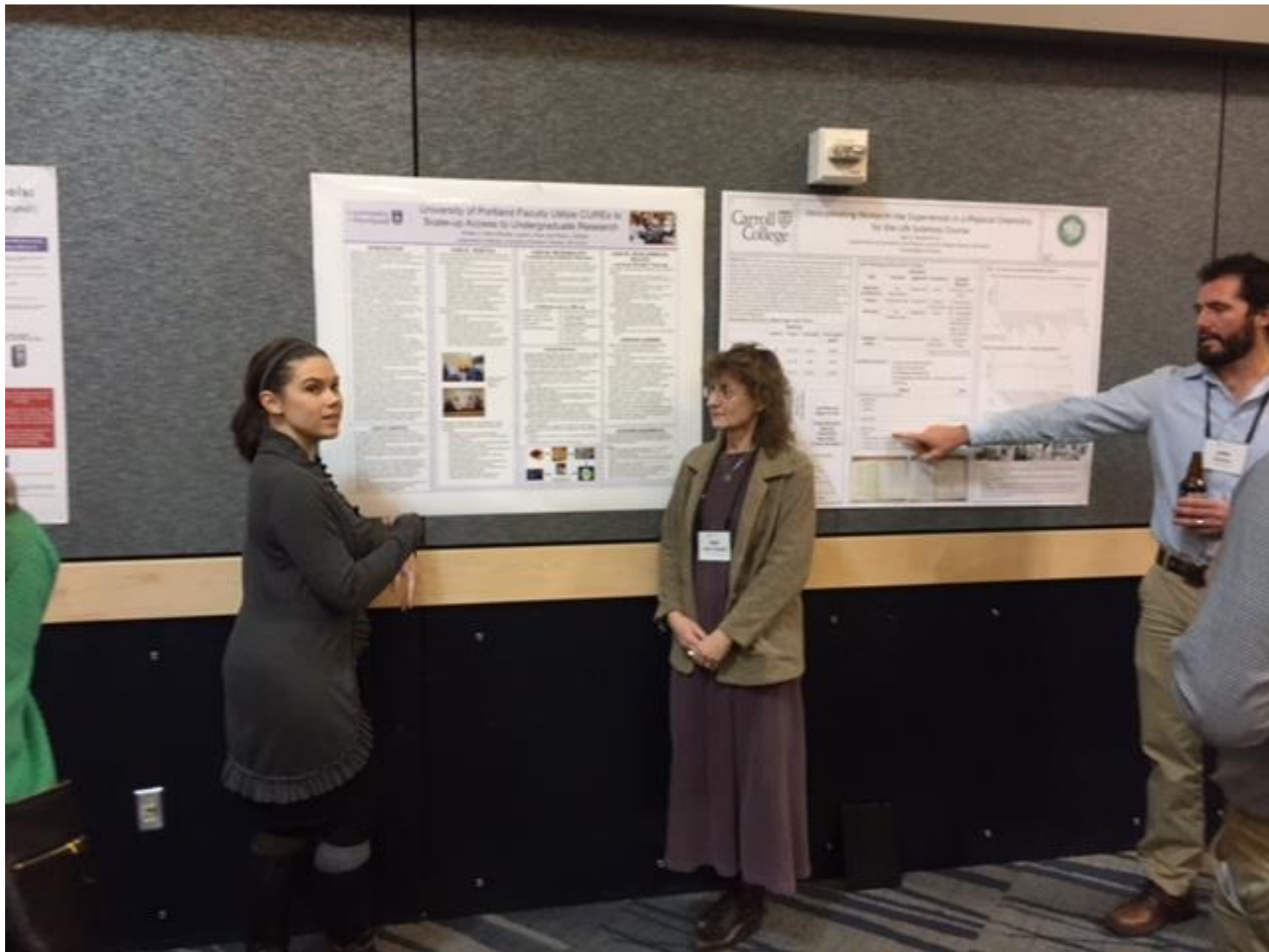
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# *Replacing Standard Labs with Discovery-Based.....\$\$ is Key Consideration*

- Summer immersion
- One-on-one mentoring for semester or year-long projects
- Research-based curriculum (primarily upper division)
- Research-infused curriculum (often lower division)



**Decreasing  
cost per  
student**





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**Toward Sustainable CUREs:  
NSF IUSE CUR Transformations Grant:  
Developing Research-Rich Curricula**

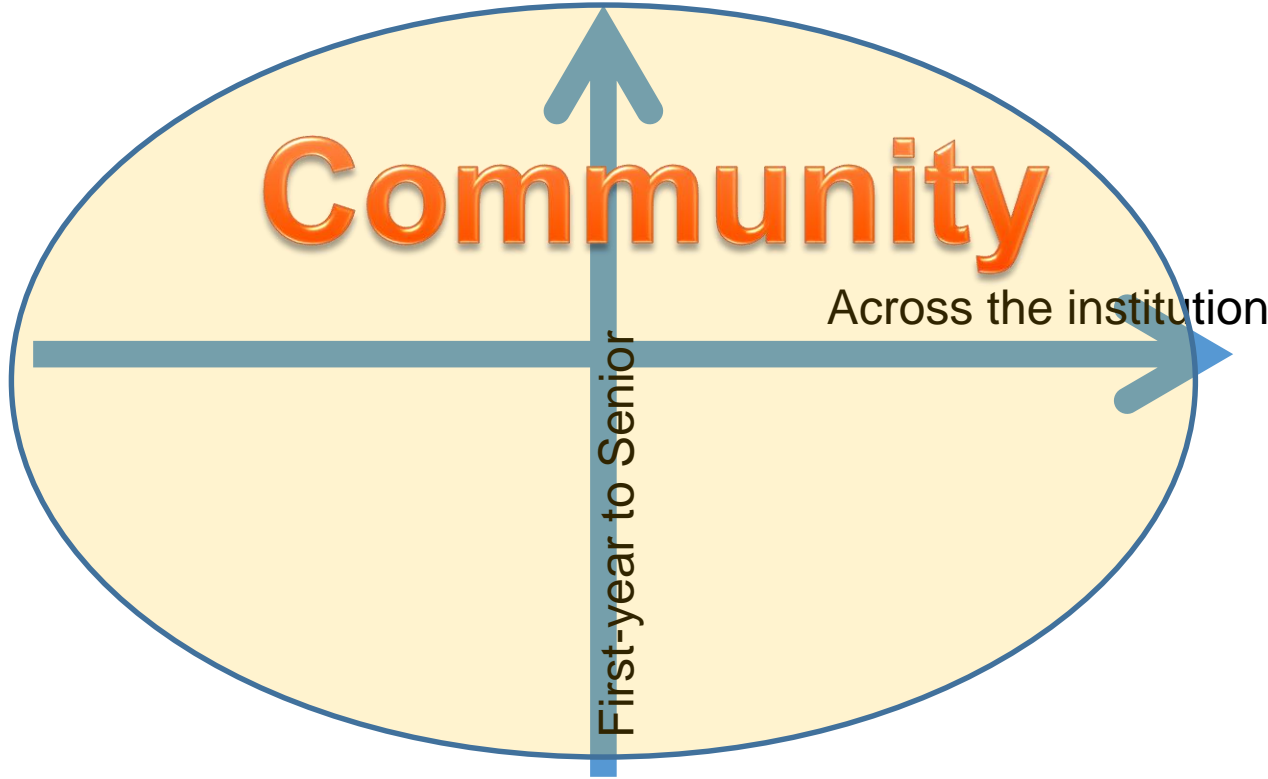
**Mitch Malachowski, University of San Diego  
Jeffrey Osborn, The College of New Jersey  
Kerry Karukstis, Harvey Mudd College  
Jillian Kinzie, Indiana University  
Elizabeth Ambos, Council on Undergraduate Research**



# CUR Transformations - Project Goals

- True curricular reform leading to sustainable CURES requires a long time arc and poses significant challenges, such as:
  - ❖ Gaining an understanding of the different disciplinary **cultures**.
  - ❖ Rethinking faculty workload and reward systems for both tenure-line and non-tenure-line faculty.
  - ❖ Developing sustainable faculty leadership structures, particularly against a backdrop of administrative and faculty turnover.
  - ❖ Establishing strong partnerships among faculty, students, and administrators.
  - ❖ Expanding student participation.
  - ❖ Scaffolding curricular elements linked to student learning outcomes.
  - ❖ Partnering with students to fundamentally change the learning process.
- Through participation in this CUR Transformations project institutions and departments will directly tackle these challenges and research the change process with respect to faculty and student culture

# The “Big Picture: CURE Sustainability



# CURES CAN BUILD COMMUNITY HEALTH AND VITALITY

## **BUSINESS FRAMEWORK:**

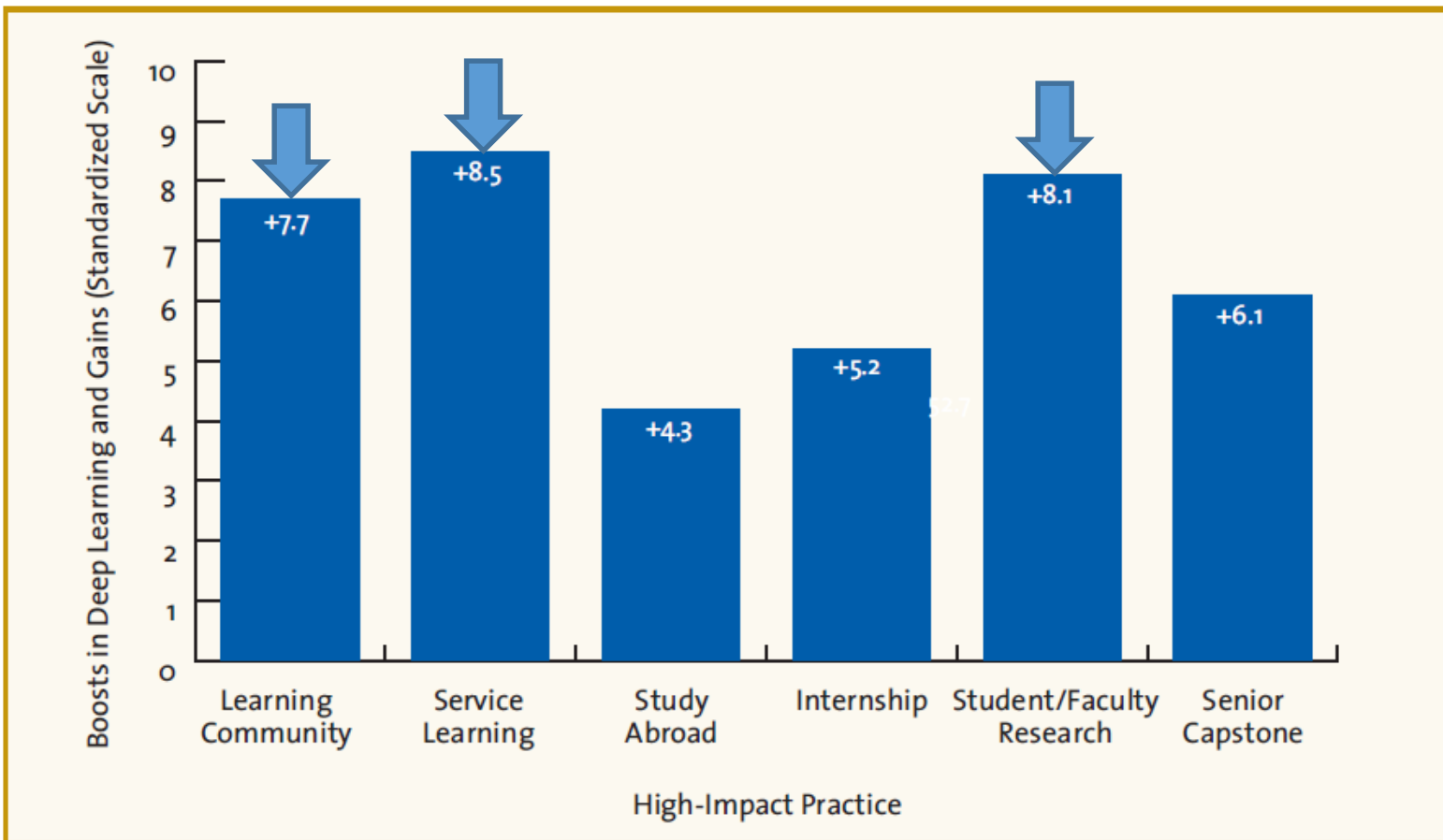
**UR CONNECTS TO ENTREPRENEURSHIP, START-UP COMPANIES, JOB CREATION**

## **SOCIETY FRAMEWORK:**

**UR CONNECTS TO  
COMMUNITY SERVICE, MEETING REGIONAL  
NEEDS**

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*Thank You*

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- We acknowledge the leadership and insights of many teacher-scholar leaders who have worked within CUR for the past decades. The ideas that form the basis for this presentation are distilled from CUR's work with more than 600 institutions who have participated in our professional development institutes, and from the leadership of CUR's governance, staff, and many external stakeholders.
- Prior National Science Foundation (NSF) funding, particularly DUE CCLI III grant # 09-20275, has been instrumental in forming our theory and framework for deep undergraduate research culture and curricula transformation that will lead to sustainable CUREs.
- We are grateful to the NSF IUSE for support of the CUR Transformations project through DUE IUSE grant # 16-25354.



# To Cite this Work

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