Vision into Practice: An Emerging Theory of Change Model for Integrating Undergraduate Research into Departmental and Institutional Cultures

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Participant’s Interests

What brought you here today?
Please write your question or area of interest in the chat. We will try to address as many as we can later in the session.
Benefits of Undergraduate Research (UGR), Scholarship, and Creative Activity

- **Student Benefits**
  - Cognitive and Intellectual Growth
  - Professional Growth and Advancement
  - Personal Growth and Development

- **Faculty Benefits**
  - Research, Scholarly, and Creative Outcomes
  - Mentoring and Teaching
  - Job Satisfaction and Personal Development

- **Institutional Benefits**
  - Learning Outcomes
  - Faculty Quality and Morale
  - Recruitment and Recognition

The educational gains from participation in UGR for students traditionally underserved by higher education are even greater when compared to students from majority groups.

Yet, UGR is not as widespread as it should be, and historically underrepresented students are less likely to participate.

Osborn & Karukstis, 2009
CUR’s Institutionalizing UGR Program

- **1996 – 2007:**
  > Offered 1-2 **national-level workshops** annually, as well as workshops to groups of institutions and/or to individual campuses upon request.

- **2007 – 2014:**
  > Offered a series of **eight regional workshops** for 64 institutions without a tradition or culture of campus-wide UGR (NSF-CCLI, Type 2 Award)
  > Offered workshops for **6 state systems and public and private consortia** to enhance the UR culture at each constituent campus and within the larger system/consortium. (NSF-CCLI/TUES, Type 3 Award)

- **2014 – present**
  > Offered **topical workshops** to connect UGR to curricula, to high-impact practices, etc.

- Served ~700 institutions to date.

Fostering System-/Consortium-wide Change

- Key results and recommendations were published in a project monograph in 2015 (*Jossey-Bass*).

- Our **theory of change model** articulates the distinct conditions needed for transformative change to occur at the individual campus level and for a system/consortium as a whole.
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CUR Transformations – Project Origin

• Almost without exception, one key goal described in each past campus plan has been to create a more research-rich, connected, and scaffolded curriculum.
• However, institutional teams invariably discover that curricular reform requires a long time arc and poses significant challenges, such as:

  - Gaining an understanding of the different disciplinary cultures.
  - Scaffolding curricular elements linked to student learning outcomes.
  - 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.
  - Partnering with students to fundamentally change the learning process.

Session Outline

Background & Project Origins

Project Overview & Design

Q&A and Discussion Prompt

Project Outcomes – Highlights

Emerging Theory of Change

Q&A and Discussion Prompt
CUR Transformations Project

NSF DUE-IUSE grant # 16-25354
2016-2022

“Integrating and Scaffolding Research into Undergraduate STEM Curricula: Probing Faculty, Student Disciplinary, and Institutional Pathways to Transformational Change”

Goals of the CUR Transformations Project

• The overarching goal of this project is to work intensively with a diverse portfolio of partner institutions over a sustained period to conduct fundamental research on student, faculty, departmental, and disciplinary influences on the process of integrating and scaffolding undergraduate research experiences throughout the curriculum.

• A key aim is to assist departments in better understanding the factors that are conducive to institutional change as we help them in developing and sustaining more research-rich curricula and receptive and supportive faculty/departmental cultures.

Essential Elements to Effect Transformational Change

- Evidence-based Curriculum Design and Pedagogy
- Curricular Integration of Research with Faculty Workload
- Leadership Development and Cultural Change
Overall Curricular Objective

The CUR Transformations Project aims to integrate the components and learning outcomes of high-quality undergraduate research throughout four-year undergraduate STEM curricula in the disciplines of biology, chemistry, physics, and psychology.

To achieve cohesive curricula that initiate students into a culture of inquiry and research in the discipline, we are using the evidence-based strategy of backward-design to build vertically scaffolded, research-rich curricula.

Overall Research Objective

We are studying two fundamental and interconnected research questions about the effects of integrating the elements of UGR into the curriculum on (a) the student learning experience and (b) departmental culture/change.

- What effect do student characteristics (e.g., preexisting academic preparation) have on scaffolded integration of UGR into the curriculum and student learning outcomes?

- How do different STEM disciplines/departments effectively integrate the components and outcomes of high-quality UGR to reach more students?
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Sustained Institutional Engagement

Partner institutions and departments have agreed to commit and deeply engage in five core project elements

• Sustained four-year commitment.
• Teamwork.
  - An institutional coordinating leadership team.
  - Two departmental leadership teams. (Including participants that are involved in educational research.)
• Consultant interaction.
• Scholarly engagement.
• Maintaining momentum.

Sustained Consultant Engagement

• Each department is assigned two expert and experienced consultants to help guide their transformation process throughout each year for four consecutive years.
• Consultants make annual site visits for each department. These site visits typically involve a department retreat to review progress and refine their annual action plan.
• Consultants prepare progress reports for each department following each site visit.
• Consultants maintain sustained contact with their teams through email, conference calls, and video chats. This regular communication, coaching, mentoring, guidance, and feedback helps to sustain progress and to provide feedback and suggestions as challenges arise.
Annual Cycle of Iterative Work

- Annual Collaboration Meeting
  24 Departments (~4 attendees per dept.),
  24 Consultants, 6 PI's & Coord., 1-3 Guests

- Iterative Departmental work on Scaffolded Curriculum
  (Action plan, Scaffolding matrix, Incentive funds, etc.)

- Ongoing Project
  Contact, Coaching...

- Project Webinars

- Project Resources
  Zotero, Dropbox, Newsletters, CUR Community, etc.

Data Collection/Analysis on Project and Institutional Research Questions
(Surveys, Interviews, etc.)

2- to 3-day Site Visit by Consultants with Each Department

Common Project Tools

Iterative and Annual Self-reflective Tools

- Action Plan

- Curricular Scaffolding Matrix

- Surveys & Interviews

- Progress Self-assessments

- Consultant Site Visit Report

- Departmental Annual Report

- Consultant Calls
Research Design Overview

Mixed-methods, case study (Quantitative and qualitative)

**Department Teams Research & Assessment Questions**

**Case Studies**

**Common Data** (student cohort outcomes, surveys)

12 Institutions = 24 Case Studies

**Mixed-methods** – Data from annual reports; scaffolding template; action plan; common data; surveys (students & faculty), and case study research design.

- **Case studies** – Case design (qualitative & quantitative evidence) to study implementation effect on students and to examine the implementation of the curricular transformation.

- **Surveys** – Based on standardized and experimental items on UGR employed on (1) NSSE, (2) FSSE, and (3) instruments employed in STEM-based organizational change studies.

  - Surveys provide formative feedback to teams, and allow for some comparison of project institutions to assess student and faculty behaviors and perceptions.
Department Role in Research: Two Levels

Level 1 – Project-wide: Work with the CUR Transformations leadership (PIs/Consultants) to explore the project’s research questions.

Level 2 – Institution/Department: Advance departmental/institutional plans to assess and explore their own questions about student learning through UGR, departmental culture, faculty work, etc.

Q&A and Breakout Discussion

- Q&A, including Chat

- Breakout Discussion
  - We have provided three case studies that describe different scenarios that a department might face as they launch a major curriculum revision process. You may choose one of these cases to discuss or you are free to pose your own scenario.
    - Faculty Dynamics
    - Faculty Workload and Faculty & Departmental Autonomy
    - Departmental Leadership
  - The goal is to suggest strategies that will enable the department to move forward on an action plan that will launch the vertical scaffolding of the elements of undergraduate research throughout the curriculum.
  - After the conversation, we will share some strategies that CUR Transformations participants used to address various challenges in order to move forward.
Common Departmental Challenges at the Outset of Curricular Revision

Team Composition and Faculty Dynamics
- Personnel changes among the team members.
- Lack of universal commitment to the project, especially from those teaching service courses.
- Lack of consensus on both the student learning outcomes and the action plan to address them.
- Faculty view of courses as individually owned.

Conceptual Challenges
- Lack of shared understanding of what is meant by undergraduate research and/or which students should participate in research.
- Significant cultural shift needed to regard course-based research as an authentic experience with high value.
- Lack of awareness and/or commitment to backward-design.
- Student learning outcomes focus almost exclusively on disciplinary knowledge.
- Skepticism about curricular revision arising from past failures.

Infrastructure Challenges
- New or interim administrators with new university strategic plans.
- Perceived lack of resources.
- Infrequent opportunities to meet as a department of the whole to sustain progress.
Given These Early Challenges, How Did Teams Overcome them and Achieve “Buy-In” and Engagement to Move Forward?

A range of strategies were adopted by CUR Transformations departments/institutions to address varying situations.

Targeted Strategies to Overcome Challenges

Faculty Reluctance to Change / Past Failed Curricular Change

- Helping faculty to see those elements of their current courses that are already addressing the objective.
- Empowering non-tenure-track faculty interested in a research-rich curriculum to drive the process.
- Creating a “Process for Departmental Reform Document” that outlines the rules for curricular reform.
- Meeting routinely to discuss what is working well and what is not.
- Bringing in an external speaker (from a comparable or aspirant institution) to showcase successful reform.
Targeted Strategies to Overcome Challenges

Workload

- Being reasonable and realistic in setting goals.
- Forming partnerships to support the effort – undergraduates, graduate students, teaching assistants, library personnel, etc.
- Forming a working group of faculty teaching the initial courses to be revised. Distributing departmental incentive funds to the working group in the form of modest stipends to acknowledge their efforts and time.
- Involving all faculty to allow for a division of labor.
- Using the curriculum transformation process to reduce redundancies in the curriculum.

Faculty Autonomy

- Recognizing that a wide range of teaching approaches and activities across the curriculum can address similar learning objectives (i.e., one size doesn’t fit all).
- Recasting the curriculum revision as a shared vision of what we want our students to achieve.
- Engaging in departmental conversations and developing a shared understanding that introductory and required core courses are “owned” by the department, not individuals.
Scaffolding as a Strategy for Equity

- To ensure all students access to high-quality, research-rich experiences.
- To even workload and involve more faculty members.

Key Aspects of the Transformations Process

**Curriculum**
- Research outcomes scaffolded throughout curriculum
- Multiple revised courses piloted
- Curricular integration into workload
- Departmental incentives support transformation

**Faculty and Team Dynamics**
- All faculty levels
- Extensive buy-in
- Department chair support
- Campus team stable/growing
- Leadership development

**Departmental and Institutional Culture**
- Project visible to various stakeholders
- Clear communication and decision-making
- Viable reward structures
- Whole department owns courses
- Senior administrative support

**Research Approach**
- Deployed student survey to more than one cohort or class
- Conceptualized departmental research agenda
- Deployed departmental research program
- Used assessment to improve student learning

**Dissemination**
- Project progress and outcomes shared outside department
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**Departmental Research & Assessment Informed and Drove Curricular Design**

**Institution A**
- Collected baseline GPA, standardized exam, coursework, etc. data to study which students graduate.
- Tracked CUR Transformations Project student survey data and outcomes of students in a disaggregated fashion.
- Changed T&P documents and department teaching evaluation process to reflect value of active pedagogies.

**Institution B**
- Studied how effective assignments are that emphasize research skills.
- Explored the impact of CUR Transformations goals on faculty workload.

**Institution C**
- Studied impact of inquiry-based curriculum on student research outcomes.
- Studied students’ perceptions of their attainment by demographic groups.

**Observing Culture Shift (in real time)**

By Year 2, departments had (for example):
- Determined decision-making processes.
- Developed learning outcomes.
- Mapped curricula and outcomes to identify redundancies/gaps.
- Initiated and used assessment results to inform planning.
- Shifted to faculty revising curricula/courses in groups vs. independently.
- Developed new faculty workload models.

As a result:
- More students are participating in research.
- These students have an increased perception of their research skills and an enhanced sense of scientific agency.

This culture shift is exemplified by the following Year 2 departmental quote:

“There is broad participation in the project...There is also the acknowledgement that this type of work is essential to fostering productive postgraduate outcomes for our students, serves to distinguish [us] from competitor institutions, and reflects authentic changes in the obligations of 21st century higher education. In sum, there is a shared acknowledgement that undergraduate research is not only the work that we want to do, but the work that we need to do.”
Observing Culture Shift

By year 4, faculty see significant impact on student learning and growth

“Increasing equity. Scaffolding research throughout the curriculum allows for all students to develop research-related skills.”

“Increase in student excitement, self-efficacy, and sense of belonging and science identity.”

“More consistent emphasis on research (including in lecture courses) across curriculum has meant more students get research experience and build skills.”

“Students are more aware of our efforts, and self-efficacy is higher. Many see what we are trying to achieve and appreciate that they are getting authentic experiences.”

“Increased engagement in some courses. Better reinforcement of learning skills and concepts.”

Emerging Themes in Leadership and Culture

Effective strategies to involve multiple groups (e.g., faculty, staff, teaching assistants) in the goals and activities of curricular transformation are emerging

“Overall, there has been a noticeable shift in attitude and language of departmental members who now see the curriculum and its delivery as a shared mission. This has increased collegiality within the department, encouraged knowledge sharing, and identified a larger group of faculty members invested in pedagogical change.”

Multiple programs have developed new approaches for the training of graduate teaching assistants to enable them to be partners in the transformation process.

Additional platforms have been developed for non-tenure-track faculty to pursue curricular innovation, to seek grant funding, and to share the department’s work more broadly.

One department conducted a three-day summer faculty “institute” for both full-time and part-time faculty to serve as a faculty learning community to discuss the expected learning outcomes for modified courses, develop course syllabi and learning activities to address specific research skills and learning outcomes, and design the assessment of those skills/outcomes.
Emerging Strategies to Sustain CUR TP Efforts

One department created a formal leadership position entitled "Associate Head for Strategic Planning, New Curriculum, and Outreach," for continual assessment of the effectiveness of their curriculum.

Another department created a departmental service position of “part-time faculty liaison” to improve dissemination of important departmental information, such as curricular changes, with part-time faculty. They are also considering the development of “course-coordinator” roles whereby full-time faculty would serve as point-persons for communicating with new and part-time faculty about the departmental learning outcomes and resources for particular courses.

One campus expanded their institutional leadership team with administrators and associate deans of “strategically selected key units” that would be stakeholders in promoting CUR-TP-like practices that improve teaching, learning, and student success.

Another department aims to secure ongoing internal funding in order to continue to offer support for faculty course revisions and pedagogy discussions using their model of summer faculty institutes.

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Emerging Theory of Change

Q&A and Discussion Prompt
**Key Factors in our Theory of Change Model**

Departments that use evidence-based principles for curricular redesign and actively align faculty and student expectations and rewards to promote curricular change goals meet with success.

**6 Conditions Correlate with Progress:**

1. Identify multiple and diverse campus leaders to maintain interactions among undergraduate research advocates to sustain curricular and cultural transformation momentum.
2. Develop an understanding of—and use—the many levers for change.
3. Use assessment results to help drive the curricular revision process.
4. Have communication and decision-making strategies that keep undergraduate research efforts front-and-center.
5. Exploit synergies among their CUR Transformations work with related initiatives on STEM student success and/or High-impact practices.
6. Align the goals of the CUR Transformations work on curricular and cultural transitions to broader departmental and institutional goals.


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**Our Emerging Theory of Change**

**Department has:**

- Emerging or existing culture and practice of undergraduate research
- Undergraduate research already embedded in some courses
- Leadership team empowered by department and institution
- Support from administration
- Commitment to assessing impact of research-rich curricula on student success
- Commitment to policies that reward undergraduate research

**STEM departments offer more research-rich, connected, & scaffolded undergrad. curricula and have supportive cultures.**

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Our Emerging Theory of Change

Department has multi-year:
- Continuous coaching by expert consultants
- Group meetings to discuss progress
- Departmental incentive grants
- Student surveys and research analytics
- Planning tool kit (learning objectives, curricular scaffold, progress assessment, UGR reference resources)
- Webinars, newsletters, and community list-serve
- Dissemination opportunities

Context ➔ Interventions/Inputs ➔ Indicators ➔ Outputs ➔ Outcomes ➔ Goal

Department progress indicated through analysis of:
- Curricular changes
- Faculty and team dynamics
- Department and institutional culture
- Action research activities
- Dissemination activities

Department outputs – counts:
- # Faculty and staff involved in change
- # Courses changed
- # Students taught in transformed courses
- # Presentations and publications

Department outputs – attributes:
- When and how courses change
- How do faculty and students engage in the change process
- When and how do policies change to support more research-centric curricula
Q&A and Breakout Discussion

• Q&A, including Chat

• Breakout Discussion
  ◆ When considering your project, what contextual elements have you taken into account, have you had to re-think, have emerged as elements that you did not initially deem important? How do these critical contextual elements shape your theory of change?

Acknowledgments

• We acknowledge the leadership and insights of many teacher-scholars who have worked with the CUR community for the past three decades. The ideas that form the basis for this project are distilled from CUR’s work with more than 700 institutions who have participated in our professional development institutes and workshops.

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References Cited
