

A MODEL FOR HOLISTIC ASSESSMENT OF COURSE-BASED UNDERGRADUATE RESEARCH EXPERIENCES

2022 ConnectUR Annual Conference

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Key Takeaways

Through engaging in this session, participants will:

- *Learn about the CURE – Purdue model for instructor development, including curriculum and assessment models.*
- *Consider how to implement new (or adapt existing) assessment of instructor development and/or CUREs at their institutions.*



This QR code will take you to the website:

(<https://purdue.edu/undergrad-research/conferences/CUR2022.php>)

Which contains information from multiple ConnectUR presentations by staff in the Purdue University Office of Undergraduate Research.



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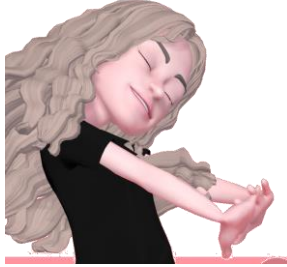
Who are we? The CURE – Purdue Leadership Team

Amy Childress
Director
Office of Undergraduate Research



"You got this."

Stephanie Gardner
Associate Professor
Biological Sciences



"I got this."

Craig Zywicki
Associate Director
Office of Undergraduate Research



"What did the participants get?"



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Presentation Outline

- The Big Picture: Undergraduate Research within:
 - Purdue University,
 - The Office of Undergraduate Research (OUR), and
 - Course-based Undergraduate Research Experiences (CUREs).
- What are CUREs? What is CURE – Purdue?
- Assessment/evaluation/research models of CURE – Purdue and CUREs.



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The Big Picture: Undergraduate Research within the University

Practices that improve the student experience and persistence (HIPs):

- First-year seminars and experiences
- Common intellectual experiences
- Learning communities
- Writing-intensive courses
- Collaborative assignments and projects
- Diversity/Global learning
- ePortfolios
- Internships
- Capstone courses and projects
- Service learning, Community-based learning
- **Undergraduate research experiences (UREs)**



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The Big Picture: Office of Undergraduate Research

UG Recruitment

- OURConnect
- Research Roundtables
- OUR Scholars
- FY URE Program
- One-on-One Consultations

Program Support

- **CURE – Purdue Fellows Program**
- UG Research Conferences
- Online Courses
- Grant Funding
- Seminars
- Mentorship
- Evaluation & Assessment

Consultation

- Grant Proposals
- Program Design
- Program Implementation
- Ongoing Program Administration

Communication

- Newsletters
- Website
- Social Media
- Course Presentations
- Student Organizations



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The Big Picture: CUREs and CURE – Purdue

Core characteristics of a CURE at Purdue:

- Authentic, novel research experiences.
- Holistic, from creation of questions through presentation.
- Mentored by a faculty/staff instructor.
- For credit.

Related definitions in CURE context:

- **Research:** Broadly inclusive, within any discipline, a scientific study investigation, scientific experimentation, social science investigation, or humanities/creative endeavor.
- **Undergraduate Researcher (UR):** Undergraduate or professional student participating in a research experience.
- **Undergraduate Research Experience (URE):** Any opportunity on campus for undergraduate students to experience research, mentored by Purdue faculty or staff.
- **Mentor:** Typically the faculty participating CURE – Purdue, but may include co-instructors, graduate students, or peer mentors.



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CUREs and
CURE – Purdue

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The Big Picture: CUREs and CURE – Purdue

	CURE	Internship/ Apprenticeship
Scale	Many students	Few students
Structure	One to many	One to one
Enrollment	Open to all students in a course	Open to a selected or self-selecting few
Timing	Students invest time primarily in class	Students invest time primarily outside of class
Setting	Teaching space	Faculty research group
Mentoring	Consistent / Structured	Varied



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(Auchincloss et al., 2014)

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The Big Picture: CUREs and CURE - Purdue

What is CURE - Purdue?

- Instructor development through:
 - Workshop-style training of instructors from a range of disciplines.
 - On-going mentoring from peer instructors.
 - On-going collaborative support via Communities of Practice.
 - Evaluation and assessment of instructor and student participants.
 - Consultation and ongoing support for additional course-specific assessment.
 - Engagement with OUR infrastructure.
- Institutional outcomes:
 - Lowering barriers to student participation in the high impact experiential learning experience of research.
 - Enabling instructors to involve large(r) numbers of students to experience research.
 - Cheap(er) solution than the apprenticeship model.
 - Strengthened connection between teaching and research.
 - Broader adoption of effective teaching strategies and practices.



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CURE - Purdue: Big Picture

Our anticipated outcomes...

...for Instructors:

- Gain new knowledge/skills (see workshop agenda).
- Each instructor creates and teaches at least one CURE, offered within the next academic year.
 - Many expected to continue beyond one year.
 - Many may apply knowledge in other courses.
- A diverse and supportive community of learners and researchers.
- Recognition of mentoring and teaching within P&T and evaluation processes.

...for Students:

- Gain new knowledge/skills.
- Makes research available to more students (by demographic/academic background).
- May put research into required curriculum; may enable more opportunities as an elective.
- Increase recruitment, persistence, and retention through more interactive and realistic course delivery.
- Expand career awareness and broaden opportunities.



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The CURE – Purdue Model vs. CUREnet

CURE – Purdue	CUREnet
Local experts, single local context	National experts, numerous contexts
2-day workshop: Institutionalized agenda	2-day workshop: Broad agenda
Academic year in-person support (peer mentoring and community of practice)	No formal support beyond workshop
Local assessment, evaluation, research	Feedback for conducting your own assessment
Participants paid (milestone outcomes)	Workshop free (grant funded) Participants pay travel/lodging
Institutional transformation	Since course/area transformation

Recommendation for implementation CURE instructor development: Attend CUREnet for single participants or for training the trainer; then adapt CUREnet for peer instructor development within your local contexts.



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Assessment, Evaluation, & Research Models

Model	Broad Questions
I: CURE – Purdue Participant Research	<i>What are the experiences and perceptions of instructors who design/teach CUREs?</i>
II: CURE – Purdue Student Research	<i>What are the experiences, perceptions, and outcomes of students in undergraduate research experiences?</i> <i>What are the differences between students who participate in an undergraduate research experience, versus those who do not?</i>
III: Institutional Reporting	<i>What count of [subgroup] did [something]?</i>
IV: Faculty Research for their CUREs	<i>[questions vary by faculty and their CURE]</i>



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CURE - Purdue Institutional Reporting (non-Research)

- Basic counts, by Cohort of Workshop Participants:

	Su 2019 Cohort	Su 2020 Cohort	Su 2021 Cohort	Su 2022 Cohort
Workshop Participants	5	--	22	37 (so far)
Courses (offered at least once)	7	--	21	--
Students, by enrollment (Fa2019 to Su2021)	216	--	--	--
Students, by enrollment (Fa2021 to Sp2022)	~141	--	~809	--



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Research Model: Theoretical Framework for CURE Mentors

Expectancy Value Theory (Wigfield & Eccles, 2000):

Motivation and achievement based on two factors:

- Expecting success for certain tasks
- Subjective values on these tasks

Sample mindset:

"How do the tasks to prepare to teach a CURE, plus the tasks to teach a CURE, impact my motivation to invest time in teaching a CURE?"

EVT in CUREs (Goodwin, Cary, & Shortridge, 2021):

Task Values	Sample Item
Attainment (ideas & identity)	I think research-based courses like the CURE are valuable because they allow for increased numbers of students to gain research experience.
Utility (tangible & professional development)	Teaching the CURE improves my mentoring skills.
Intrinsic	It is fulfilling to see students get engaged with their projects in the CURE.
Costs (emotional & time):	The lack of structure makes teaching the CURE challenging.



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Research Model: Theoretical Frameworks for Students in CUREs

Multiple frameworks, selected from:

- Perceptions of research experience (DURI).
- Perceptions of learning gains (URSSA).
- Proficiency on research skills (EvaluateUR).
- Benefits (SURE).
- Self Efficacy (NGSE).
- Project ownership, emotion, self-efficacy, identity, identity values, networking (PITS).
- Mentoring (CIMER).

Non-theoretical, but also drafted:

- Interests (Purdue OUR).
- Knowledge, skills, challenges, support (Purdue Roadmap).

Individual CUREs:

- Variable by targeted skills or conceptual knowledge.



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Data Collection Sample Timeline

When		CURE – Purdue Activities	Data Collected
2/22-5/22		Promotion and Selection Process	- Application. - Institutional Course Data. - Institutional Employment Data.
5/22-6/22		Pre-Workshop assignments	- Survey for workshop content/logistics. - Reflection.
6/22		2-day Workshop	- Worksheets (all within shared folders). - Observations and notes. - End of day reflections; end of workshop evaluation.
6/22-8/22	6/22-1/23	- CURE Prep - One-on-one mentoring	- Worksheets and other course documents. - Observations and notes.
8/22-12/22	1/23-5/23	CURE Implementation	- Course artifacts. - Observations and notes. - Other data for individualized CUREs. *
12/22	5/23	CURE Closure	- Institutional student data. * - Survey of students (t2; some also t1). *
8/22-5/23		Monthly Community of Practice	- Worksheets. - Observations and notes.
Long-term			- Follow Fellows' on-going mentoring. - Follow students' on-going UR experiences. - Interviews of focus groups with students.

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Data Collection: Surveys and Institutional Data

Surveys (Directly based on frameworks previously shown)

Institutional Student Data:

- Key variables.
- Personal identifiers.
- Personal demographics.
- Academic characteristics:
 - At start,
 - At end, and
 - Longitudinal.
- [others]

Institutional Instructor/Mentor Data:

- Key variables.
- Personal identifiers.
- Personal demographics.
- Position characteristics.
- [others]

Institutional Course Data:

- Course ID.
- Sections.
- Title.
- When (e.g., term or start/end dates).
- [others]

Typical Key Variables: Unique IDs and academic period used to distinguish unique cases.



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Data Collection via Focus Groups or Interviews

Sample Themes

Instructors (workshop participants)	Students (enrolled in CUREs)
Interest or motivation to participate in CURE – Purdue, teaching a CURE.	Interest or motivation to participate in a CURE.
Perceptions of self (as a teacher/mentor) and of the CURE.	Perceptions of self (as a student and/or researcher) and of the CURE.
Post-CURE adaptation for other teaching/mentoring.	Students' post-CURE preparation for further research experiences.
...	...



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Data Collection for Individual CUREs: Five Variations

We partner with CURE instructors for SoTL research, based on using:

- A concept inventory.
- The gradebook.
- Rubric data.
- Perceptions data.
- Qualitative data.

Key questions, when creating partnerships:

1. Do you want OUR staff involved?
2. Who is best fit to complete which parts of the study?
3. What is your authorship plan?
4. When will the study be designed, or data collected?
 - Do we first need IRB approval?
 - When do we need to collect t1 data? t2 data?
5. What are the other OUR staff commitments?



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What are your questions...

...possibly:

- What do students' research experiences actually look like in [discipline] CURE?
- What are your tips to get started with study design?
- We do not have the resources (funding, staff time, etc) to do this; what do you recommend?
- Have you considered ____? (Why or why not?)



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- Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, 53(1), 109-132. <https://doi.org/10.1146/annurev.psych.53.100901.135153>



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References for Student Data Collection

A prior slide listed frameworks prospectively useful in data collection of student participants. These links provide more information.

Theoretical:

- Perceptions of research experience (DURI): Unpublished.
- Perceptions of learning gains (URSSA): <https://www.colorado.edu/eur/research-areas/undergraduate-research/evaluation-tools-undergraduate-research-student-self>
- Proficiency on research skills (EvaluateUR): <https://serc.carleton.edu/evaluateur/index.html>
- Benefits (SURE): <https://www.grinnell.edu/academics/resources/ctla/assessment/sure-iii>
- Self Efficacy (NGSE): <https://asset-pdf.scinapse.io/prod/2109638824/2109638824.pdf>
- Project ownership, emotion, self-efficacy, identity, identity values, networking (PITS): <https://pubmed.ncbi.nlm.nih.gov/27810869/>
- Mentoring (CIMER): <https://cimerproject.org/>

Non-theoretical, but also drafted:

- Interests (Purdue OUR): Unpublished.
- Knowledge, skills, challenges, support (Purdue Roadmap): Based on the following, but consider your own institutional references that may help you select measurements that match institutional priorities: <https://www.purdue.edu/provost/about/provostInitiatives/excellence/roadmap/>



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