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Enhancing and Expanding Undergraduate Research: A Systems Approach

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NEW DIRECTIONS FOR HIGHER EDUCATION

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From the Editors

Undergraduate research is a high-impact practice that sparks students' interest in learning and love for the discipline, and it improves retention, student success, graduation rates, and postgraduation achievement. Many individual campuses have offered these programs for several years, and the Council on Undergraduate Research (CUR) has supported their efforts in many ways. More recently, CUR has partnered with state systems of higher education and public and private consortia to foster the institutionalization of undergraduate research at the member institutions and across the systems/consortia.

This volume illustrates many of the successes that entire systems/consortia and their campuses have achieved, such as:

- connecting undergraduate research to the curriculum, student success and completion, especially for underrepresented students,
- creating cross-campus discussions on curricula and pedagogy, research collaborations among departments and campuses, and enhanced interdisciplinary activities, and
- addressing the challenges of workforce development and faculty issues—especially workload and tenure/promotion.

Lessons from building a rich undergraduate research program across the systems can be applied to many other system-wide initiatives. This is of interest to faculty, administrators, and practitioners.

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Higher Education

Betsy O. Barefoot
Jillian L. Kinzie
Co-editors

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Mitchell Malachowski
Jeffrey M. Osborn
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Editors

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Mitchell Malachowski, Jeffrey M. Osborn, Kerry K. Karukstis, Elizabeth L. Ambos
New Directions for Higher Education, no. 169
Betsy O. Barefoot and Jillian L. Kinzie, Co-editors

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CONTENTS

EDITORS' NOTES 1
Mitchell Malachowski, Jeffrey M. Osborn, Kerry K. Karukstis, Elizabeth L. Ambos

1. Realizing Student, Faculty, and Institutional Outcomes at Scale: Institutionalizing Undergraduate Research, Scholarship, and Creative Activity Within Systems and Consortia 3
Mitchell Malachowski, Jeffrey M. Osborn, Kerry K. Karukstis, Elizabeth L. Ambos
An overview of the project that led to the collaborations between the Council on Undergraduate Research and state systems and consortia is described.

2. The System Effect: Scaling High-Impact Practices Across Campuses 15
Jonathan S. Gagliardi, Rebecca R. Martin, Kathleen Wise, Charles Blaich
State system and consortium offices have unique strengths in assisting member campuses to embed high levels of undergraduate research.

3. Undergraduate Research and Its Impact on Student Success for Underrepresented Students 27
Ken O'Donnell, Judy Botelho, Jessica Brown, Gerardo M. González, William Head
Undergraduate research has tremendous potential to help undergraduate students maximize their educational outcomes.

4. Undergraduate Research and Economic Development: A Systems Approach in Wisconsin 39
Dean Van Galen, Lissa Schneider-Rebozo, Karen Havholm, Kris Andrews
Connections between undergraduate research and workforce and economic development are probed in this chapter.

5. Faculty Workload Issues Connected to Undergraduate Research 51
Rhona Free, Suzanne Griffith, Bill Spellman
Recognizing faculty time in working with students on research is a critical need when designing undergraduate research programs.

6. Making Undergraduate Research a Central Strategy in High-Impact Practice Reform: The PASSHE Journey 61
James D. Moran III, Marilyn J. Wells, Angela Smith-Aumen
Initiatives to build undergraduate research as a signature program, especially when coupled with other high-impact practices, can be a driver for enrollment management and student retention.

7. Fostering Resources for Undergraduate Research at the City University of New York 73
Effie S. MacLachlan, Avrom J. Caplan
Strong grant-writing and funding skills are critical to providing support for undergraduate research efforts across entire systems.

8. Developing Research Skills Across the Undergraduate Curriculum 85
Simon Gray, Lee Coates, Ann Fraser, Pam Pierce
The curriculum is an important target for embedding undergraduate research on a campus, and ways to developmentally scaffold research skills throughout the curriculum are considered.

9. Fostering Undergraduate Research Change at the System and Consortium Level: Perspectives From the Council on Undergraduate Research 95
Mitchell Malachowski, Jeffrey M. Osborn, Kerry K. Karukstis, Elizabeth L. Ambos, Shontay L. Kincaid, Daniel Weiler
Key findings from the project, connecting undergraduate research with priorities of state systems and consortia, and a theory of change model for systems/consortia are described in this chapter.

INDEX 107

Editors' Notes

Undergraduate research has been shown to be one of the high-impact practices that lead to substantial impacts on students' cognitive and affective development in college. It addresses much of what we believe is important in education, as undergraduate research helps develop critical thinking skills and problem-solving abilities; it also improves retention, student success, graduation rates, and postgraduation achievement. Although the positive outcomes of undergraduate research are now well documented, its practice is still far from universal. Why is that the case? Some of the reasons are cultural or pedagogical, including undergraduate research not being part of the traditions of some disciplines or it not fitting into the curriculum in obvious ways. Other reasons are more practical, such as the challenges of gathering resources to support this activity or faculty issues including how undergraduate research counts in workload, and the rank and tenure process. And, of course, there needs to be institutional buy-in at a level that allows for the meaningful engagement of all the participants.

Despite the challenges, there are now many success stories from campuses that have institutionalized undergraduate research. We have been involved with many colleges/universities over the years that have moved to a level of undergraduate research that has led to deep and transformative changes in the campus practices and culture. In this volume, many of those success stories are described by the very practitioners who have made them happen. Six state systems and private/public consortia with whom we have worked over the past five years describe their journeys to harness the power of the collectives to foster the institutionalization of undergraduate research at campuses across the systems/consortia. Their experiences highlight many of the issues that others need to consider as they move toward teacher–scholar and student-as-scholar models. Their institutional commitments to undergraduate research have led to enriched curricula and more creative and dynamic learning environments. At the system/consortium level, these strategic efforts have generated opportunities for meaningful cross-campus discussions on curricula and pedagogy, fostered research collaborations among departments and campuses, and enhanced interdisciplinary activities. We discuss the model of change that systems/consortia have used to move to this new paradigm and consider ways to apply these models to other large-scale initiatives. Enjoy.

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This chapter reviews the evidence for the effectiveness of undergraduate research as a student, faculty, and institutional success pathway, and provides the context for the Council on Undergraduate Research's support for developing and enhancing undergraduate research in systems and consortia. The chapter also provides brief introductions to each of the chapters in the theme volume.

Realizing Student, Faculty, and Institutional Outcomes at Scale: Institutionalizing Undergraduate Research, Scholarship, and Creative Activity Within Systems and Consortia

Mitchell Malachowski, Jeffrey M. Osborn, Kerry K. Karukstis, Elizabeth L. Ambos

The Transformative Role of Undergraduate Research

Many academicians have embraced undergraduate research (UR) as the pedagogy for the 21st century (Brew, 2010; Lopatto, 2009). The melding of teaching and research into a collaborative enterprise of student and faculty mentor is viewed as an innovative curricular reform that eliminates the historic tension between teaching and scholarship and motivates undergraduates to learn by doing. Recognition of the pedagogical value of UR might be best attributed to numerous rigorous studies of the impact of UR on student learning and personal growth, as well as the wider impact on all other stakeholders of higher education, including faculty, institutions of all types, business and corporate associates, and nonprofit community partners.

UR is a high-impact practice that sparks students' interest in learning and love for the discipline and that improves retention, student success, graduation rates, and postgraduation achievement (Hathaway, Nagda, & Gregerman, 2002; Hu, Scheuch, Schwartz, Gayles, & Li, 2008; Hunter, Laursen, & Seymour, 2006; Kardash, 2000; Kuh, 2008; Kuh, Kinzie,

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Schuh, Whitt, & Associates, 2010; Laursen, Hunter, Seymour, Thiry, & Melton, 2010; Laursen, Seymour, & Hunter, 2012; Lopatto, 2009; Osborn & Karukstis, 2009; Seymour, Hunter, Laursen, & DeAntoni, 2004). Research on UR shows compelling benefits of participating in scholarly work for students across demographic groups and disciplines—and even higher gains for women, first-generation, and minority students (Kuh, 2008; Osborn & Karukstis, 2009). Yet, UR opportunities are often optional and highly selective, missing the very students who could benefit most from them.

While the significant benefits from undergraduate engagement in research are clear, the drive to institutionalize UR is perhaps intensified by the advantages accorded to faculty and institutions from a strong and pervasive campus UR culture. An institutional commitment to UR can enrich the curriculum, lead to more creative and dynamic learning environments, generate opportunities for meaningful cross-campus discussions on curricula and pedagogy, foster research collaborations among faculty and departments, and enhance interdisciplinary activities. A successful and unifying UR program can raise institutional reputation and visibility; enhance the recruitment of talented students, faculty, and staff; and attract external funding and committed donors (National Science Board, 1986; National Science Foundation, 1990).

Despite the wide acceptance of the benefits of UR, developing and sustaining an institutional culture of UR is a complex process (Taraban & Blanton, 2008). Many institutions lack the critical leadership to manage the challenging work of transformational change. Deficiencies in campus infrastructure to support dynamic and productive research programs are also prevalent. Many faculty members could benefit from strategies that enable them to generate new research ideas, create time for research, effectively mentor undergraduates, garner external funding, establish successful collaborations, and maintain their level of expertise. Numerous departments seek innovative models for creative research-supportive curricula and for making research experiences more widely accessible to undergraduates.

Thus, the Council on Undergraduate Research's (CUR) National Science Foundation (NSF)–funded project (Malachowski, Ambos, Karukstis, & Osborn, 2010) was designed to develop and enhance UR at a larger scale: within systems/consortia. Our approach is to leverage the synergy of higher education systems and consortia to disseminate effective practices for institutionalizing a culture of UR, utilizing both the amassed organizational experience of CUR and the shared expertise of institutions within a given consortium or system.

Overview of CUR and the Promotion of Undergraduate Research

CUR is a relatively young (37 years as of 2015) higher education nonprofit association. CUR came into existence largely to assert the value of research

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conducted at predominantly undergraduate, four-year institutions and to provide practical help to individual faculty members seeking to develop UR programs (Doyle, 1987). From its inception in 1978 as an association of 10 chemistry faculty members at predominantly undergraduate institutions in the United States, to its current reality as a vibrant organization of over 10,000 individual and 700 institutional members representing all disciplines and over 900 colleges and universities of all types, CUR has emerged as the primary voice for the global UR movement. The organization has developed an increasingly broad portfolio of programs, services, and advocacy efforts in support of many aspects of the UR enterprise. CUR's work with systems/consortia emphasizes broad-scale, long-term transformational change linked across multiple institutions. The organization's rapid growth, stakeholder diversification, and emergence as the international standard bearer for the UR movement also reflect that transformational change.

Four elements of CUR's recent organizational evolution have both strongly shaped the UR programs described in this theme volume and been shaped by the lessons learned from working with the six systems/consortia. First, CUR's rapid growth and diversification into non-STEM disciplines position CUR as a unique "marketplace" for faculty and administrators from all disciplines and vastly different academic cultures to explore UR as a unifying theory for faculty research and teaching, including recognition/reward structures such as retention, tenure, and promotion. Second, CUR's 2010 merger with the National Conference on Undergraduate Research (NCUR) to form one unified organization has led to an expanded emphasis on student programs, complementing CUR's historic focus on the professional development needs of faculty and institutions. Third, the collaborative writing process, subsequent publication, and widespread dissemination of the seminal document *Characteristics of Excellence in Undergraduate Research* (Hensel, 2012) proved to be a galvanizing focus for the organization, providing high-quality standards for UR programs for the first time. Fourth, CUR's formal adoption of three primary strategic pillars in 2012—broadening participation in UR, embedding UR in the curriculum, and assessing the impacts of UR—signified the organization's readiness to thoroughly connect UR with other domains of higher education policy and thought leadership, particularly the imperative for undergraduate student retention, graduation, and subsequent career success.

History, Scope, and Goals of CUR's "Institutionalizing Undergraduate Research" Workshop Program

One of the main types of professional development meetings that CUR offers is the multiday workshop. The longest running of these is the "Institutionalizing Undergraduate Research" (IUR) workshop through which we have worked with over 450 institutions and over 1,800 faculty members and

administrators, representing all types of institutions and disciplines. There have been three distinct phases of this project, and we will describe them next to show the evolution of our engagement with the campuses.

1996–2006: Building Capacity. Since its inception in 1996, each IUR workshop has been team-based, attracting 8–15 institutional teams nationally, with each participating institution sending a four- to six-person team. At the heart of the workshop is an expectation that each team generate a series of goals to integrate higher levels of UR that would then be adapted and expanded when the team returned to campus.

From 1996 to 2006, the program served over 300 institutions of all types. Several institutions were repeat attendees, developmentally building on their growth and successes at subsequent workshops; one institution attended four times.

2006–2010: Regional Workshops. One limitation of the annual IUR workshop was that it typically required teams to travel across the country, and these costs were prohibitive for many institutions to send a team. Moreover, the national distribution of participants limited follow-up interactions among attendees.

To address these concerns, with the support of an NSF–Course, Curriculum, and Laboratory Improvement (CCLI) Phase 2 award (Hensel, Karukstis, Osborn, Malachowski, & Singer, 2006), CUR offered a series of eight regional workshops covering the major geographical regions of the United States from 2006 to 2010. The workshops were designed for institutions that did not have a tradition or culture of campus-wide engagement in UR. Each workshop served eight institutions with each institutional team comprising three faculty members and one administrator. Overall, the project engaged 64 institutions and over 256 participants in the initial round of workshops. These workshops included discussion of issues such as implementation/expansion of a research culture, strategies and models for institutionalization, challenges of fostering institutional change, and assessment. Teams worked closely with a trained facilitator to generate an action plan that strategically guided their activities to institutionalize UR across their campuses.

The workshop outcomes were enhanced by a robust series of follow-up activities, including site visits to each of the 64 campuses approximately one year after the initial workshop. At each follow-up visit, a consultant met with 50–100 faculty members and key administrators on each campus, delivered a presentation, facilitated an on-campus retreat, assessed how the plan initially conceived during the workshop had evolved, and provided guidance on next steps for the institution's plan.

Through an extensive external evaluation, about 90% of the attendees stated that they were modifying their UR goals based on what they learned at the workshop and taking action to institutionalize UR on their campuses. These results indicated a strong disposition for institutions to change

fundamental campus goals, and they illustrated the broad impact of the workshops and follow-up visits. The project's broadest impact was ensuring the sustainable implementation of UR at the participating institutions and building regional UR communities.

2010–2014: Scaling-Up—System/Consortium Workshops. Although CUR had worked with many institutions since 1996 and had built capacity around the country, there was still a great deal of unmet need as many institutions were articulating their desire to increase adoption of high-impact pedagogies and their overall research efforts. Consequently, in 2010, with the support of an NSF-CCLI Phase 3 award (Malachowski et al., 2010), we comprehensively extended the successful model of working solely with individual institutions to work with larger organizational units that had similar or closely related missions: state systems and public and private consortia.

This workshop program was fundamentally designed to improve the quality of undergraduate education at each of the constituent campuses and within the larger systems/consortia by leveraging the synergy, influence, and power of the systems and consortia.

Twenty-four systems/consortia applied to participate, from which six were selected: the Council on Public Liberal Arts Colleges (COPLAC), the University of Wisconsin State System (UW), the California State University System (CSU), the City University of New York System (CUNY), the Great Lakes Colleges Association (GLCA), and the Pennsylvania State System of Higher Education (PASSHE). Overall, we worked directly with six systems/consortia, 80 institutions, and over 300 faculty members and administrators.

The workshop curricula were tailored to meet the needs of each system/consortium, and the curricula covered such topics as understanding and changing institutional culture, faculty hiring, tenure/promotion and workload issues, curriculum case studies, assessment, funding, supporting nontraditional students, connecting UR to service learning, community-based learning and international education, and promoting UR in all disciplines.

One key difference between this system/consortium workshop project and the earlier regional workshop project was the design and implementation of follow-up activities. Here, we brought together all of the system/consortium participants for a second workshop approximately one year after the initial one. The follow-up workshops were designed to provide support during the critical, one-year-out point in the implementation of action plans; our past experience had taught us that many teams need to be reinvigorated at this juncture. The follow-up workshops were designed to be interactive and discussion based, with the institutional teams helping each other wrestle with their own challenges and sharing lessons learned from their own experiences and best practices developed within each system/consortium.

The project evaluation identified common challenges for system/consortium-level administrators, including obtaining accurate information about the status of UR on their multiple campuses, configuring system assistance to match widely varying campus needs, promoting a reasonably consistent vision for UR across numerous and diverse campuses, and maintaining a shared vision when personnel change at the campus and system/consortium levels. Furthermore, the summative phase of the project helped to develop a better understanding of the processes and the most effective drivers of organizational and culture change.

Workshop Design. Key to the workshop design was a three-day format that involved team participation, including three faculty members and at least one senior-level administrator from each campus, and system/consortium leaders. The workshop schedule included a strategic balance of presentations, breakout discussions, and networking. Attention was focused both on serving the needs of each campus and, most importantly, on fostering connections among the system/consortium and their member institutions.

Workshop Goals and Outcomes. Each workshop was designed to achieve four interconnected goals: (a) provide teams with information on the status and landscape of UR at the national level; (b) help each system/consortium in building and enhancing a culture that supports UR, both at the individual institution level and the system/consortium level; (c) assist the system/consortium and the constituent campuses in articulating goals for institutionalizing UR, as well as developing strategies to achieve these goals on each campus; and (d) help identify common challenges and opportunities among the campuses, and help develop an integrated approach, supported by the central office, that would aid in expanding UR capacity throughout the system/consortium.

Each team worked closely with a trained facilitator who guided the team's efforts and ensured that challenging, but realistic, goals were set. The facilitators played a crucial role in the success of the workshops, and we carefully selected facilitators for their range of experiences, understanding of the national issues, and, most importantly, their ability to both facilitate the work of the teams and help them dream big while generating realistic goals. At the completion of each workshop, every institutional team left with a customized and action-oriented plan that would strategically guide their implementation activities to institutionalize UR on their own campus. The system/consortium office also developed a coordinated plan to embed and sustain UR as a central pedagogical and scholarly endeavor within the entire system/consortium. The resulting action plans included a mission statement and short-, medium-, and long-term goals (each with planned strategies, timelines, pertinent stakeholders, and assessment plans to achieve those goals and measure progress toward them) that were brought back to their campuses for implementation.

Strategies Used: An Overview of the Volume

Embedding UR across an individual campus requires considerable cooperation and an ability to work through many hurdles among the many campus units. Performing the same undertaking across an entire system or consortium magnifies the challenges enormously and requires a much higher level of planning and execution. This challenge is at the heart of our work on this project, and our understanding of how systems and consortia function is a key component of our interactions with them.

In the chapters that follow, each of the six systems/consortia that participated in the project provides a synopsis of their work to institutionalize UR, with each narrative focusing on a different pressing higher education topic. Outcomes from the institutional teams, their impacts at the system/consortium level, and different strategies used to institutionalize UR are described. Two additional chapters focus on the broader perspective of organizational/cultural change at the system/consortium level.

Chapter 2: The 30,000-Foot View From the National Association of System Heads and the Center for Inquiry in the Liberal Arts. This chapter describes issues that revolve around how particular cultures of each system/consortium inform organizational change at both the macro and micro level. Profiles of each system/consortium are provided and connections to their modes of action and strategies pursued are considered.

Issues of "systemness" are probed, and questions such as how particular components of systems/consortia facilitate the measurement and scaling-up of UR are discussed. This chapter breaks new ground in addressing the question of whether there are effective system/consortium strategies that can be used to maximize outputs for any activity, including UR.

Chapter 3: California State University System. Here the focus shifts to a discussion of the impact of UR on students from underrepresented groups and how it connects to the CSU's push for student success. There is a natural connection between UR and CSU's Graduation Initiative, as UR has been shown to have substantial impacts on underrepresented students. Finding ways to engage all students on a given campus is critical to student success. These initiatives are challenging because many students juggle family needs and/or jobs that make it difficult to engage in UR.

This chapter lays out many of the challenges that any system/institution/department faces in trying to embed UR within its programs, including the crucial need to focus on sustainability. Consideration is given to issues such as funding for students and faculty, community engagement, an undergraduate journal, celebration days, links to community colleges, and developing research-rich curricula. The CSU system has worked hard to build connections across their diverse campuses through the use of affinity groups and efforts of the central office. Paramount in the CSU approach is its impact on retention and graduation success. Data

collection and utilization are critically important in the system, so a discussion of how the CSU uses assessment dashboards is included.

Chapter 4: University of Wisconsin System. In this chapter, leaders from the UW system describe their efforts to connect UR to economic development, workforce development, and innovation. This is an important element of campus research endeavors in Wisconsin, and UR is shown to connect strongly with these statewide initiatives. The development of partnerships within and outside the campuses is a large component of these efforts, with technology transfer among all the parties in the state being critically important. Numerous examples and case studies of successful collaborations between campuses and industrial partners are described along with their direct connections to undergraduates. UR serves the state well, and many initiatives have been undertaken to strengthen student outcomes while connecting undergraduates with innovation and economic development efforts.

Chapter 5: Council of Public Liberal Arts Colleges. UR is an activity that clearly has a focus on students and student learning. However, it also impacts faculty in many ways, including issues that revolve around faculty workload and tenure/promotion, and these are described in this chapter. Leaders from COPLAC discuss the many facets of faculty professional pursuits and consider maximizing faculty support while enhancing student outcomes.

Given the diversity of faculty needs, success for these endeavors is connected to faculty buy-in of the teacher–scholar model. Strengthening connections among all the participants can challenge campuses, so COPLAC describes how they used surveys to collect valuable data about the prevalence and scope of UR activities across the consortium, from both the faculty and student perspectives, and created an innovative distance-mentoring program.

Chapter 6: Pennsylvania State System of Higher Education. High-impact practices, including UR, are powerful ways to impact student outcomes. Leaders from PASSHE describe connections among high-impact practices and focus on the centrality of UR in these efforts. This chapter describes the drivers that have helped move UR front and center at many PASSHE campuses. This conversation focuses on how PASSHE has dealt with state funding declines and differential demographics across the system, and how the system office can support and drive initiatives that promote UR as a system-wide solution.

Despite serious financial stress, enrollment declines, and retrenchment of tenured faculty members at some institutions, UR has been used as a vehicle to meet or exceed system-wide student graduation and equity targets. As a result, UR has been shown to be a driver for enrollment management efforts related to student retention, and the conversation is now centered on UR as an investment rather than as an expense. Connections to PASSHE's

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