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peerReview

Emerging trends and key debates in undergraduate education

Undergraduate Research

A Path to Engagement, Achievement, and Integration



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In early November 2005, the Association of American Colleges and Universities (AAC&U) released the first report from its Liberal Education and America's Promise (LEAP) campaign—*Liberal Education Outcomes: A Preliminary Report on Student Achievement in College*. As this report states, “For liberal education outcomes, evidence should vividly depict the rich and complex nature of student accomplishment as knowledge and skills are built over time and across disciplines.” Undergraduate research, the theme of this issue of *Peer Review*, is a promising educational innovation from which college leaders might draw evidence of achievement of the more sophisticated learning outcomes we now seek for today's students.

While working on this issue, I had the opportunity to reflect upon my own undergraduate research project that I undertook with the guidance of a three-member faculty committee during my last year as a student at Hampshire College, a member of the Greater Expectations Consortium on Quality Education. Since its inception in 1970, Hampshire has required all students to design, implement, and complete an undergraduate research project prior to graduation. Known at Hampshire as the Division III project, this independent study project must deal with a complex set of questions, concepts, skills, and abilities. My Division III project focused on the development of a prospectus for and prototype of a periodical magazine for African American adolescent females. No publication for that audience existed at that time.

The initial phase of my project involved researching and reviewing the magazines that had been published specifically for African American audiences. This task required me to spend several hours combing the special magazine collections at the Library of Congress. At the same time, I studied the periodicals that were published for young women at that time and I measured the presence of African American women in those magazines. After establishing a historical and a marketing perspective for this project, I designed a simple survey instrument to administer to black adolescent women in Washington, DC, Baltimore, and Springfield, Massachusetts. I found that initiative and persistence were key attributes needed to complete my research. One of the most challenging aspects of the entire project was locating willing participants for the test groups. I administered the survey to girls in a

host of situations, from Girl Scout meetings to an ad hoc focus group that was pulled together when, out of desperation due of an approaching deadline, I was compelled to go without an appointment into a middle school and ask the principal if I could meet with a few of his students for my research.

In the concluding stage of my project, I analyzed the information that I collected and wrote a prospectus for the proposed magazine, which I modeled after plans used for similar established publications. Finally, I created sample articles and graphics for my proposed publication—a magazine that I titled *New Horizons*—based on all of the information obtained during my research. After six months of dedicated time and effort to complete my project, I met with my committee and presented and successfully defended my Division III thesis paper and supporting materials. The completion of this project was a true capstone to my undergraduate academic career. With my committee's support and through my research efforts, I gained a sense of accomplishment and an appreciation for the process of academic discovery. I also finished with the knowledge that through concentrated planning and effort I could actualize my visions.

My lessons learned from that project were many and far reaching—ultimately, my undergraduate research experience greatly influenced my career choice. After many years of working in the field of educational periodical publishing—including a few magazine launches—I credit my independent study experience with situating me on this path of inquiry and creativity. While not all students will discover their life's calling through undergraduate research, participation in such programs is certain to bring them new insights that will help them to define their passions and will contribute to their intellectual growth.

—SHELLEY JOHNSON CAREY

This edition of *Peer Review* was planned in cooperation with the Council on Undergraduate Research (CUR). Nancy Hensel, the CUR executive director and an author of this issue's analysis article, helped to frame the scope and contents of this issue. We thank CUR and Hensel for their contributions.

Undergraduate Research Experiences: Synergies between Scholarship and Teaching

By **Tim Elgren**, past president of the Council on Undergraduate Research and associate professor of chemistry, Hamilton College, and **Nancy Hensel**, executive officer of the Council on Undergraduate Research

For good reason, undergraduate student-faculty collaborative research opportunities are firmly embedded in the landscape of the New Academy. Undergraduate research and creative expression are now distinct categories of excellence in the *U.S. News & World Report* rankings. Collaborative research speaks to some of our most fundamental educational objectives by providing a personalized education, exemplifying engaged pedagogy, and promoting students' intellectual independence and maturation. Barrett Seaman's recent account of undergraduate residential life cites undergraduate research experiences as one of the ways that students make close personal connections with faculty mentors (2005).

These relationships are particularly important at a time when undergraduates are seemingly more disengaged in their education and rarely interact with faculty members outside of the classroom. These connections with faculty, across all academic disciplines and at a wide range of institutions, can be particularly meaningful to students deemed "at risk," including first-generation college students and minorities. For the past twenty-six years, the Council on Undergraduate Research has been a steady advocate and resource for institutions and faculty members seeking to implement research with undergraduates and create supportive environments in which these activities can flourish. Since 1989, Project Kaleidoscope has also brought together faculty and administrators to strengthen the learning and undergraduate research environments for mathematics and science.

Curricular and Institutional Transformation

We often cite the transformative effect research experiences can have on our undergraduate students, but the movement to provide more of these opportunities across all disciplines has led to significant transformations of curricula and institutions as well. Curricula that incorporate discovery-based and active learning have been designed to better prepare students for the independence required for a successful research experience (Karukstis and Elgren, forthcoming). Such curricular changes promote greater exposure to the primary literature; create opportunities to articulate and test hypotheses and intellectual models; and encourage students to contextualize and communicate objectives, approaches, analyses, and conclusions. These changes infuse research and research-like experiences into the curriculum.

Faculty members also stand to benefit from these curricular reforms. The curriculum is the purview of the faculty and should be a direct expression of what faculty value in education. It is also one of the ways that faculty gain some control over time, which many regularly cite as their primary limiting resource. Balancing a scholarly agenda with heavy teaching commitments easily consumes available time, but utilizing the curriculum to better prepare undergraduates for independent research serves them well and prepares them to contribute to faculty members' own scholarly work. Building synergy between these two activities has recently been referred to as an act of "enlightened self-interest" (Mills 2005).

Long-term, sustainable models that cultivate effective student-faculty collaborations take advantage of the natural synergistic relationship between two primary objectives: ensuring good student learning outcomes and advancing the research agenda of the faculty mentor. A third objective was raised at a recent National Science Foundation-funded summit on the state of undergraduate research in the chemical sciences, where participants suggested that effective undergraduate research should also lead to the generation of new knowledge. In this emerging model of effective goals for collaborative research with undergraduates, an ideal project should promote student learning outcomes, advance the research agenda of the faculty mentor, and make a new contribution to the field. When projects are crafted to carefully balance these three objectives, both research mentors and student collaborators benefit enormously from the experience (see figure 1). It is important to understand that this balance is uniquely negotiated for every student and every project. Unfortunately, campus-wide conversations regarding the balance of these three objectives can quickly become polarized between the teaching and research objectives and can subsequently turn contentious and unproductive. Care must be taken not to let these conversations move forward with inaccurate assumptions that might pit these objectives against each other.

Many institutions have reconfigured, renovated, and built new facilities to enable these pedagogical strategies to be fully

implemented. These building initiatives have benefited enormously from the broad expertise and experiences brought together by Project Kaleidoscope at their popular “Building Spaces for the Sciences that Make a Difference” workshops. Institution teams participating in these workshops are required to have faculty and administrative representation. This makeup promotes transparency in how these projects are conceived and executed.

Expanding Participation

Introducing research opportunities where they do not currently exist can be challenging and seem daunting. Enthusiasts attempting to introduce these activities often face skeptics who claim such activity slows scholarly output and that capacity, facilities, resources, and administrative support are limited. However, many institutions have successfully cultivated undergraduate research participation across the full spectrum of academic disciplines. Princeton University, the College of Wooster, and other institutions have longstanding graduation requirements for *all* students requiring a capstone research experience. In addition to substantial annual support for summer science student stipends, Hamilton College has raised endowed funds to support twenty fellowships each summer “in areas where funding is not readily available” (www.hamilton.edu/undergraduateresearch). While many Hamilton colleagues outside the sciences were originally skeptical and reluctant to participate, these stipends are now oversubscribed and competitive.

In fact, nearly every department has had a faculty member submit a proposal. Many have come to realize that they can craft a project that allows students to contribute in meaningful ways to advancing their own scholarly objectives. Students at several campuses have also recognized the value of undergraduate research to the extent that the student government has voted to assess additional fees to support student and faculty stipends for research; such support is a powerful testimony to the benefits of undergraduate research.

Return on Investment

Recognizing the impact of undergraduate research on student learning, student and faculty retention, and institutional reputation has led many institutions to respond with extraordinary support for undergraduate research. Colleges and universities have allocated and sometimes raised funds for student (and faculty) stipends, provided sabbatical leave programs to ensure continued scholarly development for faculty members, reduced teaching loads, rewarded research mentoring activities with teaching credit, provided generous start-up packages for new faculty members, matched funds from external grants, and increased technical support for routine departmental tasks. New buildings have been designed and erected on some campuses to expand opportunities for undergraduate research.

Clearly, many of these expenditures are required to attract and retain the most competitive students and faculty members. Less clear are the returns that institutions

expect from these investments. Faculty members welcome institutional support for research and teaching, but such support also raises concerns about changing expectations for faculty and students. Concerns may vary depending on the institutional mission and culture. Faculty members who teach at primarily undergraduate institutions wonder if the increased emphasis on research and the potential for increased external funding may lead to a decreased emphasis on teaching and time spent with students in out-of-class activities. Many of these professors chose small liberal arts colleges precisely because they enjoy teaching and mentoring undergraduate students. Other professors worry that increased expectations for undergraduate research may cut into the time available for their own research interests. Increased

expectations for publications and external funding can be a source of anxiety for professors who did not begin their careers expecting to engage in research and the quest for external funding; this may be especially true for disciplines other than science. Attention to the connections between effective teaching, supportive mentoring, and appropriate research expectations is critical for maintaining a strong and vibrant academic culture on campus.

Success Begets Success

A variety of successful undergraduate research models can be found on American campuses with programs that reflect their institution's unique characteristics and geographical area. In addition to the successes described elsewhere in this issue of *Peer*

Review, it is worth describing several others that exemplify the variety of institutions and disciplines involved.

The University of Nebraska-Kearney, for example, began a multidisciplinary research project four years ago with a grant from the National Council on Undergraduate Research/Lancy program. The grant supported a dozen students from different departments who worked with a mentor to design and conduct research or creative work over the summer. When the term of the award ended, the institution continued the program, now known as the Summer Student Research Program (webcms.unk.edu/acad/gradstudies/ssrp). The original summer program focused on environmental, political, and cultural studies of the nearby Platte River area of Nebraska. It is a particularly appealing project to University of Nebraska-Kearney students, since many are native Nebraskans. An English major funded through the project reconsidered a mid-century study of Nebraska dialects. She found that while the regional variances in the lexicon still exist, a new geographic pattern has emerged that divides the state by proximity to the Platte River Valley and Interstate 80, suggesting that immigration from other states has affected language. A history student explored the common and unique characteristics of small Nebraska towns that are losing population or have disappeared. Such information is relevant to local economic development efforts. The University of Nebraska-Kearney has developed a research program that capitalizes on its geographic location and, in

Figure 1. Clarifying undergraduate research objectives

- *Student learning outcomes* comprise the myriad ways in which students benefit from being involved in hands-on, primary research projects in collaboration with a faculty mentor. Inviting students to invest intellectually in a project gives them the opportunity to help shape its direction, exert some of their own creativity, and experience the joy of intellectual “ownership” of the products resulting from the effort.
- *Continued development of the faculty mentor’s scholarly agenda* acknowledges the essential role that an active, productive research agenda plays in the ability of the faculty mentor to provide meaningful research experiences for undergraduates and advance professionally. Furthermore, without clear contributions to the faculty mentor’s scholarly interests, he or she is likely to begin viewing these mentoring activities as primarily a teaching obligation, as opposed to one of the ways in which the institution continues to support his or her professional development.
- *Making a new contribution to the field* sets a high standard for the work we value. For most disciplines, publications remain the “coin of the realm.” A steady record of bringing projects to fruition (i.e., publication) is essential for a research agenda to attract external funding. Other forms of dissemination are also important for the visibility and professional development of both the faculty mentor and student collaborator. For example, dedicated sessions for undergraduate student presentations are now included in the programs for many professional societies. The National Conference on Undergraduate Research (NCUR) has been a popular venue for undergraduates from all fields to present their research results since 1987. In another example of reporting research results, students from Wheaton College in Massachusetts regularly report the results of their water-quality research to the local water board, town conservation coordinators, and state Environmental Protection Agency officials. The Wheaton program represents a unique form of dissemination that ties nicely into their effort to promote civic engagement in the curriculum.

doing so, also contributes to the vitality of their region.

Other institutions are just beginning to develop an undergraduate research program, and often the development of the program is dependent upon the interest and enthusiasm of an individual faculty member or department. The University of Maine at Presque Isle, a small, public liberal arts college in the most northern part of Maine, is an example of an institution in the beginning phases of undergraduate research. A majority of the students are first-generation college students, many of whom have not traveled far from their small, rural hometowns. For such students, an undergraduate research experience can be a significant affirmation of their ability to do quality academic work. The English department at Presque Isle has designed several of its upper-division courses to encourage students not only to write critical essays and research papers, but also to write papers that might be presented at national conferences. Several students each year have successfully presented at national conferences and published their work. In this way, the curriculum is now building momentum around scholarly research activities.

Institutions are also conducting global undergraduate research projects. The McMaster School for Advancing Humanity at Defiance College (www.defiance.edu/pages/MS_description.html) sends student and faculty teams to work in Belize, Nicaragua, Guatemala, Cambodia, and several other countries. The projects span the disciplines and professional programs of the

college. This winter, for example, a student and faculty mentor will be working in Cambodia to study and preserve the mythology, fairy tales, and personal stories of the Khymer people. Following the genocide in that country, Cambodia has few resources to devote to cultural restoration. Environmental monitoring, soil analysis, domestic violence, teacher preparation, illiteracy, and technology assessment are some of the other areas student-faculty teams will be studying.

Indicators of a Successful Program

Success can be demonstrated in many ways. Some consider broad participation of both students and faculty as a primary indicator of a strong program. Others consider this to be the starting point and assess quality in terms of the numbers of students going on to do graduate work in the discipline, students coauthoring publications and making presentations, and faculty-raised external grants. Conversations that clarify objectives and external metrics used to assess success

can be very productive at the departmental, divisional, and institutional level. Such conversations can increase transparency and build broad understanding of the individual and institutional commitments made to implement and sustain undergraduate research programs. Institutions continue to promote and cultivate these activities because the student learning environment benefits enormously when there is synergy between a faculty member's research and the teaching mission of the institution. ■

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Leading Undergraduate Research Organizations

The Council on Undergraduate Research and its affiliated colleges, universities, and individuals share a focus on providing undergraduate research opportunities for faculty and students at predominantly undergraduate institutions.

www.cur.org

Project Kaleidoscope is an informal national alliance working to build strong learning environments for undergraduate students in mathematics, engineering, and the various fields of science, with an emphasis on what works.

www.pkal.org

The National Conference on Undergraduate Research promotes undergraduate research scholarship and creative activity done in partnership with faculty or other mentors as a vital component of higher education.

www.ncur.org

Research, Scholarly, and Creative Activity at the University of Wisconsin–River Falls

By **Virginia M. Coombs**, provost and vice chancellor for academic affairs, University of Wisconsin–River Falls

The story of undergraduate research at the University of Wisconsin (UW)–River Falls must be understood in the context of several opportunities that the campus has embraced in the past fifteen years (see figure 1). UW–River Falls began developing its current undergraduate Research, Scholarly, and Creative Activity (RSCA) program in 1999, after a group of faculty members and the dean of the College of Arts and Sciences attended a Council on Undergraduate Research (CUR) institute on institutionalizing undergraduate research. At the same time, an ad hoc committee of faculty members interested in promoting undergraduate research began to meet. Upon returning from the CUR workshop, the ad hoc committee and the group that attended the workshop conducted conversations across campus to share what they had learned about how an institution-wide program could improve the undergraduate experience and advance faculty research and scholarship at an institution with a teaching mission. The campus became a member of CUR and secured institutional funding to conduct a self-study of the campus's undergraduate research efforts.

In May 2001, UW–River Falls invited a CUR consulting team to campus to review our program and make recommendations. The CUR team met with students, faculty, and administrative staff. They learned

that our faculty were committed and caring and liked working with students. What they told us was no surprise—an institutional awareness of undergraduate research was missing at UW–River Falls. One immediate change we made was to create a new, more inclusive title for our undergraduate research program—Research, Scholarly, and Creative Activity. The consultants made several recommendations that dealt with procuring future program funding and managing constraints on faculty time when supervising these projects. Since their visit, we have been able to implement almost all of their recommendations. During this period, the institution also initiated collaborative student-faculty RSCA grants funded by year-end residuals from the campus Faculty and Staff Development Board budget. A Ronald E. McNair Program has been implemented, also.¹

RSCA Today

Faculty commitment to the value of independent work for an undergraduate student's educational experience manifests itself in several ways. Students conduct projects in an upper-division course or work with faculty during the summer. Members of the faculty have also consistently included student research as a component of their proposals seeking extramural grants. These efforts have paid off—recently, UW–River Falls was

¹ *The Ronald E. McNair program is a Department of Education TRIO Program named for an African American laser physicist and astronaut killed in the Challenger explosion. The McNair Program honors his memory and his dedicated pursuit of scientific knowledge and personal excellence.*

awarded a three-year grant from the American Association for the Advancement of Science and Merck and Company that includes summer stipends for student-researchers and some support for faculty. Campus administration has committed matching funds; the total project supports four students and two faculty per year of the grant.

The outcomes of student projects comprise a large part of the campus's annual RSCA Day, a poster session event that has been held each spring for over ten years that features student independent projects and student-faculty collaborative work as well as faculty RSCA work. In spring 2002, the poster session was well attended, but the *event* that engaged our students and sparked

an explosion of activity was the spring 2002 National Conference on Undergraduate Research (NCUR) meeting, which was held at UW-Whitewater. Several faculty members were enthusiastic about student-faculty research and encouraged their students to submit posters for the NCUR meeting. Consequently, we sent over thirty students with their posters to that conference, where

Figure 1. Timeline of institution-wide Undergraduate RSCA at UW-River Falls

April 1992	Grants Office initiates Research, Scholarly, and Creative Activity Day (RSCA Day); repeated annually
Mid-1990s	Small groups of College of Arts and Sciences faculty members attend at least two Council on Undergraduate Research (CUR) Dialogue conferences
September 1999	Ronald E. McNair Scholars Program begins, with summer stipends for ten to fifteen student researchers per year.
October 1999	College of Arts and Sciences dean and two faculty members attend CUR Institute on Institutionalizing Undergraduate Research, UW-La Crosse.
October 1999	Two faculty members launch ad hoc undergraduate research committee with approximately twenty-five faculty members participating.
March 2000	UW-River Falls institutes Collaborative RSCA grants: approximately ten \$1,200 awards, repeated yearly.
July 2000	UW-River Falls joins CUR as an institutional member.
May 2001	CUR team of consultants visits campus, interviews faculty, students, and staff. CUR team report encourages more support from the administration.
April 2002	UW-River Falls sends thirty-three students to present their work to the National Conference on Undergraduate Research (NCUR) at UW-Whitewater.
April 2002	Creation of Society for Undergraduate RSCA (SURSCA), a student organization.
March 2003	UW-River Falls Foundation initiates annual award of four summer stipends (\$2,500 per student) for undergraduate RSCA.
March 2003	UW-River Falls sends twenty two students to NCUR at University of Utah, Salt Lake City.
April 2004	UW-River Falls sends twenty one students to NCUR at Indiana University-Purdue University Indianapolis.
April 2004	UW-River Falls sends twelve students and three faculty members to inaugural "Posters in the Rotunda" in Madison, Wisconsin; repeated in 2005.
May 2004	Two biology faculty members receive three-year Merck/American Association for the Advancement of Science's grant: support for four student researchers per year, with matching funds for faculty from UW-River Falls.
Winter 2005	<i>Endeavor</i> published on line: www.uwrf.edu/endeavor
April 2005	UW-River Falls sends forty-three students to NCUR at Virginia Military Institute/Washington and Lee, Virginia.

students and faculty from other institutions asked tough questions about our students' projects—and they were able to respond with great confidence. Coincidentally, around that time our publications department had acquired a new piece of technology that allowed for the digital composition and printing of large glossy posters. Several students took these professional-looking posters to the NCUR meeting and caused quite a stir. As a result of these positive experiences, the UW–River Falls student conference participants left with a sense of assurance about their research skills and knowledge.

Upon returning from NCUR, the students decided on their own to form a student organization—SURSCA, the Society for Undergraduate Research, Scholarly, and Creative Activity. Students wanted their RSCA efforts to receive more visibility across campus. They recruited a faculty sponsor, completed the paperwork, and filed for organizational status with our student government; achieving student organization status entitles them to submit funding requests for their activities.² These students were already making plans to attend future NCUR meetings and they knew it would take substantial funding to get them there.

Institutional Support

As part of the 2002 UW–River Falls Foundation annual fund campaign, an undergraduate RSCA fund was created

to underwrite student travel to NCUR and other conferences to present RSCA findings. These gift dollars now are supplemented by the budgets from the Office of Grants and Research, individual college departments, and the provost's office. In fall 2002, proponents found themselves with an additional opportunity to ask the UW–River Falls Foundation to support undergraduate RSCA on an annual basis with summer stipends. Rather than simply sending a written proposal to the funding committee, three students who were already actively involved in research projects with faculty came to a foundation board meeting and talked about how and why this activity was making a difference in their educations. What a powerful evening—the board members were “blown away” after hearing from our students. The details of how we would spend an annual allocation of \$10,000 from the foundation were developed. We now have that support—four \$2,500 stipends are awarded annually on the basis of competitive proposals. These stipends are *in addition* to the yearly collaborative RSCA grants to student-faculty teams. The dean of the College of Arts and Sciences launched a separate competition for undergraduate RSCA in that college—the first recipients received support in spring 2003. A new endowed resource to support undergraduate RSCA was announced in August 2005 by the

UW–River Falls Foundation board. We have made great strides in funding these important educational activities.

Other Curricular Opportunities

International travel and study tours also provide settings for RSCA activities. One of our fall curricular offerings includes a semester abroad program where students design independent projects during the preceding spring semester and carry them out somewhere abroad during the following fall term. Other opportunities for study outside the United States occur during our three-plus week January term. A 2005 January-term trip to Nicaragua and Costa Rica spawned an independent project on the Mombacho volcano by biology major Sheri Zielinski that was presented at the annual spring RSCA Day. Professor Kelly Cain, one of the two faculty trip leaders, commented on the value of the students' independent projects:

In an age when the truth is an elusive thing and often the victim of competing ideologies, the value of undergraduate research truly shines. The student research projects on the Nicaragua/Costa Rica Study Tour were no exception. Whether it was biodiversity, volcanoes, leatherback turtles, or fair-trade coffee, we couldn't have been more pleased with how our students lived up to the intent of the course and higher education in general, that of the practicing and

² The SURSCA model has been presented by the faculty sponsor, Tim Lyden, at CUR national meetings and at subsequent NCUR meetings. The poster describing this model is part of the electronic data and can be viewed at www.uwrf.edu/grants/RSCA2004images/lyden.JPG.

independent critical thinker . . . the lifelong learner.

Closer to home, we have witnessed students in disciplines, not previously part of our RSCA efforts, getting involved. They are approaching faculty members with their own ideas for projects. They are learning to formulate research questions. Projects no longer only originate in the chemistry or biology laboratory; they also come from the art studio, the theater costume shop, and the greenhouse. In one recent project, Nels Thoreson, a political science major, capitalized on the presidential debates preceding the November 2004 elections. His adviser, Tracey Gladstone-Sovell, made the following observation about Nels's efforts to analyze the content of the debates:

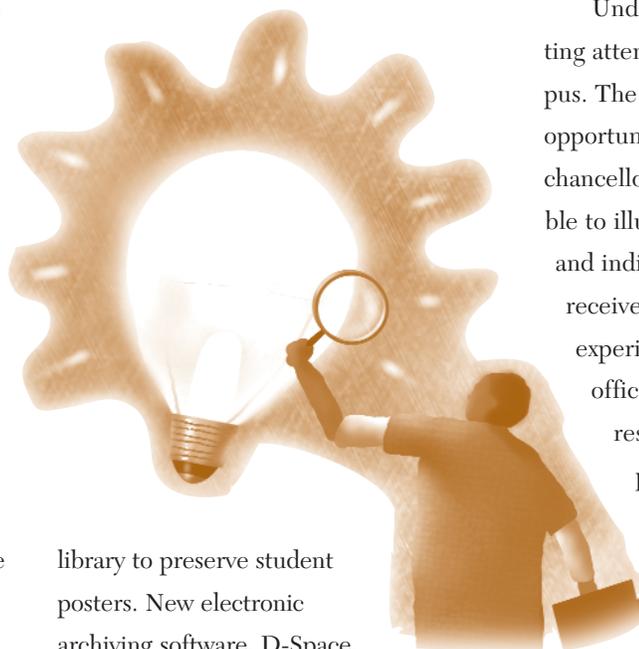
It was empowering for him to have his work praised by a leading scholar in the field. He also began to think about the possibility of graduate school as a result of engaging in this research, something he had not thought about prior to the research. Undergraduate research projects, such as Nels's, are a way for the students to demonstrate to themselves what they are capable of doing.

These examples are but a few that illustrate how students at UW–River Falls are engaging in undergraduate RSCA.

Promoting and Fostering RSCA

Our SURSCA members decided that once a year did not provide sufficient exposure for undergraduate RSCA, so they instituted a Fall Gala—an annual poster ses-

sion that serves as a recruiting opportunity for both students and faculty. During the 2004–5 academic year, two additional electronic resources were created specifically for the undergraduate RSCA program. One is the new online journal *Endeavor*, which published its first issue at www.uwrf.edu/Endeavor. The other resource is a digital archive created by the



library to preserve student posters. New electronic archiving software, D-Space, creates a persistent URL for each poster, making it easy for students to link the poster from online sources such as a course or electronic portfolio.

The UW–River Falls RSCA program and similar programs at the other ten University of Wisconsin comprehensive campuses have garnered statewide exposure as well. The UW system grants officers, led by Bill Campbell of UW–River Falls, have organized “Posters in the Rotunda” in the state capitol in Madison (an event similar to the CUR’s national “Posters on the Hill” event). The poster

session program is set in the capitol rotunda, where our members of the legislature can interact with students and learn about their projects and the importance of this activity to their educational experiences. The UW system also sponsors a day-long undergraduate RSCA symposium each year at one of the eleven comprehensive campuses.

Undergraduate research is now getting attention from all corners of the campus. The admissions office uses our RSCA opportunities as a recruiting tool; the chancellor uses examples whenever possible to illustrate the educational quality and individual attention our students receive as part of their undergraduate experience; and our development office takes undergraduate researchers around the country to present at alumni events. The institutional commitment to undergraduate research is now so ubiquitous that it has found its way into current work on revising the institution’s mission statement and core values—one of the recommendations from the CUR team that visited campus in 2001.

At UW–River Falls, the faculty, staff, and administrators are committed to helping students learn. Bill Campbell, director of grants and research, helps coordinate RSCA activities on campus in addition to his grant responsibilities. Why does he do it? He says, “Students tell me that they learn more during their RSCA projects than in all their courses combined. How could I refuse?” ■

Community-Based Research as Scientific and Civic Pedagogy

By **Elizabeth L. Paul**, interim vice president for student life and associate professor of psychology, the College of New Jersey

My pedagogical efforts over the years have focused on two key challenges I have faced in mentoring undergraduates:

1. How do I help undergraduates discover the thrill and value of social scientific research?
2. How do I help undergraduates connect meaningfully with their communities and become active and responsible citizens?

Community-based research (CBR) has become the means I employ to overcome these challenges.

How do I connect research methods instruction with real questions that captivate students' interests? Novices often feel overwhelmed by details of methodological mechanics and miss the point that methods are just tools for exploring fascinating questions. Instructors in social scientific research methods courses typically try to overcome this challenge by encouraging students to define research questions and hypotheses relating to students' experiences. While some of these studies are entertaining, to students they still often feel similar to the typical "canned" learning experiences that go no further than the professor and, after receiving a grade, are relegated to the "circular file."

The undergraduate research movement has heeded this call for more meaningful engagement of undergraduates in the research process. Working with close faculty mentoring, students engage in *real* research projects, sometimes of their own design and other times as an apprentice in the faculty mentor's research. Students working in such rich undergraduate

research programs benefit as much from involvement in real research as from close faculty mentoring and disciplinary socialization.

But at the same time, I am increasingly concerned about contemporary undergraduate students' civic apathy and disconnection from the "outside" world. Undergraduate students' struggles with finding meaning in the research process seem to be symptomatic of a bigger disconnect between personal action and understanding how action can make a difference. Moreover, many youths who are privileged to attend college are dissociated from individuals whose opportunities have been overtly limited by social injustices. This dissociation is often further reinforced by the rigid boundaries of time (e.g., an eighty-minute class period, a fourteen-week semester) and space (e.g., rows of chairs in a classroom, the protected walls separating a college or university from area neighborhoods) that structure learning in higher education. Undergraduate education needs to focus as much on providing exposure to and fostering civic awareness as on helping students learn knowledge and skills that will allow them to make a difference.

Certainly, the burgeoning service-learning movement in higher education has been an answer to this call for facilitating students' connection with the *real* world. Students have been sent to community locations nationwide to provide direct service and extend a helping hand. But students are infrequently given opportunities to use new higher-order academic skills in these experiences, and because they are typically unaccompanied by

faculty, they miss the benefit of direct faculty role-modeling and engagement.

How can the best of the undergraduate research and service-learning movements be united so that their respective strengths compensate for their weaknesses? Community-based research answers this challenge by engaging undergraduate students in a collaborative partnership to work on real research that will make a difference for local communities. Students are socialized as *public scholars*, learning actively about the research process and about how empirical inquiry can be applied to real social issues.

Community-Based Research

Community-based research is collaborative inquiry that is dedicated primarily to serving the research or information needs of community organizations. The CBR community-campus partnership includes representatives of the community organization, students, and faculty. These partners work together to address a community organization's need to study itself (e.g., to evaluate a program), or to gather information necessary for organizational or program development (e.g., a community needs/assets assessment).

CBR is public scholarship—rigorous research as a form of service to the public good. Community organizations aim to provide services for target populations. To ensure that limited resources are used as effectively as possible and to compete for increasingly limited funding resources, community organizations must study the needs and assets of their target population and the effectiveness of their programs and

services. Yet community practitioners typically lack training in research, and therefore are at a disadvantage as they seek to sustain their organization.

The expectation in CBR is that all partners will bring some skills and expertise to the partnership and all partners will learn from the collaborative experience—all partners are both teachers and learners. Community partners are professionals who are experts in working with the target community and with the issues at the heart of their agency's mission. They are experts in nonprofit management, fundraising, and navigating the political terrain. Campus partners bring knowledge of research design and methodology, time and energy for study implementation, and skill in data analysis and presentation. They may also bring connections with relevant theory and basic and applied research. By the conclusion of the partnership, community partners have developed research acumen that will be of continued benefit to organizational development. Campus partners have developed deeper understanding of social justice, of the nonprofit sector, of the applied value of research, and often of the social policy implications of their work.

Social power imbalances, role expectations, and stereotypes make achieving balance, equality, and mutuality in the community-based research partnership a key challenge. Public notions of professors keep faculty at a respectable distance: they are stereotyped as too high-brow to associate with commoners; their work is construed as esoteric and far above ground-level concerns. Many community partners are used to “ivory

tower” academics sending their research assistants down to the streets to study them, or sending their students to serve the needy. CBR counters these stereotypes by defining faculty partners as equal to student and community partners. The faculty partner needs to have sensitivity to these stereotypes, and must help establish working relationships based on shared roles and shared respect. Undergraduates can be pivotal partners in achieving this balance. The explicit role of students as learners facilitates the community partner's role as expert and teacher, helping community partners to feel more equal as both “giver” and “taker” in the partnership. Admittedly, this challenges the traditional roles and habits of many faculty members. As with other forms of undergraduate research, attention is needed to how these powerful teacher-scholar activities are regarded and supported in definitions of faculty roles and rewards.

Fusing Undergraduate Research and Community Engagement

Through the Trenton Youth Community-Based Research Corps (TYCRC) at the College of New Jersey, I have integrated undergraduate research and community engagement. TYCRC developed out of my interest in engaging undergraduate students in research that would make a difference in the lives of children living in poverty in Trenton, New Jersey, a neighboring city to our suburban campus. We partner with nonprofit social service agencies that otherwise lack the resources to hire external researchers to evaluate their programs. Yet such research is increasingly

necessary for their economic survival, not to mention for developing maximally effective programs and services.

Initially, TYCRC was a one-semester course in community-based research methods in which students completed a small demonstration research project. This was a familiar model that comfortably allowed me to experiment with engaging undergraduates in CBR. We quickly gained appreciation for how engaging the research was to all involved, and how complex the learning experience was, extending deeply into but also far beyond research methods. Moreover, given the challenges of working in a real-world setting with professionals who follow a standard calendar rather than an academic calendar, I quickly realized the necessity of extending the program beyond a semester. The periodicity of a semester constrains learning to particular times (and typically to particular contexts) and is mismatched with the real-time nature of CBR. (Of course, that also led me to question the artificial compartmentalization of other undergraduate research projects and appreciate a more natural developmental process.)

TYCRC is now a three-semester program. Students first enroll in a course entitled *Downtown: Inner-City Youth and Families*. This course grew out of lessons learned about preparation needed to support students in engaging meaningfully in intense urban CBR projects. The majority of students involved in TYCRC have had little to no exposure to the realities of inner-city children and families living in poverty. Initial exposure to these realities and awareness of the mission and strategies of community

organizations is necessary for preparing the students for the CBR partnership.

Downtown: Inner-City Youth and Families is a “course within a course”—a community course within a college course. Students enrolled in *Downtown* also take the Trenton Community Orientation Course, an eight-session program fostering youth advocacy skills in concerned citizens. Other participants are typically adult social service professionals, retired citizens interested in finding volunteer opportunities, or philanthropists wanting to learn more about Trenton’s needs and assets. Each session focuses on a different issue (e.g., child abuse and neglect, education) and meets at a local social service agency. TYCRC students learn firsthand about pressing inner-city issues; they get to know many Trenton citizens; they learn through observation, interaction, and testimonials about Trenton youth and families; they learn about numerous social service agencies, including the economic pressures they face; and they develop familiarity with and comfort in traveling to Trenton. These community sessions are complemented by class sessions at the college that include reflection, relevant social science readings, and discussion with area professionals about the role of research in social service agencies.

TYCRC students then enter yearlong CBR partnerships in which they accomplish major research projects with and on behalf of their community partners. Three students work on each CBR project; this small-team approach encourages collaboration among students while also providing manageability in terms of project organization and communication. Students are assigned to CBR

teams based on their interests and work habits. I establish the initial partnership with the community organizations and have preliminary conversations about their research needs. Students join the partnership, and then the mutual work of defining and executing the CBR project begins.

We start by discussing and defining the agency’s research needs. We discuss at length what research aims will provide the most useful information to the agency. The students and faculty spend time getting to know the agency by holding all meetings there, and students volunteer time to help at the agency. The students, with input from other partners, conduct professional literature searches to further inform the research questions.

Once the objectives of the research are clearly defined, a realistic research design is defined, measures and data-collection methods are designed, and study implementation logistics are planned. Research ethics are reviewed by the Institutional Review Board of either the community organization (if available) or college. Students are instrumental in administering the data-collection process, and they take the lead in statistical analysis and the presentation of results. The full partnership participates in discussing and interpreting results, and in developing recommendations for the agency based on the results. When appropriate, focus groups are held with clients of the agency to gain their perspectives on the results and implications for the agency. The agency defines the most useful format for reporting study results. Typically, agencies request a formal research report (this is particularly helpful

in seeking grant funding) as well as a presentation for agency staff, the board of directors, and sometimes clientele. Students are the primary authors on the research report, with substantial input on multiple drafts from all partners.

I stimulate partnerships with community organizations by maintaining active involvement in various stakeholder groups in Trenton and engaging in conversation with agencies about research needs. Like any relationship, a CBR partnership must be nurtured. Sometimes a CBR partnership grows out of weeks of conversation; other times the organization is not yet ready for a CBR partnership but benefits from learning about potential collaborative projects and discussing strategies for developing readiness. In developing a CBR partnership, it is important to have open conversations about how this approach to research differs from other approaches (e.g., hiring an outside evaluation consultant). Making guiding principles explicit, maintaining open communication, and addressing partnership challenges promptly will ensure a productive CBR partnership.

Powerful Learning Experiences

I am continually awed by the commitment and motivation of TYCRC students. These students are also awed by the power of their learning experience, the quality of the final CBR report, and the significance of their work. However, the CBR partnership experience is a challenge for students. Students' traditional expectations of learning "rules and regulations" are exploded. The partner-

ship defines the work plan. Working on a real-life project requires flexibility and adaptability. Students must step up as equal partners, exercising both leadership and collaboration skills. In the course of the project, students become experts in the CBR project's area of focus. When interpreting results and developing recommendations, students must learn to use that expertise thoughtfully and responsibly. Students must develop their communication, problem-solving, project organization, and professional writing skills. They discover writing as a collaborative process, including editing and revision. They experience research as a helpful tool, and they are confronted with the realities of conducting research and making practical choices. The CBR experience is especially thought-provoking for students who have also had experience with more basic disciplinary undergraduate research; these students provoke excellent conversation about philosophies of science and the ramifications of different research design and method choices. Students learn about real-life organizational dynamics, often in a dramatic firsthand way, and they learn through close-up observation and interaction about social injustices and the politics of social service provision.

Community agency partners have used CBR project results to gain additional grant funding, to expand services to reach new populations, and to further develop programs to increase their effectiveness. Students who have completed the TYCRC program have advanced to employment in area nonprofit community organizations and social policy research institutes, and

gained admittance to graduate programs in public health, medicine, social work, public policy, law, counseling psychology, and developmental psychology. And I am motivated by the role of "public teacher-scholar" catalyzed by my involvement in CBR partnerships. CBR presents a unique opportunity to weave together my professional roles as teacher, scholar, and citizen in a most rewarding way.

Community-based research engages undergraduate students, community agents, and faculty alike in social scientific inquiry as a powerful tool for social change. All partners grow as researchers and effective citizens. And in the process, stereotypes are challenged, divides are bridged, a bigger sense of community is forged, and "making a difference" becomes a way of life. As one former TYCRC member reflects,

CBR taught me that research could directly influence people's lives. And my CBR experience has helped me to develop a greater sense of personal responsibility for making positive changes within the community. I have always believed that research is important, but I only thought that research was geared toward proving hypotheses. Community-based research illustrated to me that research can help a community. My CBR experience has strengthened my belief that although no single individual can ignite major changes by themselves, many passionate individuals are necessary to organize a cooperative effort to make positive changes within the community. ■

Creative Scholarship through Undergraduate Research

By **Mary Crowe**, director, Center for Undergraduate Research, Xavier University of Louisiana

What do the following titles have in common? “A Study of Medieval Iconography in Relationship to Chaucer,” “Cycle of Distortion: Local Televised News and African Americans’ Perspectives in New Orleans,” “Preparing Nanoparticles of Double Fluorides,” “Examining the Ethics of Race-Based Biomedical Research,” “The Use of Fish as Bioindicators of Endocrine Disruption in Southeastern Louisiana.” All were titles of collaborative faculty-student research projects funded by Xavier University of Louisiana’s Center for Undergraduate Research in the 2004–5 academic year.

Xavier is the only Catholic institution among the nation’s historically black colleges and universities (HBCUs), and one of its goals is to increase the number of underrepresented students who pursue graduate degrees. As readers of this article know, African Americans have been seriously underrepresented in the higher education community. Students who choose to pursue graduate studies usually make that decision due to passion for the discipline. At Xavier, we think that one of the best ways to capture student interest and create enthusiasm for a discipline is via research (creative scholarship) in close collaboration with faculty mentors. Recent studies focusing on undergraduate students in research programs at other campuses support this premise, particularly for first-generation college and minority students.

A Teacher-Scholar Campus

Many of our students are placed in summer research opportunities at federal labs and PhD-granting univer-

sities during the summer, but Xavier recognizes that this is not enough. Underrepresented students need high-quality research opportunities on their own campus so that *every day* (not just during an isolated ten-week summer program) they can work with the faculty and be exposed to the resources needed to prepare for graduate school and careers.

In the past decade, by leveraging funding from federal, state, and private foundations, Xavier has transformed itself into a campus that encourages faculty members to collaborate with students in research, creative scholarship, and related activities. As a campus community, Xavier has come to understand that building an institutional culture of undergraduate research takes a coherent plan, time, and the infusion of additional resources.

As is true on most campuses, Xavier’s movement toward becoming a teacher-scholar campus began with individual faculty members involving students in their research. A few of these faculty members then applied for program-wide funding from the Ronald E. McNair Postbaccalaureate Achievement Program and the National Institute of Health. These initial programs were critical in building a research culture on campus. The staff and faculty members who administered the programs and mentored students did such an excellent job that in 1995 the National Science Foundation (NSF) designated Xavier as one of only six “Model Institutions for Excellence in Science, Engineering, and Mathematics.” NSF funds allowed for the construction of new science facilities, the addition of much needed

equipment, the hiring of additional faculty, and the establishment of a Center for Undergraduate Research. The center was initially focused on the sciences. However, after a team of faculty members attended the “Institutionalizing Undergraduate Research” workshop in 2000—sponsored by Council on Undergraduate Research (CUR)—the administration worked to open opportunities for students and faculty members across the entire campus.

The Center for Undergraduate Research at Xavier University

The Center for Undergraduate Research at Xavier University is dedicated to supporting and promoting undergraduate research, creative expression, and other scholarly experiences for our students. These experiences can be part of a class or independent project mentored by Xavier faculty. Students can also gain these experiences through work with faculty members at other institutions or with partners in industry, nonprofit, for-profit, and governmental agencies. The center is staffed by one full-time director and two associate directors, all of whom are faculty members, and by one administrative assistant and student employees.

Xavier’s Center for Undergraduate Research receives funding from a variety of sources, including the university, state and national funding agencies, and private foundations. It works closely with graduate placement, career services, and service-learning offices to make sure that every student who is interested (and academically qualified) has the opportunity

to participate in a meaningful research experience. Stellar GPAs and GRE scores are important, but in today’s competitive world, a student’s own undergraduate independent research project can also contribute significantly to his or her acceptance into and persistence and success in graduate school. Five years ago, this statement might have been true for only those students majoring in the sciences, but this trend has spread across all academic disciplines. Personnel in the center have worked with faculty members

the results of their creative scholarship at our two-day Festival of Scholars. Students presented their research through posters, talks, debates, panels, performances, and demonstrations.

Also nested within Xavier’s Center for Undergraduate Research is *XULAnexUS*, Xavier’s online student research journal. It is different from most campus-wide journals in that after students are done with their research, they enhance their work by adding images, video clips, and audio files, which aid in understanding.

In today’s competitive world, a student’s own undergraduate independent research project can also contribute significantly to his or her acceptance into and persistence and success in graduate school.

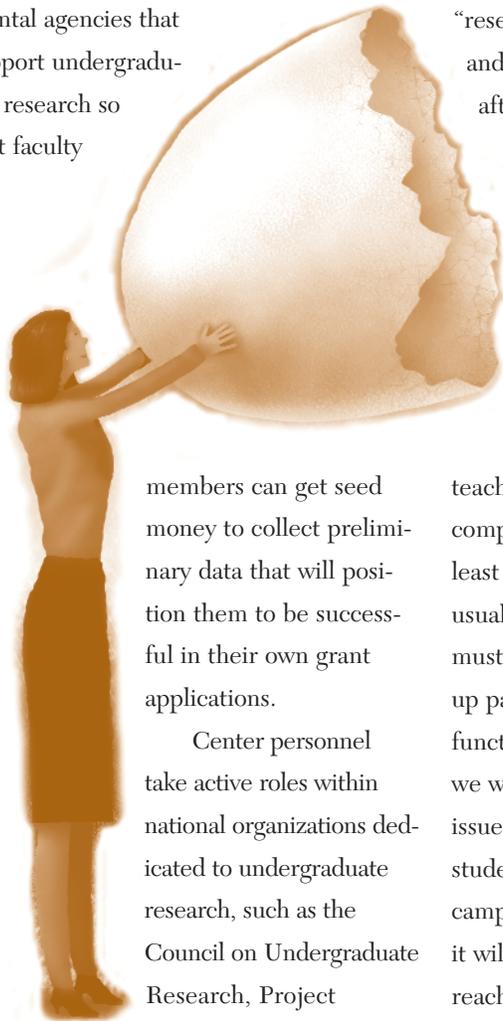
in the humanities and the arts to help them incorporate students in their creative endeavors. We helped one of our artists put into words his artistic vision and what he hoped a student would get out of working with him on a project. We funded another student’s travel to Israel to participate in a dig to unearth ceremonial artifacts.

Xavier’s Center for Undergraduate Research sponsors a wide variety of activities for students and faculty members. This past April, approximately 5 percent of our four thousand undergraduate students, representing nearly every major, presented

The center also hosts a variety of student workshops. Students in these workshops discuss how to create an effective poster, how to identify the right summer research program, and what to expect from a research experience. Center staff willingly work with students on their applications. In order to continue to enhance collaborative research experiences across the campus, the center conducts faculty development workshops centered around three themes: how to integrate teaching and research, how to effectively mentor students, and how to obtain funding for their own projects.

Expanding and Enhancing Research Experiences

Xavier recognizes that even with attention to professional development, our 275 faculty members cannot accommodate all the students who want research experiences; therefore, we work with national organizations (such as the Leadership Alliance Program), national research laboratories, and individuals at research universities to find research opportunities for our students in other settings. Simultaneously, we have worked to expand and enhance the research experiences available on campus, writing grants to foundations and governmental agencies that support undergraduate research so that faculty



members can get seed money to collect preliminary data that will position them to be successful in their own grant applications.

Center personnel take active roles within national organizations dedicated to undergraduate research, such as the Council on Undergraduate Research, Project

Kaleidoscope, and the National Conference on Undergraduate Research. As a result of the increased faculty-student research opportunities in the past five years, Xavier has seen a 30 percent increase in the number of its science, technology, engineering, and mathematics (STEM) graduates who enter graduate school. Nearly 50 percent of Xavier's recent graduates enroll in professional and graduate schools, and once enrolled, 92 percent successfully complete their degrees.

While the campus has made much progress, Xavier's transformation to a "research rich" campus is not complete and has clearly been interrupted by the aftermath of Hurricane Katrina. As we recover from the hurricane and the flooding, we will need to rebuild our programs and tackle issues that were not completed. For example, as we reestablish laboratories, classrooms, and student-faculty interactions, we also need to work to address the significantly higher teaching loads carried by Xavier faculty as compared to those at peer institutions (at least twelve contact hours each semester, usually fourteen in the sciences). We also must find ways to offer competitive start-up packages to new faculty. Once normal functioning of the campus has resumed, we will continue to tackle these difficult issues. However, given the success of our students and faculty members and the campus's tradition of building on success, it will be just a matter of time until we reach our next pinnacle. ■

In addition to its annual meeting, AAC&U offers a series of working conferences and institutes each year. Additional information about the upcoming meetings listed below is available online at www.aacu.org/meetings.

AAC&U's Annual Meeting

January 25–28, 2006

Demanding Excellence:

Liberal Education in an Era of Global Competition, Anti-Intellectualism, and Disinvestment
Washington, DC

Network for Academic Renewal Meetings

March 9–11, 2006

General Education and Outcomes That Matter in a Changing World

Phoenix, Arizona

April 20–22, 2006

Learning and Technology: Implications for Liberal Education and the Disciplines

Seattle, Washington

Summer Institutes

June 9–14, 2006

The Institute on General Education

Washington, DC

June 21–25, 2006

The Greater Expectations Institute

Snowbird, Utah

Creative Activity and Undergraduate Research across the Disciplines

By **Lori Bettison-Varga**, associate professor of geology, director of the Keck Geology Consortium, and associate dean for research and grants, the College of Wooster

Wooster seeks a liberal education that will truly liberate our undergraduates for a lifetime's intellectual adventure, one that will help meet new situations as they arise, one that will allow them to develop harmoniously and independently.

—Howard F. Lowry, the College of Wooster's seventh president, in a 1945 speech

In the College of Wooster's Summer 2005 issue of the *Wooster* magazine, you can read about the passions of six recent graduates, and how those were translated into personalized and challenging independent study projects. The independent study is far more than a senior thesis; faculty at Wooster know, because they have witnessed it, that independent study is a transformative experience. As English major Amanda Phillips puts it, "Working on each chapter of [my independent study] was like walking down a hallway of mirrors—and not always the flattering kind." Instead of the planned outcome of his independent study, a light-emitting compound, chemistry major Dan Skully found the scientific pathway to discovery illuminated—a pathway that often presents unpredictable results that lead to meaningful new knowledge. Denise Bostdorff, associate professor of communication, watched as her mentee, senior Emily Moore, became a more inquisitive and engaged student during her project looking at nurses' communication strategies. From the ordinary to the extraordinary—this is the independent study experience.

For the last fifty-eight years, the College of Wooster, an independent, privately endowed liberal arts college with approximately 1,800 students and

150 faculty members, has required that all students design and complete an independent research and/or creative project—the independent study. For Wooster faculty, when the independent study process is in full swing, it is hard to remember that independent study is more than just a capstone experience: it is, at its core, a philosophy of education that sets Wooster apart from most other colleges. The independent study program was initiated by former Wooster President Howard Lowry, who passionately believed that all students should be challenged to come to their very best work in order to achieve creative and independent thought. The program is challenging and rewarding, intense in its resource demands and, ultimately, the culminating experience of an education that lays the foundation for lifelong creativity, learning, and reflection.

The Independent Study

What three components combine to make Wooster's independent study program unique? Independent study is a requirement for all graduates of the college, the program for most majors involves three semesters of independent work, and the curriculum is designed to support student development toward

the independent study experience. The Wooster independent study program provides students with transferable skills, including the ability to formulate questions, to propose strategies to answer those questions, to independently pursue their quests with a tangible result or performance, and to explain their work to a larger audience. Given the level of effort, it is no surprise that Wooster ranks fourteenth in the baccalaureate origins of PhD degrees from 1920 to 1998. As many Wooster alumni have commented, independent study gave them a head start in preparation for graduate work.

For most majors at Wooster, independent study begins with a one-credit class, taken during either the fall or spring semester, representing one-eighth of the typical student load during the junior year. The junior-year independent study varies by department, as each discipline uses its own pedagogical approach to introduce students to research in the field. Some departments bring juniors together in a seminar or methodology course with an independent project component. In other departments or programs, students work on a topic of their choice and meet weekly with their advisers, with their project culminating in a paper or senior independent study proposal and sometimes a departmental presentation.

Senior independent study represents one-fourth of a student's load during the senior year. The key distinctive aspect of the senior independent study is the weekly one-on-one meeting between faculty mentors and their students; the

yearlong mentoring is perhaps even more intensive than what many graduate students receive. While projects officially begin in the fall, students often prepare during the summer by reading and doing background research (e.g., in the library, field, or laboratory—developing their topics so that they begin their senior year with the beginnings of a project). A perusal of departmental independent study handbooks on Wooster's Web site shows the repeated warning to students that success in senior independent study is often predicated on summer preparation.

The independent study is due the Monday following Wooster's two-week spring break and is celebrated campus-wide. The jubilation of the Independent Study Monday event far surpasses that of graduation, just six weeks later. Faculty read the independent study theses and the students endure the dreaded oral exams and sometimes written critiques of their work. The final grade for the independent study takes in various components of the yearlong project, including the student's process, performance on the oral exam, and the written and/or creative piece. For their efforts, students who pass independent study are awarded grades of Honors, Good, or Satisfactory.

A sampling of some independent study titles from the Class of 2005 displays the range of topics:

- Jonathan Bell, biology: "Far from Sterile: The Microbial Contamination and Food-Borne Disease Potential of Mung Bean (*Vigna Radiata*) Seeds"

- Andrea Danielson, sociology/anthropology: "God Didn't Create Adam, Eve and Dr. Steve: A Comprehensive Study of Mennonite and Non-Anabaptist Midwives' Beliefs and Practices"
- Dan Utley, physics: "Measuring the Reflectivity of Semiconductor Mirrors Using Light Intensity Ring-Down in a Half-Symmetric Resonator"
- Julie Tiffit, art: "The Human Landscape"
- April Guarnera, economics: "Can Bankruptcy Be Predicted? The Creation of New Bankruptcy Prediction Model"

Supporting Independent Study

In the face of the demands of independent study, in terms of student skills and ability, the time-intensive nature of one-on-one faculty-student mentoring, and the costs associated with particular projects, Wooster has developed a support network that begins with the curriculum.

How is Wooster's curriculum designed to prepare students for independent study?

While Wooster's curriculum has much in common with that of many other selective liberal arts colleges, it differs from them in the focused progression of work leading toward the independent study experience. A Wooster education begins with a required first-year seminar in critical inquiry, which consists of small seminars (average fifteen students) with topics chosen by the faculty. These writing-intensive courses require students to analyze and synthesize material from a variety of

sources, to formulate questions, to articulate arguments supported by evidence, and to evaluate different kinds of evidence. All students continue to build their writing and analysis skills through a required writing-intensive course that must be completed after their first-year seminar but before they take junior independent study. At Wooster, students often take more than one of these tagged “W” courses during their four years at the college. In the major, courses are designed to develop the critical thinking, writing, and speaking skills that are necessary for independent study. The complete picture, from beginning to the completion of the junior independent study, sets the foundation for the rigors of senior independent study.

How are faculty supported as independent study mentors?

Independent study is a demanding process, for students *and* faculty. While President Lowry may not have recognized this when the program was originally instituted, he did acknowledge that the program would require significant resources to support a faculty of engaged teacher-scholars. To that end, the college established one of the most generous sabbatical leave programs in the country, providing both research and study leaves for tenured faculty, who are eligible for a full-year, fully paid leave after eight semesters of teaching. Equally as important is the recognition of time engaged during the semester mentoring student independent study projects. Faculty are awarded teaching credit for

independent study (five students for the year equals one course), and independent study advising is a component of evaluation for promotion and tenure.

What financial resources are available to support independent study projects?

Recognizing the need for financial support for student independent study projects, the trustees of the college established an endowment for independent study in the honor of Henry J. Copeland, Wooster’s ninth president. The fund is in its eleventh year of operation and awards approximately \$90,000 annually. Student applications are invited in the fall to support students enrolled in a senior-level course, and in the spring, juniors may apply for summer support. The scope and type of grants are not limited, but preference is given to projects that have unusual distinction and promise and have related expenses that are above what might normally be expected in undertaking independent study. Some departments have endowed funds to support independent study projects, particularly those requiring fieldwork or analyses (e.g., geology). Just as the curriculum progresses towards independent study, so too does the ladder of support for student research. Research experiences are supported by the college’s internally funded Sophomore Research Program, and a variety of external grants support additional research experiences for sophomores and juniors. In addition, the college has a student travel benefit to support conference presentations.

How are the independent study projects assessed?

Shortly after it was instituted, a thorough assessment of independent study revealed that while faculty and students embraced the independent study program, there were challenges to address. Faculty were not uniform in their responses to how much effort students put into independent study and felt that the program, for some, breeds procrastination. Some students were frustrated by the lack of uniformity in standards across the departments and others felt valuable courses were replaced by the experience. In response to the national movement toward outcomes assessment, the college is currently designing a comprehensive analysis of the success of independent study, which will provide useful feedback for the next decade of the program. During the most recent curriculum revision discussions, students and faculty strongly agreed that the independent study program is an enriching educational experience. After almost sixty years, the independent study program remains at the heart of a Wooster education. ■

Reference

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Undergraduate Research as a Catalyst for Liberal Learning

By **David Lopatto**, professor of psychology, Grinnell College

Undergraduate research experiences—experiences that include doing original research while being mentored by an experienced researcher—have a high status in contemporary higher education. The 2002 report from the Association of American Colleges and Universities (AAC&U), *Greater Expectations: A New Vision for Learning as a Nation Goes to College*, advocates more undergraduate research activities. Major sources of research funding, such as the National Science Foundation (NSF), provide support for undergraduate research. National organizations such as the Council on Undergraduate Research, Project Kaleidoscope, and the National Conference on Undergraduate Research provide platforms for faculty discussion of undergraduate research and student presentations of undergraduate research. We may well wonder why undergraduate research is seen as such a promising activity, and if the activity lives up to its promise.

The undergraduate research experience may be the epitome of engaged learning. Undergraduate research is valuable because it sets the occasion for attaining a wide range of educational goals. As a single experience it may facilitate empowered learning (including communication, problem solving, and teamwork), informed learning (allowing the student to study the natural and cultural world), and responsible learning (permitting the study of social problems and the self). It promises benefits that reflect the National Student Survey of Engagement (NSSE) student engagement benchmarks—high academic

challenge, active collaborative learning, intense student-faculty interaction, enriching educational experience, and supportive campus environment (Kuh 2003). Moreover, it can be situated as a capstone senior experience or a first-year experience; it can be housed in the sciences, social sciences, or humanities; it can occur as a dispassionate intellectual exercise or a form of social action; and it can be done at the home campus or abroad.

The Benefits of Undergraduate Research

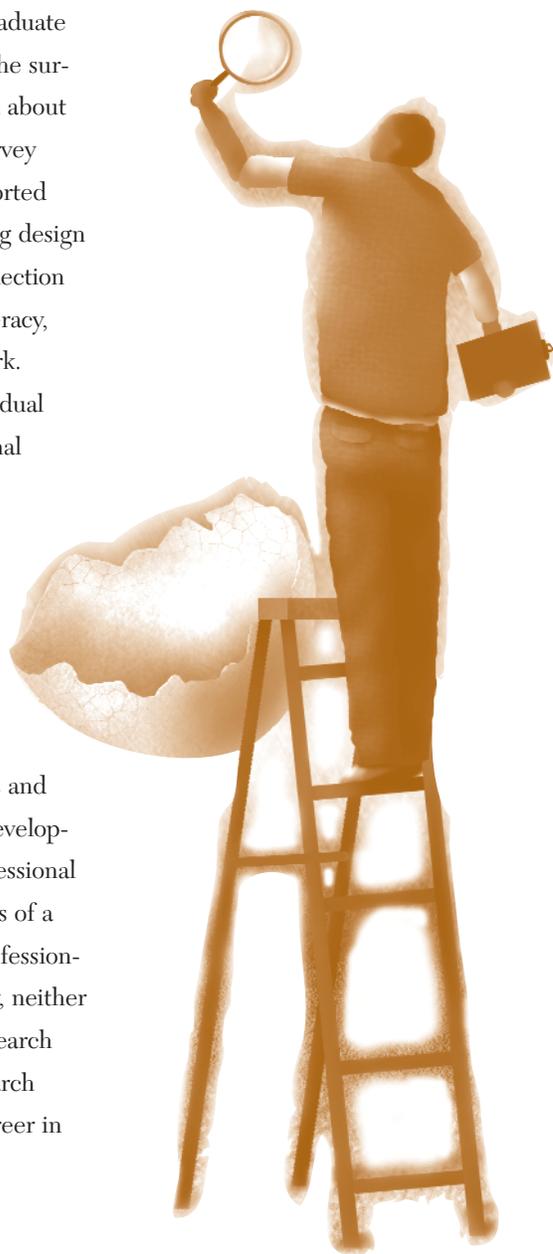
But what precisely are the benefits of the undergraduate research experience? The literature on undergraduate research is filled with anecdotes, endorsements, and assertions that the benefits are self-evident. The lack of solid information about these benefits led my colleague Elaine Seymour and me to propose a study of undergraduate research to “clarify, and estimate the relative importance of, the benefits of ‘good’ undergraduate research experiences.” Performed under the auspices of a National Science Foundation Research on Learning and Education grant, our initial research on the undergraduate research experience involved a mixed qualitative and quantitative methodology aimed at delineating the benefits of the undergraduate research experience in the sciences. We chose as our research vehicle the summer research programs at four liberal arts colleges known for their outstanding undergraduate research. Seymour and her associates employed an interview protocol with student and faculty respondents at the four sites. Transcripts of each interview were carefully coded

to yield the reported benefits of the undergraduate research experience (Seymour et al. 2004).

Concurrent with this work was a survey I devised that gathered quantitative information about the benefits of the research experience at the same four research sites over a period of three years. The results of the qualitative and quantitative work were fairly consistent and helped triangulate the benefits of undergraduate research to students. In addition, the survey was used to gather information about features of the experience. The survey results indicated that students reported gains on a variety of skills, including design and hypothesis formation, data collection and interpretation, information literacy, communication, and computer work. These gains were accompanied by dual gains in professionalism: professional advancement and professional development. Professional advancement included opportunities for publications and presentations of work, enhancement of professional credentials (i.e., building a resume), and development of relationships with mentors and other professionals. Professional development included understanding professional behavior, appreciating the demands of a career, and understanding how professionals work on problems. Significantly, neither the qualitative nor quantitative research indicated that undergraduate research compelled students to pursue a career in science.

Fostering Personal Growth

Faculty mentors, especially those in science, often keep their focus on the payoff of undergraduate research for graduate school careers. But our research found evidence for a kind of development seen only out of the corner of the eye, so to speak. Personal development, including the growth of self-confidence, independence, tolerance for obstacles,



interest in the discipline, and sense of accomplishment, centers on the increasing understanding of one's self and one's capabilities.

Undergraduate researchers reported gains on these dimensions and, when asked to indicate which benefits of undergraduate research were most important, included personal gains among those benefits. Personal development grows with professional development but may contradict it. A student reaching a new level of independence and self-confidence may have the insight that he or she will not be fulfilled by continuing on the career path taken thus far. Personal development has a humanistic quality, providing general benefits regardless of the career path the student takes. By fostering personal growth, undergraduate research experiences realize the goals of liberal education.

The results described are from samples of students whose experience was in science. Do they also describe the benefits of undergraduate research to students in social science and humanities? During the period of the NSF research, two of the collaborating institutions offered research experiences in these areas. I was able to collect a modest pool of data from seventy-three students in social science and humanities. Results were compared to those from science students and suggested the following:

- Science students report more direct contact with their mentors. Weekly contact ranged from fifteen hours per week for chemistry to six hours per

week for mathematics and computer science. Social science students reported about eight hours per week, while humanities students reported about three. The number of contact hours, however, did not relate to student-reported learning gains or satisfaction. Rather, the differences reflected the variability in the way disciplines go about mentored research.

- The majority of science students have their research project assigned by the faculty mentor. Only a third of social science and humanities students have their projects assigned. A higher proportion of these latter students, about 42 percent, reported collaborating with a mentor to design a project.
- The most common interactional style between science students and their mentors was “learning by example,” described as “my mentor showed me how to do the work and then I did it.” The most common style for social science and humanities students was “self-organized,” described as “I did all of the work on my own.”
- While only about 20 percent of science students reported working alone, 58 percent of the social science and humanities students reported working alone.

Despite these differences in their experience, the benefits reported by science, social science, and humanities students were comparable. All students rated benefits such as “learning a topic in depth,” “developing a continuing relationship with a faculty member,” “understanding the

research process in your field,” and “readiness for more demanding research” very highly. When asked to evaluate behavioral traits of their mentors, students across the disciplines gave nearly identical profiles of their mentors, rating the mentors highest on traits including “friendly,” “treats you like a colleague,” and “respectful” (lowest ratings were given for the trait “organized”). Two traits, “responsive to your questions” and “treats you like a colleague,” were directly correlated with the students’ satisfaction with the research experience.

Subsequent Research

Subsequent to this research, the Howard Hughes Medical Institute funded a project to produce an online survey for students to evaluate their research experience in the sciences. Collaborating with Professor Sarah Elgin of Washington University in St. Louis to produce the Summer Undergraduate Research Experiences survey, I analyzed responses from over 1,130 students at forty-one institutions. The data supported three propositions: that the educational experience of undergraduates is enhanced by undergraduate research, that undergraduate research programs in the sciences are attracting and supporting students interested in a science career, and that benefits of the research experience are gained across gender and ethnic groups (Lopatto 2004). Among the highest-rated learning gains for these students were “understanding the research process,” “readiness for more demanding research,” and

“understanding how scientists work on real problems.” A mildly surprising finding was that the rating of learning gains did not differ by type of institution. Student responses from nineteen research universities, fifteen colleges, and seven master’s-level universities showed the same pattern of results. A more sobering finding was that the least gain was in “learning ethical conduct,” a finding that was also true in the earlier NSF research.

Although the assessment of undergraduate research benefits is largely descriptive and correlational, it forms a credible picture of the benefits. Quantitative and qualitative information, student and faculty reports (Lopatto 2003), and differences in ratings by students who are enthusiastic about continuing in the field versus students who have become disillusioned all point to the general portrait of undergraduate research described here. What is missing is a strong test of causes of a good experience. The current data support two significant influences: careful selection (or self-selection) of qualified students and good mentoring. The majority of students who are selected to participate in undergraduate research already fit the experience into a provisional plan for a career, using the experience to confirm or refute the career plan. Many are tentatively engaged in the experience from the time they apply. Mentors (most often faculty members) can make or break a research experience. The intensity of this influence is such that students who complete

an otherwise quantitative multiple-choice survey will volunteer additional text comments praising or criticizing their research mentors.

Once the benefits of undergraduate research are described, it becomes useful to think that the changes engendered by the experience make some theoretical sense. One promising area of theory has to do with college student development. Described as theories of “epistemological development” or “reflective judgment,” these theories specify how students become more sophisticated thinkers and more committed learners. At least one study (Rauckhorst et al. 2001) linked undergraduate research experiences to accelerated epistemological development, and many of the benefits described here could be subsumed into this theoretical approach.

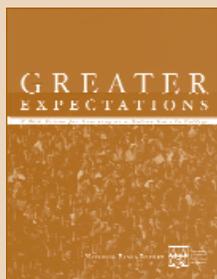
The evidence supports the promise of undergraduate research as a catalyst for student development across disciplines, genders, and ethnicities. While cost factors, including money, time, and faculty priorities, need be considered during the creation of an undergraduate research program, the benefits to students are consistent with our greater expectations for liberal learning. ■

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Related AAC&U Resources

The following resources from AAC&U call for students to do capstone work—including undergraduate research projects—and for campuses to assess this work for liberal learning outcomes as well as knowledge specific to particular fields of study.

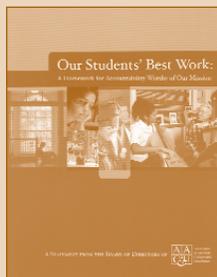


Greater Expectations: A New Vision for Learning as a Nation Goes to College

The report of the Greater Expectations National Panel recommends the creation of a New Academy characterized by high expectations; a focus on learning; commitment to demonstrated achievement; intentional practices; and an engaged, practical liberal education for all students.

Liberal Education Outcomes Report: A Preliminary Report on Student Achievement in College

This report is designed to provide an overview of national data on the importance of liberal education outcomes and how well college students are achieving these outcomes. It is designed to generate dialogue and spur implementation of more systematic ways to measure student learning outcomes across the curriculum and at incoming, milestone, and capstone levels.



Our Students' Best Work

Designed to help campuses respond to demands for greater accountability, this statement calls for assessments that measure higher-order learning aims such as critical thinking, integration of knowledge and ideas, and application of knowledge to real-world problems in different disciplinary domains. It sketches out five key educational outcomes, offers a set of principles for higher education accountability, and suggests a set of accountability questions every college or university should ask.

Undergraduate Research as the Next Great Faculty Divide

By **Mitchell Malachowski**, professor of chemistry, University of San Diego

One of the most dramatic transformations at liberal arts colleges and comprehensive universities during the past twenty-five years has been the increased expectation for faculty to generate original scholarship with publishable results. We have reached the point where many of us have difficulty remembering a time when faculty did not embrace the “teacher-scholar” model. But of course this was not always the case. University priorities clearly have evolved since John Henry Newman wrote in 1852 that

a University . . . is a place of teaching universal knowledge. This implies that its object is . . . the diffusion and extension of knowledge rather than the advancement. If its object were scientific and philosophical discovery, I do not see why a University should have students. (Newman 1996)

The trend among faculty to expand their involvement in research is accelerating as faculty at four-year and even two-year colleges have increasingly embraced this approach. To support these efforts, there has been a substantial shift in how faculty spend their time, in the allocation of resources, in facilities, and in teaching loads. In addition, the increased involvement in faculty research has resulted in the formation of grants and sponsored programs, offices of graduate and undergraduate research, and technology transfer agreements.

There was a time not so long ago when the great faculty divide was between faculty who performed research and faculty who did not. Now, however, with

most faculty engaged in research, the new line of demarcation is instead between faculty who engage students in their research and those who do not. Faculty scholarship tends to fall into one of two approaches: a results-oriented approach or a collaborative, process-oriented approach, with both methods including an expectation of publishable results. The results-oriented approach is taken in many disciplines where a more individual approach to scholarship is the norm. Although there may be some loose collaborations under this approach, faculty typically work singularly and publish single author papers. Students are rarely part of these efforts. A second and very different model is one in which faculty collaborate with others and the work is performed as a joint effort. This type of collaborative research frequently involves students, and when the work is published, students are coauthors of the papers. As the focus on research continues to increase among faculty, I think it is time for us to step back and ask fundamental questions about the type of research being conducted on our campuses and the impact this new priority is having on undergraduate students and student learning.

My basic premise is that there is a cultural divide springing up around how groups of faculty spend their time. Based upon the goals of their research activities, the fundamental purpose of research is quite different between these two models. In the natural sciences and the experimentally-oriented social sciences, one of the main goals of faculty research is to enhance student learning and student outcomes. For example, many

private and federal funding agencies (such as the National Science Foundation) consider the impact on student learning as one of the criteria for funding. Let me be clear that I believe that all research should be of such quality that it can be, and should be, publishable, and that publication should be one of the goals of faculty scholarship, but what distinguishes this scholarship is the involvement of students.

While faculty at PhD-granting institutions have long realized the importance of faculty research on graduate students, for many faculty at predominately undergraduate institutions (PUIs), enhancing student outcomes is not one of the explicit goals of their research work. Some would argue that faculty research is beneficial for students even when that is not the stated goal, since the results of faculty research can be shared with students. This is true. Yet, it is my belief that student learning is negatively affected by faculty who take a research-oriented approach to their professional lives rather than a student-oriented one. This belief is supported by Alexander Astin (1993), who has shown that the faculty's orientation toward research and toward students reflect not only how they spend their time, but also their personal goals and values, and their interest in and accessibility to students. Astin and others have shown that the extent to which faculty are student-oriented has tremendous impact on student satisfaction, learning outcomes, and affective development. In contrast, when faculty are primarily research-oriented, student outcomes are

negatively affected. For example, the divide between teaching and research at PhD-granting institutions has led the faculty to substantially distance themselves from undergraduates and undergraduate education, and this has been detrimental to student learning. Could those of us at PUIs be moving too far and too fast in

The divide between teaching and research at PhD-granting institutions has led the faculty to substantially distance themselves from undergraduates and undergraduate education.

this direction, and could our institutions become the functional equivalents of research universities without graduate students?

I have written elsewhere of the importance of student-centered approaches to scholarship (Malachowski 2003). Is this approach time-consuming? You bet. Is it frequently frustrating? Yes. Does it slow down results? Possibly. Is it worth doing? Without a doubt. By its

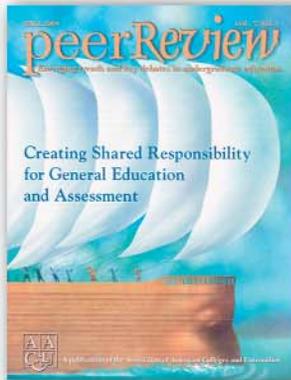
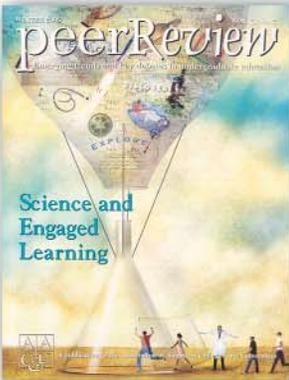
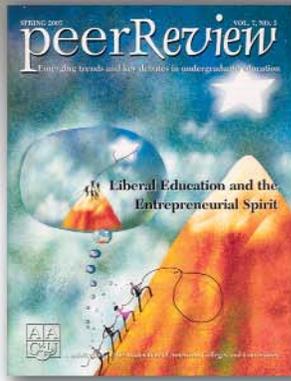
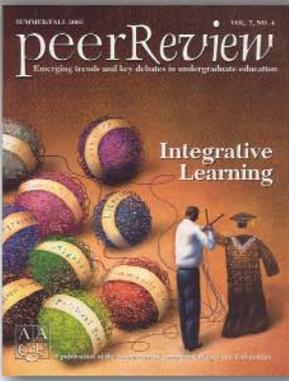
very nature, undergraduate research involves both teaching and research and it plays nicely into the needs of our students for contact with faculty and the interests of the faculty to engage in scholarship.

So it is time to ask ourselves, "Do we really believe that faculty can dedicate more and more time and effort to research work that does not include students and does not explicitly seek to improve student learning and yet somehow avoid the negative outcomes enumerated by Astin and others?" I believe it is time to own up to the risks involved in our teacher-scholar models and conduct an open discussion of this issue. My call, then, is for us to reflect not only on the impact our research is having on our disciplines, departments, institutions, and careers, but also to consider the impact our research is having on our students and on student learning. We owe this to them. ■

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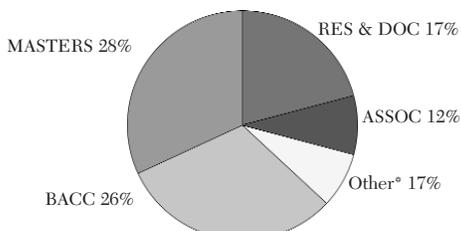
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