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CUR Focus on the Web

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Everything We Teach Was Once Someone's Research: Creating a Culture of Discovery on Campus

Colleges and universities are very old, traditional institutions. It is no surprise that professors are some of the few people left in our utilitarian society who, along with members of the judiciary and ordained clergy, dress up in funny hats and gowns in public and are treated as objects of respect, rather than ridicule. Our odd garb on ceremonial occasions, we believe, demonstrates our continuity. Our origins go back to the first universities of the Mediterranean world, created by Islamic and Christian religious teachers and judges in the 12th century. Like many ancient institutions, of course, we emphasize our lineage because we, in fact, have only survived by adapting constantly to new challenges. Those institutions that are blindly conservative in the sense of holding only to the past, die, as that great conservative Edmund Burke warned the British monarchy in the midst of a revolution in a century previous to ours. True conservatism, as even Burke saw, is holding wisely and only to what has passed the test of time and continues to be useful, while embracing, thoughtfully, the changes necessary to make the best of the past live on into the future.

One of the most important ways in which colleges and universities have changed is by becoming more and more committed to research. Despite our ancient heritage, the truth of the matter is that in our modern form, all colleges and universities in America—indeed, almost in the entire Western world—are only a little over a century old. In the mid-nineteenth century, the movement between high school and college was still a blurry one, as was college and graduate school. I have a wonderfully generous donor to undergraduate research at the College of William and Mary who had had a distinguished career and whom we were justly proud to call an alumnus. Proud, that is, until a sharp-eyed, back-office staff member in development noted that he in fact had never graduated from the college. He had merely left and gone to medical school. In fact, as late as the 1940s, it was not uncommon to be admitted to medical school or to sit for the bar, for that matter, without having a college degree. (We fortunately found a few credits that had somehow been overlooked for 60 years, and presented him with a diploma.)

Colleges and universities embraced research because it fed them the ideas, scientific theories, technological innovations, and cultural and artistic interpretations that academic leaders came to see as the core of what they were teaching to students. This was both a natural parallel to changes in society—growing literacy, the increase in technology, rising specialization—but also a difficult transformation from what colleges had been. Colleges had been dedicated primarily to passing on the received wisdom of the past, often classical Greek and Latin texts as well as religious doctrine, for an elite. The education of this elite was designed to mark them off from the rest of society as much as it was provided to help them serve society as leaders. Because shaping this elite was the goal, colleges rarely had special departments for more than a few subjects. It is striking to read college catalogs, even from the early twentieth century, and see historians teaching political science, philosophers psychology, and so forth. The goals of classical education have not been lost in the change to research as one of the prime missions of higher education. Now, general education or liberal-arts education for undergraduates fulfills some of its goals, by educating students broadly, as well as preparing them for specialized research, professional education, or careers. Nonetheless, the shift away from classical education for the elite has been profound and really captures the essence of modern higher education in the twentieth century. Colleges and universities preserved what was best in the liberal arts, created research as an important product of higher education beyond general education, and defined undergraduate, graduate, and professional education as component but separate parts of their mission.

After the spectacular growth of the research university and the clear demarcation of graduate, research-oriented education from broad, undergraduate education, one of the most exciting developments of the last twenty years in higher education has been the growth of research done by undergraduates, an achievement for which many of you, and your compatriots across North America, have been largely responsible. The growth in the activity of the Council on Undergraduate Research over its thirty-year history is one indicator of the trend. Since the 1990s, Howard Hughes Medical Institute and National Science Foundation REU grants have accelerated the expansion of undergraduate research. On my campus, in arts and sciences, half of the scientists coming up for tenure have

published with an undergraduate, while about two-thirds of those coming up for full professor in the sciences have done so.

I would argue that the growth of undergraduate research is part of another great transformation going on, in this case for the twenty-first century. The essence of graduate and professional education is specialization. That is what colleges and universities achieved in developing out of the undifferentiated colleges of the nineteenth century. Specialization is an incredibly powerful tool. Yet we all realize that, increasingly, the most exciting work in virtually every discipline involves integrating insights from other disciplines and other professions. Law schools hire JDs who also have PhDs to teach budding lawyers. Women's studies, neuroscience, film studies, integrative biology—on every campus represented here interdisciplinary studies and multi-disciplinary studies are one of the largest areas of creative work. About 25 percent of the arts and sciences students at William and Mary graduate with a major in an interdisciplinary field, while the curricula within disciplinary majors increasingly blend the traditional disciplines. A composer whom I recently hired has engineers as some of his closest colleagues because he uses digital technology to teach and compose. One analogue to this explosion of interdisciplinary studies, I would argue, is the growth of undergraduate research. Just as the division into separate disciplines, undergraduate and graduate education, and general education and professional education was at the heart of the history of twentieth century higher education, so integrating research into the heart of undergraduate education is one of most important tasks we face as twenty-first century educators. Just as higher education's differentiation in the twentieth century paralleled the growth of industrial and urban society, so the integrative revolution of the twenty-first century both captures and helps drive forward the globalizing, multi-dimensional society of the emerging future.

If undergraduate research is a great frontier with many possibilities open for us, how can we best continue to move forward? Let me you give my perspective as an administrator who has been blessed by being able to work with many gifted faculty members mentoring students in research, but who has also had to face challenges and obstacles to **the** growth of undergraduate research. Let me share with you some of what I have learned by asking and trying to answer a set of questions about undergraduate research:

1. How do we define it?

I would define it as faculty-mentored, independent student projects with a clear product. Every part of this definition is important. Undergraduate research is still educative, not simply discovering new knowledge or new interpretations as a postdoctoral fellow, research scientist, or creative writer would do. In this sense, it is a research *experience*. Faculty members guarantee its educational aspect. Yet the student has to carry out the work. But at the same time, the student learns best by having a goal, a product. This can be broadly defined, in ways that may be jarring to scholars or scientists used to articles or books as the end product of research. A Web site, a collaborative group paper, a poster session, a video, a journal—all of these constitute valid products of a research experience.

2. How can we defend it?

The critics on my campus and other campuses attack undergraduate research from two angles. Some argue that "research" is not the right word for what undergraduates do with their faculty mentors. It might be more independent and inquiry-based or involve more work outside the classroom than the typical lecture class. But it is not research. Many, though not all, of those who are argue this are scientists. Another argument on the same side, often from humanists, argues that only the best and ablest students can really do research. If one is a classicist or a scholar of Arabic, how many undergraduates are going to have sufficient knowledge of ancient Greek or of Arabic to do anything like what their faculty mentor does?

The other side attacks undergraduate research because they see it as destroying the breadth and freedom of the liberal arts. Why should we force undergraduates who have so much to learn from so many disciplines to specialize so quickly? Is not the essence of liberal-arts education that it is pure inquiry, without a product in mind?

My first response to these criticisms is to point out that the growth of a student from general education to graduate education, professionalization, or a career is a continuum. We move them along best by helping them see how every discipline has new interpretations and discovery at its core. Undergraduate research teaches students how new knowledge is created. In some disciplines, it can rely on secondary sources, not primary texts, just as the scholarship we do as faculty members embraces a wide variety of techniques and activities. Promotion and

tenure committees at the college or university level are always fun to watch when you have someone like a mathematical neuroscientist trying to evaluate the tenure dossier of an expressionist painter. The point is, we do embrace all. We should be as ecumenical with our students.

My second response is to say that liberal arts was never only about breadth of general education, in the sense of producing the well-rounded individual, or only about the freedom of inquiry. It has also been about learning by doing. Much of the traditional liberal arts are encapsulated in knowledge or free inquiry—what one might call, to use the ancient terms, scientia, sophia, or philosophy. But the liberal arts have also included what the ancients or the Renaissance humanists would have called rhetoric or oratory. If philosophy was about learning in order to think, to know, and to discover, oratory's goal was to persuade, to test, and to act. Testing one's ideas, discovering how knowledge is applied, and learning how action and knowledge interact is as much as part of the liberal arts as is disinterested general education or freedom of inquiry.

3. How can we track it?

One of the glories of undergraduate research is also one of its most frustrating aspects. As I have argued, it can and must take a wide variety of forms, at least as varied as the work of my faculty, which spans the spectrum from high-energy physics to Tibetan Buddhist texts to dance choreography. The best way undergraduate research can be done is within a small capstone seminar. But for a variety of reasons, some departments use their senior seminars to emphasize research less and integrative teaching more. We argue about this a good deal, but not every capstone or senior seminar, which almost every program has, provides an undergraduate research experience. Other departments or programs find ways other than seminars to have students do research. Chemistry at William and Mary has every student majoring in the department do a research stint with a faculty member as a requirement for the major. Many colleges and universities proudly tout statistics on undergraduate research. I have found the data behind these claims, perhaps understandably, often to be less than convincing. At my college, we have surveyed both departments and programs, on the one hand, and the transcripts and individual experiences of graduating seniors, on the other. About third of the students reported that they had done a significant body of research with a faculty member in an organized seminar class. This squares with the syllabi of the senior seminars. A little more than another third of the graduating seniors had done research with a faculty mentor during the summer, through an independent study during the semester, or via an honors thesis. All told, about 65 to 70 percent of the students said that they had done what we would consider undergraduate research. If undergraduate research is going to be one of the major goals of our education, we need to do a better job of tracking it. Surveying its progress and learning its weaknesses are essential to helping departments and programs to do it more effectively. Ideally, we would like a Web-based system tied into our student records, into which both students and faculty would enter key data. Updating the data would make it much more useful—later publications coming out of research experiences, post-graduation education, etc. We have made progress, but here is where we have a great deal of work to do.

4. How we can fund it?

Being in the midst of a $10 million budget cut, my college now finds funding anything a challenge] Private fundraising is one of the crucial ways we can fund undergraduate research. For an institution that prides itself, and is proudly acclaimed by its alumni, as a school dedicated to teaching, research could be seen as a dirty word. I once had an alum, one with a masters degree and younger than I am, say, "I don't want to help the faculty do their research. That just means that they won't teach." Changing that mentality has been one of the biggest tasks I have had as a dean. The one publication that I help pay for is *Ideation*, our award-winning research magazine whose skillful editor, Joe McClain, ensures it has students prominently featured in almost every story about faculty scholarship and research. At the College of William and Mary, we have made the case to foundations and alumni donors that the best students, and increasingly most students, come to the college because they want to study with the best teachers who are also approachable scholars, artists, and scientists. Alumni are struck by our surveys of graduating seniors showing that, along with study abroad, research with a faculty member is one of students' most satisfying experiences in college. Seeking to raise funds for undergraduate research turns out to involve helping change people's perceptions of what goes on in colleges and universities. We have grouped our publicity and development efforts into what we have called our "Faculty Student Research Initiative." We make the argument that teaching and research are deeply, integrally linked. Everything we teach was

once someone's research. And, done properly, few things teach as powerfully as research.

Like many other institutions, William and Mary has also funded undergraduate research with REU grants from NSF, grants from the Howard Hughes Medical Institute, and grants from the Beckman Foundation. One of our primary challenges now is to build a stronger base for undergraduate research, what we call "research across the curriculum." The Mellon Foundation has given the College of William and Mary a substantial grant to promote inquiry-based learning, that is, to use research as a teaching tool, particularly in sophomore and junior classes, so that students can learn more about the importance of research and scholarship and deepen their knowledge of how to do research as they move from the introductory freshman courses to senior seminars. Private funds from donors can create imaginative projects such as the Weingartner Global Initiative at William and Mary, which funds a professor's research and, once fully funded, up to six students doing research with the professor on his or her scholarly project and doing their own projects as part of it, on a major topic in international affairs. With creativity and hard work, we have to begun to win support from alumni and other donors by selling support for undergraduate research as helping students have "hands-on, practical experience" to "better prepare them for today's world."

One of our newest techniques to raise funds has just being launched, our own "donor's choose" Web site, so to speak, for honors fellowships. Forty approved honors theses projects were posted on the site, and donors could contribute small or large sums to help the students do summer research. We sent a test email "blast" out to alumni, and over 30 percent—which is an encouraging response for email solicitations—opened the message. We hope over the next few years to encourage alumni to fund individual students' research, get them excited about hearing from the student or students whom they have funded, and deepen their understanding of how exciting it can be to help a young person grow as an independent discover and explorer.

5. How can we guide it?

Deans can't successfully oversee and guide the growth of a true culture of discovery on campus. Chairs can't either. A campus needs to find a faculty member who loves teaching, understands research, and sees the possibilities of collaboration. The College of William and Mary is blessed with such a leader: Joel Schwartz, the director of our teaching and learning center, known as the Roy R. Charles Center from the funds that endowed it. He has pioneered by writing grants and soliciting funds for undergraduate research, such as both the Mellon grant and the honors fellowship Web site I mentioned. He organizes faculty committees to select student projects that the Charles Center will fund, helps sponsor large symposia at which students display the results of their research, and encourages donors by having students write letters to those who provided funds. One of the most exciting steps the Charles Center has taken recently is another Web project, called POUR—Process of Undergraduate Research. This is a blog aggregation site that brings together student entries on their in-progress research. POUR, like the research symposia, email newsletters, and campus news bulletin, informs students about the research other students are doing with faculty members. This helps sophomores and juniors seek out faculty mentors and find students from whom to ask advice. It also helps students doing research get advice. For example, a student in environmental science using GIS posted a question about how to tackle a problem and received help from a faculty member experienced in GIS who mentoring another student. Through giving a talented faculty member resources and opportunities, we can help foster a campus climate that stimulates research by students.

6. How we can extend it?

We need to find ways to extend our reach. Providing free summer housing has been a great step. At William and Mary, we have over 300 students every summer on campus doing research with faculty members. Wherever possible, our faculty members have adapted their grants to include student researchers. The Mellon grant has supported experiments using senior undergraduates as teaching and research fellows in faculty-taught courses; the fellows help sophomores and juniors use research materials. In some cases, we have created one-credit courses alongside the lecture course to provide a research experience. We have recast lab sections to make them more research-based in order to prepare freshmen and sophomores for doing research more independently. In the social sciences, simulations can be a teaching tool to help integrate research into lecture courses.

It is essential to make undergraduate research something that faculty members receive credit for in merit pay and promotion

decisions. Chemistry is the best example at William and Mary. Every Chemistry major is required to take a 1 SCH research course, and 80 percent of majors go on to earn American Chemical Society certification for their research with a faculty mentor. Faculty mentoring of student research is given credit in annual merit reviews in both teaching and research categories.. William and Mary is blessed with a low student/faculty ratio, but it is instructive that the two largest majors in arts and sciences (the two departments almost overwhelmed by advising large numbers of students)—government and psychology— have some of the greatest success with undergraduate research. They include it in courses for juniors and sophomores, write it into grants, and require every major to do a senior seminar involving an independent student project.

Some of the most exciting work is being done by combining undergraduate research with the other major goals of an engaged undergraduate education, service learning and international study. An innovative psychology course, Applied Development Science, taught by professor Danielle Dallaire, includes a semester-long commitment to a community-partner agency. One of the course assignments is to produce a community education pamphlet for a lay audience on a topic of concern for that agency. Our Hispanic Studies program requires every student in its summer programs in Mexico and Spain to design and complete a project under the supervision of the faculty director. .. Professor Anne-Marie Stock's cinema students produced subtitles for recently released Cuban films; professor Silivia Tandeciarz's students created a documentary on migration along the U.S.-Mexican border; professor Jonathan Arries' teachers-in-training completed service learning in schools in Nicaraugua; and professor Francie Cate-Arries's.students of the Spanish Civil War traveled to Madrid to document commemorative culture in today's Spain, constructing a website to guide future undergraduate fieldwork in this area http://madrid.wmblogs.net

7. What does it mean for higher education?

I believe that by integrating inquiry-based learning into our curriculum, bringing students into close working relationships with faculty, and helping students apply their knowledge in concrete ways, we are adapting once again to keep the best of what we have from the past and moving it forward for a new century.

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