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Journal Editorial: "Undergraduate Research—Catalyzing Learning and Lifelong Success"

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Since the emergence of colleges and universities in the late medieval period, their primary mission has been teaching and learning. Scholars organized in faculties were paid fees by affluent families to educate their adult children in what we would recognize today as the liberal arts: rhetoric, philosophy, math, astronomy, theology, and law. University-based research—the empirical investigation of the natural and social worlds—first arose over the 19th century with the emergence of distinct scientific fields (e.g., biology, physics, geology) and, late in that century, the social sciences (e.g., sociology, political science, and anthropology).

The role of university research finds its apogee in the American system of research universities expanding after WWII, informed by the lessons of that war regarding the need to organize and fund research at a much larger scale. While there are obvious exceptions such as Cambridge, Tsinghua, and ETH Zurich, most of the world's top research universities are found in the United States, and no country has such a large system of research universities serving a mass population.

This unique accomplishment—one of America's greatest—affords tens of thousands of undergraduate students the opportunity to enrich their traditional university experience—teaching and learning—with the invaluable experience of research. The Association of American Colleges and Universities identifies undergraduate research as one of the most powerful "high-impact" learning practices associated with superior educational, professional, and life outcomes.[1] Students able to take advantage of the opportunity to conduct research benefit from a transformative experience, one catalyzing their intellectual and professional development, opening new opportunities, producing more informed and engaged citizens, and helping institutions better realize their missions.

A wide range of studies and reports demonstrate that hands-on research catalyzes students' intellectual development. One National Science Foundation study of nearly 7000 undergraduates in the STEM and SBES (social, behavioral, or economic sciences) fields found that undergraduate research opportunities improved student academic performance, increased interest in graduate school and, more generally, increased self-confidence and self-awareness while affording a deeper understanding of the research process. These outcomes were particularly strong for traditionally underserved student populations, significantly increasing retention when research opportunities were available early. Overall, positive outcomes were strongest when undergraduates were full participants in research, either independently or as part of a larger group. The specific catalyst seems to be exposure to the culture of research across the planning, implementation, and analysis stages of research; the benefits of informal mentoring and tacit knowledge; and participation in publication or conferences.[2] Another study reports that participation in scientific research improves undergraduates' understanding of the scientific method generally, the

1. Kuh, G.D. (2008). High-impact educational practices: What they are, who has access to them, and why they matter. AAC&U, Washington, D.C.
2. Susan H. Russell, S.H., Hancock, M.P., & Mccullough, J. (2007). Benefits of undergraduate research experiences. Science, 316(5824), pp. 548–549

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design of research projects, the inevitability of tradeoffs and limitations, sharpened skills in data analysis and interpretation, and more effective oral communication. That study also found non-academic advantages such as greater tolerance of obstacles and appreciation for the importance of evidence and proof.[3]

Participation in research has also been found to enhance career-readiness and awareness of the range of post-graduation opportunities available to undergraduate students: student researchers are more aware of the range of opportunities and better positioned to pursue them, whether at research universities through graduate programs or cutting-edge private sector institutions. I recall as a freshman joining the debate team our collective research the day the new topic came out. About a dozen friends would get rolls of quarters from the bank for the photocopy machines in the basement of the Knight Library. At that time nearly the most recent one to two years all the academic journals to which the UO subscribed were kept in stacks in the basement: "current periodicals" (back issues were in the main stacks). Thousands of journals were on display with the most recent preceding issues stacked behind the most recent. My teammates and I would scour up and down the current periodical stacks scanning each issue for articles with any plausible connection to the topic. I became familiar on a first name basis with a couple hundred leading journals in all areas – sociology, political science, cultural theory, Marxism, history, communication studies, natural sciences. I learned about the enormous universe of scholarship and developed the capacity to link streams of research across journals within fields and across fields, organized under the Library of Congress Classification system. No single course or even collection of courses came close to exposing me in a systematic and informative way about the world of scholarship and the foundational principles on which it was organized.

Those undergraduate research experiences gave me the awareness and ability to effectively and efficiently research any academic or social or political or economic topic under the sun. I learned how to use and navigate government documents – from congressional hearings and report to the specialized information products of executive agencies. I learned how to research law reviews and case law. I learned how to find contact information for government agencies and how to place information requests, including hundreds of successful Freedom of Information Act requests. These experiences, honed over several years as a successful debater, prepared me to work as a freelance researcher and an opposition research specialist in the political arena. I learned that the world was knowable and that I could come to know it. And I learned how to send a constant stream of articles to my teammates staffing the copy machines, to obtain the articles for processing for use as arguments in future debate tournaments.

My scouring of these databases also resulted in an article, which I published as an undergraduate in Covert Action Quarterly, a journal started in the 1970s by former CIA agents dedicated to documenting the impact of American intelligence services on the world. Shortly thereafter, I used my FOIA skills to obtain classified defense department documents about the then-emerging "National Information Infrastructure" in the transition from the Bush to the Clinton administrations, demonstrating the consistency in vision and investment across the two administrations: the public should subsidize the research and development required to build out the nascent internet, but do so in a way that would permit private corporations to reap all the benefits of development while also perfecting the C4I (command, control, communications, computers, and intelligence) required to maintain US military and intelligence hegemony over a volatile world in the early post-Cold War years.

3. Lopatto, D. (2007). Undergraduate research experiences support science career decisions and active learning. CBE Life Sci Educ., 6(4): 297–306.

I learned a great deal in my courses at Oregon, especially in the Sociology Department, where I earned my degree. But no courses, not even all my courses take together, came close the education that I acquired, applied, and continue to use from my exposure structure of the wide world academic scholarships and my own undergraduate research those experiences produced.

Modern societies, with their complex systems and technologies, benefit immensely when more citizens have experience and competence in analyzing matters of great natural, social, and economic importance—the enduring and transferrable abilities conferred by participation in rich research experiences. These graduates are less susceptible to manipulation and more likely to embrace their responsibilities. As citizens, they are better able to contribute as informed citizens in democratic governance and influence ongoing socio-technical change.

Those institutions prioritizing undergraduate research opportunities benefit as much as their students. Modern research universities embrace a twin mission of teaching/learning and research. Undergraduate participation in research helps these institutions achieve both missions, often improving the quality and extent of the research occurring on their campuses. Reasons for this effect include that strong undergraduate research opportunities help recruit and retain excellent students, providing richer opportunities for faculty engagement, teaching and mentorship, and the creation of a vibrant intellectual culture across the campus.

Undergraduate research is not without challenges, including greater demands on resources, both personnel and budgetary. But those investments and commitments are clearly worth their costs. The strong role of undergraduate research at the University of Oregon and other R1 research-intensive colleges and universities provides enormous benefits to those students and the faculty and graduate students with whom they work and interact. Those opportunities draw high-performing students to the university and graduate better-prepared scholars, citizens, and leaders. Undergraduate research opportunities help institutions like the University of Oregon—and undergraduates like myself, once—fulfill their missions to serve the communities of which they are a part.