Part I: Engaging Undergraduates in Research and Scholarship

Value of Undergraduate Research and Scholarship

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Undergraduate Research and Scholarship Defined

The Council on Undergraduate Research (CUR) defines undergraduate research and scholarship as a “student-faculty collaboration to examine, increase, and share new knowledge or works in ways commensurate with practices in the discipline” (Hakim, 2000). The CUR’s definition of undergraduate research is similar to the research missions of many traditional universities. For example, traditional research is often the product of collaborations between researchers and their junior colleagues (e.g., graduate students). Like traditional research, undergraduate research seeks to discover new information. That is, undergraduate research is not simply the replication of old findings, but involves the creation and discovery of new knowledge (Merkel & Baker, 2002). Like traditional research, the goal of undergraduate research is the dissemination of these new findings at conferences and in peer-reviewed publications (Ali et al., 2007).

Recent Trends in Undergraduate Research and Scholarship

Over the past 25 years, there has been a growing recognition of the value of integrating research and scholarship into the undergraduate curricula. Many universities have developed sustainable undergraduate research and scholarship programs (Brakke, Crowe, & Karukstis, 2009; Stocks, Ramey, & Lazarus, 2004). In a recent survey, for example, approximately 50% of undergraduates in the natural and social sciences reported having an undergraduate research experience (Russell, Hancock, & McCullough, 2007). This trend is not isolated to predominantly undergraduate institutions; it is also gaining momentum at large research universities with successful graduate-degree programs (Wilson, Cramer, & Smith, 2004). There are several reasons for this trend. First, many
universities are recognizing that undergraduate research and scholarship results in better educational experiences for their students (Wilson, 2000). As a result, students are more competitive for top tier graduate programs and industry jobs (Webb, 2007). Second, undergraduate research programs enhance the research productivity of the institution, making faculty more competitive for extramural grants (Goodwin Holmes, & Hoagland, 1999). Third, a thriving undergraduate research and scholarship program enriches the educational mission and reputation of the institution, which attracts and retains the brightest students and faculty (Hakim, 2000). Finally, the community benefits from the influx of college graduates who have conducted research because they are better informed citizens and critical consumers of research (Stocks et al., 2004). Each of these benefits will be elaborated on below.

Benefits to Students

The undergraduate research experience is crucial for a student’s professional and personal development, career preparation, and general skill development. For example, students will learn academic honesty through the acknowledgement of previous work (Wilson, 2000), adopt the ethical standards specific to their discipline through meaningful interactions with their mentor and other research personnel (Merkel & Baker, 2002), and develop a strong work ethic when their research projects do not go according to plan (Hakim, 2000). As students gain more experience in research, they will develop the confidence and persistence necessary to complete their projects (Petrella & Jung, 2010), defend their ideas, and present their work to the scientific community (Stocks et al., 2004). This confidence is a trait that a student can use for the rest of his or her life (Merkel & Baker, 2002).

Conducting an undergraduate research project will help a student decide what career to pursue. For example, a recent study on the career choices of undergraduate science majors reported that 68% of students were more interested in their discipline following an undergraduate research experience (Russell et al., 2007). Additionally, 30% of undergraduates with 12 or more months of research experience planned to pursue a Ph.D., compared to only 8% of students without any research experience (Russell et al., 2007). Proper mentoring will help a student in this endeavor. For example, a good mentor identifies the strengths and weaknesses of the student to better inform them of their likely success in graduate school or industry (Merkel & Baker, 2002). Working closely with a faculty mentor can be life-changing for those students who normally do not excel at school or for students from underrepresented groups (Leggett, 2003; Stocks et al., 2004). For many students, the undergraduate research experience will spark a life-long quest for research and discovery (Stocks et al., 2004).

Undergraduate researchers will develop skills that are not taught in the standard university curriculum (Hakim, 2000). For example, students will
learn to be more collegial by working on a research team. Undergraduate researchers will also develop superior communication and problem-solving skills as they carefully research a question and disseminate their findings at conferences and in journals (Russell et al., 2007). These skills allow the student to interrelate research and scholarship with other undergraduate courses, such as composition and speech (Goodwin et al., 1999). Employers want, but often complain, that college graduates do not have these skills (CNN, 2007). Therefore, college graduates with research skills are more competitive in the job market.

Benefits to Mentors

The undergraduate research experience benefits faculty mentors in many aspects of their workload. For example, faculty who regularly mentor undergraduates report an increase in morale, self-esteem, and satisfaction that comes from close interaction with intelligent and stimulating students. As a result, they are more rejuvenated than faculty who do not mentor undergraduates (Wilson, 2000). With experience, faculty mentors become effective role models as researchers and more successful as teachers in the classroom. Because of their repeated contact with bright, motivated students, their lectures become more interesting and current (Hakim, 2000). A renewed faculty member is important because his or her enthusiasm contributes to a successful undergraduate research experience (Russell et al., 2007). Most undergraduate mentors are faculty members, but approximately 21% are either graduate students or postdoctoral researchers (Lopatto, 2010). Not surprisingly, there are also benefits to this category of mentors. For example, many graduate students and postdoctoral scientists reported an improvement in their qualifications (e.g., teaching & communications skills) for an academic job after an undergraduate mentoring experience (Dolan & Johnson, 2009).
Although an undergraduate research project should not be a dissertation, it should be a research project that challenges the student to discover new knowledge. This allows for more flexibility in the type of research that can be conducted in the faculty mentor's program. For example, it could be a riskier project that can serve as the basis for a larger project for the faculty mentor (Brakke et al., 2009). It could also be a complementary study that normally would not be conducted due to time and money constraints. Or, it could be a short project. Regardless of the scope, all undergraduate projects should ask questions that lead to new knowledge (Merkel & Baker, 2002).

Undergraduate researchers also free up time so that the faculty mentor can fulfill other duties, such as preparing a grant proposal or writing a manuscript. Although there is a significant amount of time invested at the beginning of the relationship, the faculty member can devote less and less time as the undergraduate researcher becomes more independent. It is worth the investment of time because there will be the personal satisfaction of giving someone a life-changing experience and getting more work done.

Benefits to the University

A thriving undergraduate research and scholarship program enriches the reputation and educational mission of the institution in many ways. First, it increases the retention of top students (Hakim, 2000; Goodwin et al., 1999). In fact, students rarely transfer institutions following a rewarding undergraduate research experience (Goodwin et al., 1999). As a result, undergraduate researchers become the best advertisers for their institution and attract talented students to their undergraduate programs. Graduates with undergraduate research experiences are more likely to be involved with their alma mater through alumni associations, funding drives, and advisory boards (Brakke et al., 2009). These post-graduate activities benefit the institution’s reputation. Also, universities with thriving undergraduate research and scholarship programs attract and retain good faculty members. For example, faculty engaged in mentoring undergraduate research develop an exciting and contemporary curricula and are well-positioned for attracting extramural funds (Goodwin et al., 1999). These outside grants can be used to buy new equipment, which then can be used for further research, discovery, and so on.

Institutions that support undergraduate research and scholarship also qualify for extramural funds from large granting institutions. For example, the National Science Foundation (NSF) funds a program called Research Experiences for Undergraduates (REU) and the U.S. Department of Energy sponsors a research program called the Undergraduate Research Internships. Both programs aim to create a new generation of scientists.
Summary

More and more universities are developing strong and sustainable undergraduate research and scholarship programs. Successful undergraduate researchers develop a relationship with a mentor so that a good letter of recommendation can be written for graduate school or industry (Merkel & Baker, 2002). Following an undergraduate research experience, students are more competitive for top tier graduate programs in their areas of study. Faculty mentors benefit by enhancing the quality and scope of their research programs. Institutions profit by enhancing their reputation and increasing student and faculty retention.

References


