Undergraduate research is defined as “a mentored investigation or creative inquiry conducted by undergraduates that seek to make a scholarly or artistic contribution to knowledge” (Council on Undergraduate Research, 2021, para. 5). Traditionally, research opportunities were not available to students until graduate school when students pursued master’s and doctoral degrees. Major steps were taken to develop undergraduate research at the 1953 meeting of the National Science Foundation (NSF), the 1969 founding of the Undergraduate Research Opportunities Program (UROP) by Massachusetts Institute of Technology (MIT), and in 1978 with the formation of the Council on Undergraduate Research (CUR) (Kinkead, 2012). In the 1990’s, colleges and universities began institutionalizing undergraduate research (Kinkead & Blockus, 2012), and over the last three decades undergraduate research has greatly expanded with offices of undergraduate research at colleges and universities, undergraduate research conferences, and undergraduate research journals. Immersing undergraduate students in research benefits students, professors, and the college/university.

Benefits of Undergraduate Research for Students

Undergraduate students at 2-year and 4-year colleges and universities yearn to learn more about their disciplines and future professions. Undergraduate research fosters student learning and provides opportunities for exploration and expansion within a field of interest. By participating in undergraduate research, students are rewarded with discipline knowledge, research experience, and career exposure.

Traditional college classes include coursework of reading assigned textbook chapters, completing quizzes and exams, participating in class discussions, writing papers on assigned topics, and fulfilling appointed laboratories. For students who want to expand the traditional exposure to standardized topics within their field of interest, undergraduate research rewards students with in-depth discipline knowledge on a topic of great interest. For example, the class participant “Jose,” a student pursuing a degree in aerospace technology, has taken thus far have provided him with the key topics of aerospace history and practice. However, it is Jose’s novel research on the effects of
temperature on aerospace composite materials that provided Jose with in-depth and personalized knowledge within his discipline that exceeds what his classmates are attaining from traditional coursework alone.

Research involves in-depth analyses of peer-reviewed literature on a topic of choice, creating hypotheses and experimental designs to test the hypotheses, conducting experiments, statistically analyzing collected data, making conclusions about trends in the data, and presenting the findings in understandable ways that can be used by others to expand knowledge and lead to improvements. The experience that students obtain through each aspect of research cannot be obtained through reading about it or even studying it. By conducting research, students gain experience and skills in literature analyses, design, mathematics, writing, and presentation. In a survey of 465 undergraduate research students asked, “What did you get out of your undergraduate research?” 92% selected “knowledge about the topic” and 74% selected the outcome they valued most was “specific technical skills/job experience” (Craney et al., 2011, p. 98). The experiences and skills attained through undergraduate research transfer to the students’ future careers.

Volunteering, internships, and undergraduate research are ways for students to acquire exposure to their future career fields before they complete undergraduate degrees. For example, participant “Emma,” a sophomore, thought she wanted to pursue a career in dentistry. Her undergraduate research on the effect of marijuana on oral tumors was interesting to her, but not fulfilling. Emma realized through her research that it was not the mouth that interested her, but sonography medical imaging that she used in her research to examine oral tumors. Instead of spending many years and many thousands of dollars on a degree in dentistry only to later figure out it was not a good fit, Emma’s research exposed her to a career in sonography which she is passionate about and is now a professional sonographer. More often than Emma’s scenario, undergraduate research cements a student’s desire to pursue a career in the field they are researching. After completing undergraduate research, 120 students were surveyed, and the most common response students provided about student benefits of undergraduate research was learning about their future career by completing aspects of their future career (Nolan et al., 2020). Undergraduate research removes the barrier of unattainability with career exposure.

Students with undergraduate research experience are more desirable to graduate schools and employers. This early experience with research provides students the opportunity to learn more about and demonstrate commitment to their chosen fields. Additionally, students with undergraduate research experience gained many of the entry-level skills and training that enable them to start graduate school or employment better prepared than their peers. In a study of 102 undergraduate students who presented their research at conferences, students reported long-term benefits including development of job skills, increased extracurricular engagement, and “career boost” (Little, 2020, p. 236). Undergraduate research provides students with professional growth and an edge over other students applying for the same graduate programs or employment because they have developed skills, attained experience, and demonstrated commitment towards their future careers.
Benefits of Undergraduate Research for Professors

Depending upon the college or university, research may be a major, minor, or non-requirement of employment for professors. However, all professors have a background in designing, conducting, analyzing, and presenting research during their master’s and doctoral programs. Professors have opportunities to expand their own research and share experiences with students through undergraduate research.

Professors may desire to continue research stemming from their own research in graduate school, may have ideas for research based on new interests or discoveries, or may be immersed in research that would be more successful with more personnel. Most undergraduate research students are captivated by research, eager to learn, and dedicated to the goal of research discovery. Incorporating undergraduate students will provide an enthusiastic workforce to develop and accelerate research ideas into productive research.

More importantly than professors benefiting from additional personnel to fulfill research endeavors, professors disseminate skills and experience to the next generation through undergraduate research. The professional goal of professors is to educate students about their area of expertise and prepare students for their future careers in that area. Undergraduate research is about teaching students how to conduct research and immersing them in research within their future career field. In a study of 1,135 students who completed undergraduate research in a science discipline, more than 83% were continuing to graduate school in a science field (Lopatto, 2004). Professors can share their acquired expertise and propagate that knowledge to the next generation in their field through undergraduate research.

Benefits of Undergraduate Research for the College

The benefits of undergraduate research for the college/university are the most tangible of the three groups. With undergraduate research comes positive exposure for the college and opportunities to market the college. These can lead to increased recruitment, retention, and graduation rates of students, as well as potential donors and grant funding.

Like all levels of research, undergraduate students present their research at conferences as poster and oral presentations. There are state and national conferences specifically designed for undergraduate research, such as the Florida Undergraduate Research Conference (FURC) and the National Conference on Undergraduate Research (NCUR). Many of the discipline-specific state and national conferences have recently allowed and now encourage undergraduate students to present their research. With the help of their research mentors, undergraduate research students can publish their research in peer-reviewed journal articles. In recent years, more colleges/universities, state, and national journals have been created to publish undergraduate research, including the Florida Undergraduate Research Journal (FURJ). Each time an undergraduate student presents or publishes research, it is excellent publicity for the college. The college name is associated with outstanding learning and research.
Opportunities to market the college as a desirable place to prepare for future careers expand with undergraduate research. Recruitment of students may increase by attracting students who desire to conduct research to gain the skills and competitive edge for their future career. Retention and graduation rates of students may increase with the development of inclusivity of research students being an integral part of a research project. Bowling et al. (2015) reported science, technology, engineering, and math majors who participated in undergraduate research activities had higher retention rates during all four years of undergraduate than students who did not. Student success with undergraduate research does not only apply to academically strong students; students with low GPAs prior to research had increased GPAs during the year they completed undergraduate research (Haave & Audet, 2013). In addition to drawing in and maintaining students, marketing the college as a center for undergraduate research provides eligibility to apply for more funding through grants and donations. The National Science Foundation, National Institute of Health, and the Howard Hughes Foundation are some of the national groups that recognize the importance of and fund undergraduate research (Petrella & Jung, 2008).

Conclusion

Undergraduate research has costs of time and money. However, the benefits for students, professors, and colleges far outweigh the costs. Undergraduate research is high-impact education that may enhance professional growth, personal accomplishment, and institutional success. With clear rewards, undergraduate research opportunities, programs, and journal publications will continue to expand.

References


