

Proposal Summary.

Title

A Systematic Review of Undergraduate Research Programs

Abstract

This study systematically evaluates existing literature concerning the academic, non-cognitive, and post-college outcomes of students participating in undergraduate research programs. We also consider how relationships/effects vary by discipline, institution type, and student population.

Proposal Text

Objective/Purpose

Since the 21st century, evidence-based research and decision-making have been a hallmark of the United States and Canadian public policy (Haskins, 2018; Kiefer et al., 2005). Ensuring that people make decisions informed by rigorous research is necessary to promote quality outcomes. Nearly every field, from education to health care, has experienced this shift (Baron, 2018). Emphasizing rigorous research is particularly important during the current moment, where people will refute stylized facts under the veil of “fake news” to push a particular agenda, for example. As a result, it may not be hyperbolic to suggest that the future of a country’s vitality might depend on the strength and vigor of the next generation of scholars that colleges and universities produce.

Some colleges and universities have adopted undergraduate research programs to help train this cadre of researchers and scientists. The Council on Undergraduate Research (n.d.) defines undergraduate research as “a mentored investigation or creative inquiry conducted by undergraduates that seek to make a scholarly or artistic contribution to knowledge.” Undergraduate research traditionally takes place in an independent study option or a tiered research-lab mentoring experience; however, institutions have diversified these opportunities to accommodate a variety of student interests (Healey & Jenkins, 2009). Undergraduate research also includes the mentorship of a faculty member or senior researcher that initiates the student into the methods of a discipline. In addition to the scholarly knowledge students generate, this programmatic effort affords budding scholars an intimate view of the knowledge production process with wide-ranging implications for policy and practice (Healey & Jenkins, 2009). As a result, undergraduate research participants gain relevant research skills alongside other potential academic, social, and economic gains.

While the public benefits of cultivating researchers are clear, what is opaque are the potential advantages of students participating in undergraduate research programs on their outcomes, both during- and post-college. What is missing is a synthesis of existing research that examines the broader impact of these programs while being attentive to important differences by disciplines (e.g., Science, Technology, Engineering, and Math [STEM] vs. social sciences), institutions, and student populations.

The purpose of this study is to provide a synthesis of the research literature concerning undergraduate research programs. Specifically, the following research questions guide this study:

1. What is the relationship/impact of undergraduate research on academic performance (e.g., grade point average, persistence, and degree completion) and non-cognitive skills and experiences (e.g., sense of belonging and time management)?
2. What is the relationship/impact of undergraduate research on post-college outcomes and experience (e.g., graduate school enrollment, career exploration, etc.)?
3. How do these outcomes vary by discipline, institution, and student population?

A Brief Overview of Undergraduate Research Programs

Undergraduate research has emerged primarily over the past three decades to increase student engagement and retention. The push for undergraduate research in the U.S. began when the National Commission on Educating Undergraduates in the Research University, known as the Boyer Commission Report (BCR), in 1995 advocated developing and refining undergraduate research programs (Katkin, 2003). One of the primary reasons to incorporate undergraduate research programs was to improve undergraduate education, as an increasing number of research-intensive universities were producing baccalaureate graduates. Some stakeholders, however, thought these graduates were “ill prepared for both the current workforce and the new and emerging demands” (Katkin, 2003, p. 19). The decline of students majoring in STEM fields was coupled with this push for undergraduate research initiatives (Katkin, 2003).

Consequently, the BCR contended that research universities were well equipped to offer research opportunities that addressed significant disparities in the STEM fields and broader workforce needs drawing on the resources of their established research enterprises.

In 2008, another initiative led by the AAC&U promoted undergraduate research programs. George Kuh (2008) published a report advocating for teaching and learning practices, also known as High-Impact Practices (HIPs). Kuh (2008) asserts that undergraduate research and nine other HIPs are helpful to students from all backgrounds, especially students of color (Finley & McNair, 2013). Presently, undergraduate research falls into one of four categories: independent study, course-embedded, program-embedded, or summer research experience (Fischer et al., 202; Healey & Jenkins, 2009). Colleges and universities in the U.S. and Canada actively promote these HIPs.

Methods and Analytic Approach

To answer our research questions, we conduct a systematic literature review using a four-step approach (see Figure 1). First, we began with a manual search for peer-reviewed journal articles published since 2000. We selected this timeframe because it marked a sharp increase in the share of first-generation, racially minoritized, and economically disadvantaged students attending postsecondary education in the U.S. and Canada (Usher, 2020; Winkle-Wagner & Locks, 2020). We selected ERIC and Google Scholar databases because they include a robust catalog of education

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research. We use a variety of search parameters, such as “undergrad* research” AND impact OR effect (a list of keywords is in Figure 1). The inclusion criteria were for peer-reviewed articles or reviews published between January 1st, 2000, and January 1st, 2023, on undergraduate research and the following topics: impact, engagement, retention, persistence, GPA, graduation, minorities, STEM, non-STEM, minorities, and first-generation. We excluded all articles that were non-peer-reviewed and published before January 1st, 2000. Our analytical approach is to judge all results against broad inclusion or exclusion criteria. We then conduct a thematic analysis of the selected articles and categorize the study on emerging themes. These themes emerge not only from the existing literature but also from existing theoretical models of student engagement (Kuh, 2008).

Preliminary Findings

Based on existing search and analysis thus far, we have identified five themes: 1) undergraduate academic success, 2) development of non-cognitive or “soft” skills, 3) creation and use of campus/peer support, 4) identity development and self-efficacy, and 5) graduate school and career exploration. For our ASHE proposal, we discuss two preliminary themes.

Creation and Use of Support Systems

Overall, research shows that, on the one hand, undergraduate research programs provide access to campus and peer support systems (Espinosa, 2011; Hurtado et al., 2009; Hurtado et al., 2008; O'Donnell et al., 2015; Posselt & Black, 2012). On the other hand, some research programs may not help integrate students into campus (Hurtado et al., 2009). Research has demonstrated that undergraduate research programs connect students and build support systems (Espinosa, 2011; Hurtado et al., 2009). This finding was particularly highlighted in two studies focusing on women of color navigating the STEM field and their research programs (Espinosa, 2011; Ong et al., 2011). However, Hurtado et al. (2008) found that peer networks were essential to gaining access to undergraduate research programs. Still, they found no direct evidence linking undergraduate research to students' integration on college campuses. As a result, although some studies saw engaging in an undergraduate research program as providing access to resources, they otherwise would not have, accessing these programs may depend on existing structures in place at a university.

Graduate School and Career Exploration

Participation in undergraduate research programs saw a significant and positive relationship with students' future planning. Overwhelmingly, undergraduate research programs helped steer students into graduate school and discipline-focused career pathways (Carpi et al., 2013; Carter et al., 2015, 2016; Eagan et al., 2013; Fakayode et al., 2014; Fuchs et al., 2016; Lopatto, 2004; Louzada et al., 2008; McCoy & Winkle-Wagner, 2015; Seymour et al., 2004; Slovacek et al., 2012). Specifically, being in these undergraduate research programs allowed students to cultivate transferable research and employment skills. For instance, Carter et al. (2016) found undergraduate research experiences promoted students' communication, teamwork, and leadership skills.

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relevant to their future job placements within the engineering field. A salient aspect of undergraduate research programs was how vital mentorship was to students (Daniels et al., 2016; Davis, 2008; O'Donnell, 2015). According to Daniels et al. (2016), high-quality mentors were associated with more considerable academic and psychosocial gains.

Importance/significance for the study of higher education

This study contributes to the scholarly conversation concerning undergraduate research's purported and actual outcomes. The preliminary findings suggest that undergraduate research offers benefits over and above narrow conceptions of academic success, like retention and graduation. As a result, the findings have implications for colleges and universities designing and implementing these programs alongside federally funded programs, like the Ronald E. McNair Scholars Program.