



The Long-Term Role of Undergraduate Experiences: Predicting Intellectual and Civic Outcomes

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Accepted: 1 July 2022

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Abstract

Scholars and the public alike have questioned the benefits of obtaining an undergraduate education. Although research has extensively examined short-term outcomes associated with college experiences, relatively few studies have investigated non-economic outcomes beyond graduation. This paper explored the link between college experiences and post-college outcomes among 21,716 bachelor's degree recipients from 68 private institutions. Although some variation across demographics was observed, good teaching, academic challenge, and diversity experiences were consistently—and often strongly—related to alumni's perceptions of intellectual and civic growth.

Keywords Post-college outcomes · Academic experiences · Diversity experiences · College alumni · Gender · Race

The value of a college education is being questioned with new fervor (e.g., Arum & Roksa, 2011, 2014; Brown, 2018; Mitchell & Belkin, 2017; Selingo, 2013). College costs coupled with concerns about student loan debt have students and families asking whether college is worth it. When contextualizing these concerns against U.S. higher education expenditures that exceed \$500 billion per year (National Center for Education Statistics, 2017), it is surprising how little is known about how experiences and environments encountered during higher education influence students after they graduate.

Concern over higher education's effectiveness begs a key question: Which long-term outcomes should a college education promote? Higher education attainment has long been heralded as the key mechanism for facilitating social mobility (Blau & Duncan, 1967; McMahan, 2009), with credential attainment serving as an essential marker of human

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capital development (Becker, 1993). A substantial body of literature has investigated the essential proposition of human capital theory: education increases productivity, which the labor market rewards through future earnings (Gill & Leigh, 2003; Light & Strayer, 2004; Long, 2010; Ma et al., 2016; Molitor & Leigh, 2005; Neumann et al., 2009; Park, 2011; Perna, 2003, 2005; Rumberger, 2010; Taniguchi, 2005; Wolniak et al., 2008). While career outcomes may be the most evident—and are indeed important—they are certainly not the only outcomes that matter. We contend that the fundamental long-term outcomes of higher education should also encompass intellectual and civic domains. These domains are grounded in the works of leading scholars (see Clotfelter, 2017; Delbanco, 2012; Gutmann, 2014; McMahon, 2009), the American Academy of Arts & Sciences' Commission on Undergraduate Education (AAA&S, 2017), and those who have empirically synthesized the effects of college (Mayhew et al., 2016; Pascarella & Terenzini, 1991, 2005). Collectively, these scholars trace higher education's history of enriching students' life of the mind and preparing young adults to contribute as active and engaged citizens in their communities.

Given higher education's role in promoting diverse long-term outcomes among alumni, it seems prudent for higher education stakeholders to identify the practices and conditions consistently and positively associated with intellectual growth and civic engagement. A host of financial factors have compelled colleges and universities to prioritize curricular and co-curricular programs (Dickeson, 2010), and it is necessary to know which types of programmatic priorities hold the most promise for achieving desirable post-college outcomes, particularly from the perspectives of college graduates. The present study responds to this necessity by focusing on several salient types of experiences in relation to alumni intellectual and civic outcomes after college. We sought to understand the extent to which students' experiences and encounters with institutional environments during college were associated with such outcomes after college.

Moreover, we sought to uncover dynamics related to potential inequities in post-college outcomes by examining whether certain experiences may have compensatory effects that provide greater benefits to populations of alumni who have been historically underserved by higher education. Given the hostile campus climate that students from minoritized backgrounds often encounter (see Harper & Hurtado, 2007; Ogunyemi et al., 2020; Rankin et al., 2010), some college experiences may be particularly influential for students who face micro- and macroaggressions.

The present study focuses on private colleges and universities in the United States. Private and public institutions share many intended student learning outcomes and values, particularly in terms of graduates' career outcomes. However, private institutions are especially likely to discuss academic rigor, the role of liberal arts education (particularly with respect to civic engagement), and development of undergraduate students generally in their mission statements, whereas public institutions (particularly research universities) focus more on knowledge creation and dissemination within a broad public service mandate (Morphew & Hartley, 2006; Pascarella et al., 2005). Given the greater dependence on revenue from tuition and donations at private institutions (National Center for Education Statistics, 2020), these colleges and universities should be particularly attuned to their graduates' perceived benefits of their education. We contend that understanding the relationships between experiences and environments engaged during college and post-college intellectual and civic outcomes will aid in a clearer articulation of higher education's value proposition.

The present study extends and improves upon prior research in several ways. First, it explored a set of outcomes that has received very little attention, as most studies of

post-college outcomes examine labor force participation and success, subjective well-being, and health outcomes (see Hout, 2012; Mayhew et al., 2016; Pascarella & Terenzini, 2005). Second, the large dataset used here allowed us to explore a variety of moderators, including identities that are almost never examined in research on college alumni (e.g., non-binary gender, Native Hawaiian/Pacific Islander). Third, given the heterogeneity in the analytic sample, we were able to directly examine whether and how the link between experiences and outcomes differs as a function of the time since alumni received their undergraduate degree, which recent alumni studies of civic outcomes have not been able to do.

Ultimately, this study provides new empirical evidence from which to consider the practices that drive post-college outcomes of higher education by addressing the following research questions within a large sample of graduates from private institutions: (1) To what extent do student-faculty interactions, academic challenge, and diversity interactions predict alumni intellectual and civic outcomes after college? (2) Do gender or racial/ethnic identities moderate these relationships? (3) Do the relationships between experiences and outcomes differ as a function of the time since alumni received their undergraduate degree? This focus on the college experiences across the research questions is based on Mayhew et al.'s (2016) large-scale synthesis of the college impact literature; these authors concluded that diversity experiences and good teaching (which generally involves student-faculty interactions and academic challenge) appear to have the most consistent, positive effects of any college experiences across a broad range of student outcomes.

Prior Literature on Post-College Outcomes

An abundant research base has explored the association between college experiences—particularly major field of study—with graduates' post-college earnings (Gill & Leigh, 2003; Light & Strayer, 2004; Long, 2010; Ma et al., 2016; Molitor & Leigh, 2005; Neumann et al., 2009; Park, 2011; Perna, 2003, 2005; Rumberger, 2010; Taniguchi, 2005; Wolniak et al., 2008). However, limited research has examined the long-term effects of college attainment on a broader set of outcomes, despite governments worldwide justifying their investment in education for reasons that extend beyond economic benefits. Such social outcomes, often referred to as externalities and studied extensively by McMahan (2009) in *Higher Learning, Greater Good*, include college graduates' propensity toward involvement with civic and nonprofit organizations, charitable giving, and voting. The outcomes in the present study were informed by McMahan's work and represent a rare effort to examine graduates' post-college intellectual and civic outcomes. We discuss this limited literature base in terms of the relationships between collegiate experiences and environments and these outcomes in the next sections.

Long-Term Intellectual Outcomes

Critical thinking and related cognitive outcomes are commonly noted in university mission statements (Morphew & Hartley, 2006), yet few studies have directly investigated the role that postsecondary education might play in fostering long-term intellectual outcomes. This paucity of literature is surprising when one considers the substantial amount of students' time during college that is dedicated to broad-based and disciplinary study. We review the available literature below.

Ardelt (2010) and Ardel et al. (2018) examined the relationship between educational attainment, age, and perceptions of 3D wisdom (a combination of cognitive, reflective, and affective/compassionate wisdom). In a sample of 655 adults, Ardel (2010) found older college-educated adults had higher scores on 3D wisdom than younger college-educated adults, both of whom had higher scores than older adults without a college degree. Expanding their study sample to nearly 15,000 adults, Ardel and colleagues (2018) found educational attainment positively associated with overall 3D wisdom and the disaggregated components of cognitive and reflective wisdom. Only an extremely small difference in compassionate wisdom by education level and age was observed.

Guerra-Carrillo et al. (2017) examined the relationship between educational attainment and executive cognitive functioning and reasoning with a sample of nearly 200,000 subscribers to an online cognitive training program. They found that educational attainment positively associated with performance across the set of domains, but reasoning domains showed greater differences than processing domains. Moreover, performance differences persisted across the full age range, with the strongest associations at ages most associated with “traditional age” college graduation (mid-20 s for bachelor’s degrees and mid-30 s for graduate degrees). Guerra-Carrillo and colleagues argue that this result is consistent with the cumulative effect of educational attainment decreasing as the college experience becomes more distant. Unfortunately, none of these cognitive studies examined how experiences during college may have informed these results.

Luo and Jamieson-Drake (2009) conducted surveys of 6049 graduates from four highly selective private universities. The analyses considered the link between alumni’s college experiences and the perceived contribution of their alma mater to their intellectual development (e.g., ability to formulate creative and original ideas). They identified several significant predictors of intellectual development, including interracial interaction, having their beliefs questioned, and participating in academic and extracurricular activities. Although this study has some notable strengths, the small number of institutions constituted a limitation, and the analyses did not examine whether these relationships depended on how long ago these alumni had graduated.

The engineering disciplines have been particularly interested in following their alumni to better understand how particular experiences prepare graduates for industry. Building on Zydney et al.’s (2002) findings that alumni who engaged in undergraduate research “reported significantly greater enhancement of important cognitive and personal skills” (p. 156) than their uninvolved peers, Kinoshita et al. (2014) examined alumni skill perceptions of engineering design (a key outcome associated with intellectual development within the discipline). They found that alumni who participated in undergraduate research, completed an internship, and were either a woman or underrepresented racial minority engaging in an engineering club reported higher design scores three years after graduation.

Taken together, the extant literature is inconclusive about the relationship between time since degree and long-term intellectual outcomes. Ardel and colleagues (2010, 2018) found higher levels of 3D wisdom among older alumni (although this advantage was limited to compassionate wisdom in the 2018 study with a larger sample), while Guerra-Carrillo et al. (2017) found more recent college graduates were most advantaged in reasoning and processing cognitive domains compared to those who had completed their college degrees years earlier. We found only one study that examined the relationship between college experiences and perceived institutional contribution to broad-based intellectual growth among alumni (Luo & Jamieson-Drake, 2009), along with two studies that focused on discipline-specific knowledge in engineering (Kinoshita et al., 2014; Zydney et al., 2002). Across these studies, experiences with diverse peers, academic challenge, and

engaging in educationally purposeful activities (such as participating in faculty research or doing an internship) were positively associated with intellectual outcomes; moreover, these relationships sometimes differed as a function of alumni's gender and race. In light of the role that broad-based and disciplinary study plays within a college education, the present study responds to the gap in the literature to examine how college practices and conditions promote long-term intellectual outcomes among recent and more seasoned alumni and the extent to which the strength and direction of the relationships vary by student characteristics.

Long-Term Civic Outcomes

Undergraduate field of study has received the most attention in relation to long-term civic outcomes. Drawing from the extant literature (Hillygus, 2005; Ishitani & McKittrick, 2013; Nie & Hillygus, 2001), it appears a curriculum that explicitly examines, discusses, and promotes civic skills and engagement (most commonly associated with social sciences and, to a lesser extent, education and humanities) may lead to alumni perceptions and behaviors that are more civically motivated. This finding is juxtaposed with those majors that have seen the greatest increase in student enrollment (i.e., business) or have been substantially promoted in recent years (science, technology, engineering, and mathematics), which may not bode well for future civic engagement among college graduates.

Myers et al. (2019) conducted the most expansive examination of college experiences and alumni civic engagement within a nationally representative postsecondary sample using outcomes assessed roughly eight years after expected high school graduation. Also informed by the high-impact practice framework (Kuh, 2008), they found alumni who engaged in an internship, co-op or other field experience; research with a faculty member; or a community-based course project as an undergraduate were more civically engaged than their peers. Furthermore, they found no differences in alumni civic engagement between those who had attended public versus private institutions, net of other factors. Although not an explicit examination of student-faculty interaction, academic challenge, and diversity interactions, the high-impact practices (Kuh, 2008) investigated here provide insight into the curricular experiences that promote civic engagement and honor higher education's implicit social contract of contributing to the social fabric. Extending beyond these structured contexts, Astin et al. (1999) also observed positive results for volunteer experiences during the undergraduate years predicting several civic outcomes that occurred 5–6 years after graduation.

In addition, several studies focused on the potential effects of college diversity experiences on subsequent civic attitudes and behaviors, such as volunteering, making charitable donations, keeping track of current affairs, and having a pluralistic orientation. Consistent with Astin et al. (1999), this work used cooperative institutional research program (CIRP) data that was collected at the beginning of the first year, the end of the senior year, and after college; the studies either examined alumni from predominantly private institutions six years after graduation (Bowman et al., 2015, 2016; Denson et al., 2017) or alumni from a single Catholic university 13 years after graduation (Bowman et al., 2011). The primary finding was that interpersonal, curricular, and co-curricular undergraduate diversity experiences were all associated with enhanced civic engagement, providing further evidence that these types of experiences may have a long-term impact.

In summary, a paucity of research has investigated the long-term effects of college experiences and environments on alumni intellectual outcomes, while much of the research on

civic outcomes would benefit from an update given the myriad sociopolitical movements that have occurred over the past decade. Furthermore, the erosion of national confidence in the value of a postsecondary degree, seen in arguments and commentary that today's college students may simply not be learning enough (Arum & Roksa, 2011; Delbanco, 2012; Mitchell & Belkin, 2017), will likely persist unimpeded without empirical evidence of higher education's influence on students beyond the college years. It is from this vantage point we assert the significance of the present research.

Conceptual Framework

This investigation is grounded in theoretical and conceptual tenets that connect intellectual, and civic outcomes following an undergraduate education. Specifically, studying alumni outcomes requires the synthesis of multiple perspectives that collectively frame post-college outcomes through a lens comprised of human capital and socialization perspectives. Human capital theory presents education as playing a critical role in promoting “future monetary and psychic income by increasing resources in people” (Becker, 1993, p. 11). In formalizing human capital theory, Becker explicitly assumed that schooling results in greater earnings and productivity, because it provides “knowledge, skills, and a way of analyzing problems” (p. 19). A great deal of the higher education research using human capital theory has estimated the earnings premiums, wage differentials, or rates of return associated with higher education attainment (e.g., Mayhew et al., 2016; Toutkoushian & Paulsen, 2016). However, the theory's foundational assumption—that education builds within an individual a set of resources to deploy for personal and community advancement—undergirds college impact research much more broadly. The present study examines alumni perceptions of their intellectual development in relation to aspects of the college experience. This framing builds on prior research by identifying factors associated with human capital development that have proven meaningful in the minds of college alumni years after they have left college and likely entered the workforce.

Although human capital theory posits that education is central to developing an individual's knowledge, skills, and dispositions, the theory does not explicate how such development occurs. Essential within the educational experience is the socialization that enhances one's personal attributes, psychosocial resources, and values (Pallas, 2000). Our study is thus further informed by Weidman's (1989) model of undergraduate socialization, and later expanded by Weidman and DeAngelo (2020), which suggests that students' career choices, learning, development, and values are shaped by a combination of normative contexts (e.g., institutional characteristics, academic major) and socialization processes (e.g., interpersonal interactions, social and academic integration). Grounded in Astin's (1970a, 1970b) I-E-O framework, Weidman's model highlights the role of students' background characteristics from before they enter postsecondary education (including socioeconomic status and demographic characteristics), which moderate subsequent decisions and experiences while in college, and in turn influence outcomes after college.

Particularly salient to the current study is evidence of the importance of student experiences that center good teaching, high expectations from faculty, and exposure to respectful, inclusive, and diverse environments for learning (Chickering & Gamson, 1987). While the above frameworks have been employed extensively in relation to college student outcomes

(Mayhew et al., 2016), they have rarely been examined in relation to alumni perceptions of learning and development.

Altogether, the above suggests a conceptual model that builds on human capital assumptions that exposure to formal education through an undergraduate education is an investment that cultivates resources within individuals that lead to subsequent (post-college) market-based and non-market-based returns. McMahon (2009) has written extensively on these topics, empirically connecting human capital formation to individual outcomes across both domains: such as earnings and employment (i.e., market returns), as well as such things as health, happiness, household welfare, and community advancement (i.e., non-market returns).

We extend on these human capital tenets in two important ways. First, we conceptualize human capital returns as a psychological construct that can be measured in terms of alumni attitudes towards the influence their college education has had on intellectual and civic functioning. This conceptualization extends beyond more common approaches of assessing human capital returns through observed behaviors, such as employment, earnings, and civic engagement, and aligns with notions that human capital formation encompasses productive skills as well as dispositions. Second, we theorize that specific experiences, institutional environments, and socialization processes individuals encounter during college influence their post-college intellectual and civic functioning; this is premised on decades of college impact research (Astin, 1970a, 1970b; Mayhew et al., 2016; Weidman & DeAngelo, 2020).

Grounded in human capital theory (Becker, 1993; McMahon, 2009), we conceptualize intellectual and civic outcomes following college within the broader context of research on how college affects post-college outcomes (including market- and nonmarket-based outcomes). In addition, we rely on socialization models (Pallas, 2000; Weidman & DeAngelo, 2020) to frame our thinking regarding the long-term influence of the undergraduate learning environment (Astin, 1970a, 1970b; Mayhew et al., 2016) and dimensions capturing the quality of experience—which include exposure to good teaching, academic challenge, and

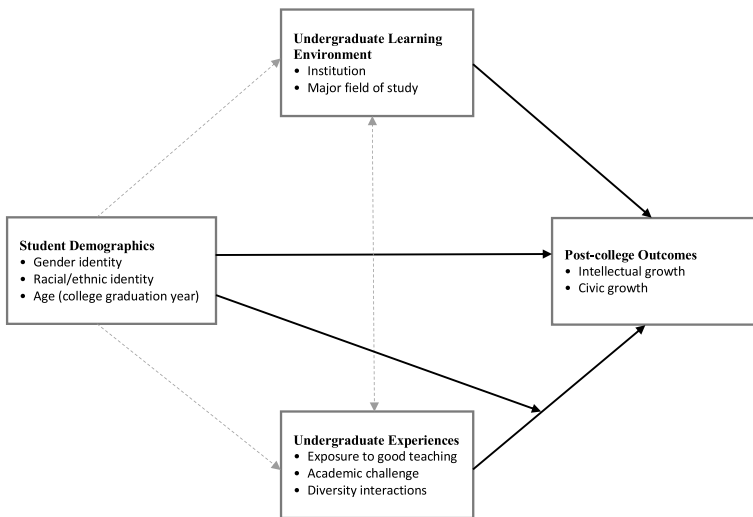


Fig. 1 Theory- and evidence-based factors connecting undergraduate experiences to post-college intellectual and civic outcomes in college alumni

diversity interactions (Chickering & Gamson, 1987)—and the potential conditional nature of their influence. Figure 1 reflects these relationships in the form of the study's conceptual framework, where the solid lines are directly examined through our analytic design in order to address the research questions.

Method

Data Source and Participants

This study examined data from the higher education data sharing (HEDS) consortium alumni survey. This instrument was administered to alumni from 68 private institutions over three academic years (2015–2018). Although some institutions participated in multiple years, these schools invited different groups of alumni in each year, so no one completed the survey multiple times. Fifty-eight participating institutions were members of the HEDS Consortium, which only consisted of private institutions at the time the survey occurred; 10 non-HEDS members also participated. The majority of these institutions were Baccalaureate Colleges with an Arts and Sciences focus (72%), were small in size (1000–2999 total students; 69%), were highly residential (at least half of undergraduates live on campus; 90%), were more selective in admissions (80th–100th percentile in test scores; 60%), and had a large percentage of their undergraduates attend full-time (at least 80% full-time; 96%). The vast majority were predominantly White institutions; the sample included two Hispanic-serving institutions and no historically Black colleges and universities or tribal colleges. Many of these private institutions had a current or former religious affiliation, but changes in affiliation over time and the wide range of present-day incorporation of religious practices (from highly observant to almost nonexistent) makes it difficult to provide specific, meaningful figures for this institutional characteristic.

The surveys were primarily targeted toward alumni who were one year, 5–6 years, or 10–11 years after graduation, but some institutions ($N=19$) also chose to send this survey to alumni from a variety of years, including decades after graduation. Overall, the 21,716 alumni who completed the survey ranged from 1 to 66 years post-graduation ($M=8.1$, $SD=6.9$). Within this sample, 37% of participants were men, 0.6% identified outside of the traditional gender binary, 76% were White/Caucasian, 5% were Hispanic/Latinx, 4% were Asian American/Asian, 3% were African American/Black, 3% were not U.S. citizens or permanent residents (and therefore were not coded for U.S. race, per IPEDS categories), 2% were multiracial, and 7% did not have data for race/ethnicity. The overall response rate for this alumni survey was 25%.

Study participants were generally representative of bachelor's degree graduates at these 68 institutions in terms of Carnegie classifications for basic categories (75% attending Baccalaureate Colleges with an Arts and Sciences focus), size and setting (88% attending highly residential institutions and 64% at small institutions), and undergraduate profile (94% attending institutions with the vast majority enrolled full-time and 68% at more selective institutions).

Measures

Dependent Variables

The study included two alumni outcome measures pertaining to perceptions of intellectual and civic growth. Specifically, respondents reported the extent to which they perceived their undergraduate experiences as contributing to their growth on intellectual outcomes (e.g., “Examination of ideas, evidence and assumptions before accepting or formulating a conclusion”) using a four-point scale (1=very little, to 4=very much). This 10-item index had strong internal reliability ($\alpha=0.87$). A four-item index with the same response options was employed to examine perceived growth within civic outcomes (e.g., “Promoting the quality of life in a community, through both political and nonpolitical processes”; $\alpha=0.83$).

These outcomes should be interpreted carefully. They likely do not provide direct or accurate measures of changes over time, especially since the constructs in this study were assessed well after college for some participants (see Herzog & Bowman, 2011; Porter, 2013). Instead, we view these outcomes as representing alumni’s perceptions of growth, which are important indicators of feelings about the quality of learning that results from one’s postsecondary education (Bowman, 2014; Gonyea & Miller, 2011).

Independent Variables

The primary independent variables consisted of three types of college experiences that are well-established as significant predictors of a variety of undergraduate student outcomes (Chickering & Gamson, 1987; Mayhew et al., 2016). First, good teaching and high-quality faculty interactions were measured via nine items about interactions with instructors that occurred within and outside of the classroom (e.g., “Most faculty with whom I had contact at this institution were interested in helping students grow in more than just academic areas”; 1=strongly disagree, to 5=strongly agree, $\alpha=0.91$). Second, academic challenge was measured through a 14-item index capturing exposure to things such as challenging assignments and high faculty expectations (e.g., “Argued for or against a particular point of view and defended my argument”; 1=never, to 5=very often, $\alpha=0.89$). Third, interpersonal and co-curricular interactions with diversity was measured through six items that included engaging across difference and/or discussing issues of difference (e.g., “Had serious discussions with students whose political, social, or religious opinions were different from your own”; 1=never, to 5=very often, $\alpha=0.86$). This variable focused mostly on interpersonal interactions, and it also included two forms of structured engagement (diversity or cultural awareness workshop and debate/lecture on a current political/social issue).

Moderators and Covariates

The choice of moderators and control variables was also driven by findings from previous research on outcomes during and after the college years (Mayhew et al., 2016; Pascarella & Terenzini, 2005) as well as conceptual considerations about how postsecondary learning environments may be experienced differently based on students’ identities, proclivities, and prior experiences (Chickering & Gamson, 1987). Given the unique nature of this dataset, we were able to include time after graduation as a moderator, since one might expect that

any impact of college experiences would diminish over time after alumni engaged in additional subsequent experiences.

Dummy variables were used to indicate student demographics. Preliminary analyses tested a variety of referent groups for each categorical demographic variable, and we selected the referent group whose moderation results diverged most strongly from the other groups. The moderating variables were race/ethnicity (American Indian/Alaskan Native, Asian American/Asian, Hispanic/Latinx, Native Hawaiian/Pacific Islander, White/Caucasian, multiracial, not a U.S. citizen or permanent resident, and race/ethnicity not reported, with African American/Black as the referent group); gender (woman and man, with non-binary as the referent group); and the number of years after college graduation (fewer than five years, 5–9 years, and 10–14 years, with 15 or more years as the referent group). Time after graduation was originally a continuous variable, but it was transformed into discrete categories due to its substantial skew. Undergraduate major also served as a control variable (biological sciences, business, communications, education, engineering, fine arts, health sciences, humanities, physical sciences, and other major, with social science as the referent group).

It is important to note that the referent groups we used for race and gender (Black and non-binary, respectively) represent a departure from conventional research practices, in which privileged identity groups often serve as the referent groups (i.e., White/Caucasian, man). Our approach explicitly de-centers privileged identities as constituting the default referent group and aligns with other efforts to condition data within a critical quantitative tradition (e.g., Mayhew & Simonoff, 2015; Stage, 2007). While each of our referent groups constituted a small proportion of the analytic sample, the large total sample size provided sufficient statistical power to detect significant relationships. We relied on preliminary analyses to guide our approach which indicated, for example, that the most significant moderation effects were found for Black students relative to White students (who had weaker relationships for diversity interactions predicting both outcomes), thus informing our decision to de-center White students in favor of Black students.

A slightly more recent (and virtually identical) version of the full survey instrument is available from the HEDS Consortium (2021). Descriptive statistics for all variables are provided in the appendix. The dependent variables and continuous independent variables were subsequently standardized with a mean of zero and a standard deviation of one to facilitate interpretation of effect sizes; that is, the unstandardized regression coefficients for continuous predictors are identical to standardized coefficients. We used this approach and then presented unstandardized coefficients to provide interpretable results not only for continuous predictors, but also for binary predictors (as these results represent a standardized mean difference or Cohen's d when accounting for all other variables in the model).

Analyses

Multiple regression analyses were used to predict each of the dependent variables. Institutional fixed effects were employed to account for all between-school variation, so the resulting coefficients can be interpreted as comparing students within the same college or university. Given the large number of alumni in this study, each institution had an average of over 300 participants in this survey sample, so there was ample opportunity to examine within-institution variation. The initial analyses used the college experiences, gender, race/ethnicity, time after graduation, undergraduate major, and institutional fixed effects as predictors. These analyses can be summarized via the following equation:

$$y = a + \beta\mathbf{x} + \gamma\mathbf{z} + e$$

such that y is the alumni outcome, \mathbf{x} is a vector of student predictors, \mathbf{z} is a vector of institutional fixed effects based on dummy variables indicating each institution, a is the intercept, and e is the error term.

Additional analyses incorporated interactions between the three college experience scales and gender, race/ethnicity, and time after graduation. The interactions for each of the three moderating constructs (gender, race/ethnicity, time after graduation) were explored in separate models to avoid problems with multicollinearity. Missing data were deleted listwise, which resulted in a sample size reduction of 5–6% across analyses. The assumptions of multiple regression analyses (i.e., linearity, normality, homoscedasticity, independence, lack of multicollinearity) were examined and found to be upheld.

Given the large sample size in this study, we caution against drawing strong conclusions from any single statistically significant result, especially if the effect size is modest. We have focused our discussion in the following sections on patterns of findings that are consistent across multiple outcomes and/or multiple related predictors. We have also indicated three different levels of statistical significance in the tables ($p < 0.05$, 0.01, 0.001). It is important to note that $p < 0.05$ is included primarily for its use with smaller groups in the moderation analyses, since this same threshold may not reflect a meaningful relationship in the main analyses.

Supplemental analyses showed that the present findings were robust to different model specifications. For instance, the findings were virtually identical if hierarchical linear modeling or multiple regression without institutional fixed effects were used instead (note that this study's fixed-effects approach only added about ½–3 percentage points, or 0.005–0.03, to the total variance explained by these models). Moreover, given the substantial time period over which some participants attended college, supplemental analyses also showed that the findings from the primary analyses and race/gender moderation analyses were not affected by excluding participants who graduated more than 11 years before the survey (this cutoff was used since the earliest targeted "cohort group" of graduates received their degrees 10–11 years prior to survey participation).

Limitations

Several limitations should be noted prior to interpreting the results. First, the sample consists exclusively of alumni from private institutions, and the good majority of these institutions were members of the HEDS consortium. Although we have no a priori reason to believe that the observed relationships vary by institutional control, it is unclear to what extent these findings may generalize to graduates of public colleges and universities or to graduates of all private institutions. Second, the measures of intellectual and civic outcomes consist of alumni's perceptions of growth rather than longitudinal assessments of changes over time. As noted earlier, we believe that these self-reports provide useful information, but we reiterate our caution that these should not be viewed as necessarily indicative of actual changes in cognitive abilities or civic engagement. Third, consistent with much of the research on non-economic post-college outcomes, this observational study cannot be used to make strong claims about the causal nature of these relationships, so we have attenuated our language accordingly. Fourth, this study had a limited number of precollege or "input" variables, which prevented us from taking alternative approaches to exploring these data (e.g., propensity score analyses). Finally, the available demographic

item for race/ethnicity was based on IPEDS data, so we did not have information on international students' race or the specific races of multiracial students. As a result, the participants who were identified with a specific racial/ethnic group in this study did not include alumni who were international students or who identify with at least one additional race/ethnicity. Given that the three gender categories in the questionnaire were man, woman, and non-binary, we were also not able to identify trans participants, since some trans alumni may have responded that they are a man or woman; thus, we maintain the original survey language of "non-binary" throughout the paper to describe participants who selected this option.

Results

The results of the primary analyses are presented in Table 1. All of the key practices examined here have positive and highly significant relationships with both outcomes ($p < 0.001$). Among these three practices, academic challenge and good teaching are most strongly related to perceived intellectual growth ($B = 0.53$ and 0.21 , respectively), while diversity interactions are most strongly related to perceived civic growth ($B = 0.38$).

Although the direct relationships of demographics and undergraduate major with post-college outcomes were not the main focus of the study, some of the resulting patterns are noteworthy. Compared to alumni who identify with non-binary genders, women and men both reported greater intellectual growth ($B > 0.20$, $p < 0.001$). Relative to Black alumni, several groups perceived lower intellectual growth: Asian ($B = -0.16$, $p < 0.001$), Native Hawaiian/Pacific Islander ($B = -0.47$, $p < 0.01$), White ($B = -0.13$, $p < 0.001$), and multiracial ($B = -0.11$, $p < 0.05$) alumni, along with alumni whose racial identities were not available in this study ($B = -0.18$, $p < 0.001$). Furthermore, undergraduate major often had significant associations with the outcomes. Relative to social science graduates, alumni who majored in biological sciences, business, engineering, health sciences, and physical sciences have higher perceived intellectual growth ($B > 0.07$, $p < 0.001$). In addition, biological sciences, engineering, fine arts, humanities, and physical sciences alumni reported lower civic gains than their social science counterparts ($B < -0.04$, $p < 0.001$), whereas health sciences graduates reported greater civic growth ($B = 0.10$, $p < 0.001$). These relationships may, to some extent, reflect different opportunities and experiences in the labor market tied to their undergraduate field of study.

Table 2 displays the results of interaction terms for gender identity, highlighting where gender has a moderating influence on the results of college experiences. Good teaching practices are more positively related to intellectual growth among alumni who identify outside of the traditional gender binary than among men and women ($B > 0.32$, $p < 0.001$). No other interactions with gender are significant. Key interactions between the three college experiences and race/ethnicity are displayed in Table 3. The relationships between diversity experiences and both dependent variables are frequently more positive for groups of non-Black alumni than for Black alumni ($B > 0.06$, $p < 0.05$). The 32 different interactions between race/ethnicity variables and the other two college experiences (good teaching and academic challenge) were rarely significant and therefore not presented within Table 3. The lone exception was that the relationship between good teaching and intellectual growth is more positive for Latinx than for Black alumni ($B > 0.08$, $p < 0.05$).

Table 1 Results of multiple regression analyses predicting post-college outcomes

Independent variable	Intellectual Growth	Civic growth
Good teaching	0.214*** (0.006)	0.166*** (0.006)
Academic challenge	0.526*** (0.007)	0.278*** (0.007)
Diversity interactions	0.076*** (0.006)	0.380*** (0.006)
Man	0.205** (0.067)	0.034 (0.068)
Woman	0.262*** (0.067)	0.129 (0.067)
American Indian/Alaskan Native	-0.027 (0.095)	-0.062 (0.094)
Asian American/Asian	-0.163*** (0.041)	-0.047 (0.041)
Native Hawaiian/Pacific Islander	-0.466** (0.145)	0.105 (0.143)
White/Caucasian	-0.134*** (0.032)	-0.024 (0.032)
Hispanic/Latinx	-0.053 (0.038)	0.010 (0.038)
Not a U.S. citizen or permanent resident	-0.064 (0.045)	0.097* (0.045)
Multiracial	-0.106* (0.044)	-0.029 (0.044)
Race/ethnicity not reported	-0.176*** (0.040)	-0.074 (0.040)
Fewer than 5 years after graduation	-0.017 (0.026)	-0.063* (0.026)
5–9 years after graduation	-0.023 (0.024)	-0.033 (0.024)
10–14 years after graduation	-0.031 (0.024)	-0.061* (0.024)
Biological sciences major	0.088*** (0.016)	-0.075*** (0.016)
Business major	0.066*** (0.018)	-0.008 (0.018)
Communications major	0.041 (0.025)	0.004 (0.025)
Education major	-0.003 (0.023)	0.033 (0.023)
Engineering major	0.286*** (0.037)	-0.079* (0.037)
Fine arts major	-0.024 (0.017)	-0.124*** (0.017)
Health sciences major	0.149*** (0.029)	0.095*** (0.029)
Humanities major	-0.002 (0.013)	-0.035** (0.013)
Physical sciences major	0.095*** (0.018)	-0.158*** (0.018)
Other major	0.002 (0.020)	0.016 (0.020)
R^2	0.499	0.504
N	20,524	20,459

Standard errors are in parentheses. Dependent variables and continuous independent variables (i.e., good teaching, academic challenge, and diversity interactions) were standardized with a mean of zero and a standard deviation of one so that these results are identical to standardized regression coefficients, and the results for binary predictors can be interpreted as standardized mean differences or Cohen's d . Institutional fixed effects were used to account for all between-school variation. Referent groups for dummy-coded variables were man, White/Caucasian, and social science majors

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

Finally, Table 4 displays interactions between time after graduation and key college experiences. The relationship between academic challenge and perceived civic growth is stronger for those who graduated fewer than five years ago than at least 15 years ago ($B = 0.06$, $p < 0.05$). In contrast, the link between diversity interactions and civic growth is weaker for alumni who graduated fewer than five years or 5–9 years ago than for those who graduated at least 15 years ago ($B < -0.06$, $p < 0.05$). The association between diversity

Table 2 Results of regression analyses exploring gender moderation of the link between college experiences and post-college outcomes

Key independent variable	Intellectual growth	Civic growth
Good teaching	0.545*** (0.073)	0.272*** (0.072)
Academic challenge	0.478*** (0.076)	0.293*** (0.076)
Diversity interactions	0.052*** (0.082)	0.298*** (0.083)
Man	0.148 (0.076)	-0.012 (0.075)
Woman	0.205** (0.075)	0.082 (0.075)
Man × good teaching	-0.339*** (0.073)	-0.108 (0.073)
Woman × good teaching	-0.329*** (0.073)	-0.107 (0.073)
Man × academic challenge	0.055 (0.077)	0.007 (0.077)
Woman × academic challenge	0.043 (0.077)	-0.031 (0.077)
Man × diversity interactions	0.022 (0.083)	0.064 (0.084)
Woman × diversity interactions	0.024 (0.082)	0.094 (0.084)
R^2	0.500	0.505
N	20,524	20,459

Standard errors are in parentheses. Dependent variables and continuous independent variables (i.e., good teaching, academic challenge, and diversity interactions) were standardized with a mean of zero and a standard deviation of one so that these results are identical to standardized regression coefficients, and the results for binary predictors can be interpreted as standardized mean differences or Cohen's d . Institutional fixed effects were used to account for all between-school variation. Analyses also controlled for race/ethnicity, time since graduation, and undergraduate major

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

interactions and intellectual growth is also weakest for the most recent graduates and significantly different from the pattern for the most distant graduates ($B = -0.05$, $p < 0.05$).

Discussion

With this study, we sought to understand the extent to which aspects of the undergraduate experience and encounters with the college environment might promote alumni outcomes pertaining to perceptions of intellectual and civic growth. We additionally sought to uncover potential inequities in post-college outcomes by examining whether particular experiences may distinctly advantage or disadvantage populations of alumni who have been historically underserved by higher education, along with the extent to which the potential influence of college experiences varies as a function of time since graduation. Drawing upon data from the HEDS Alumni Survey, representing over 20,000 survey respondents from 68 private institutions across the United States, we examined relationships between important dimensions of the college experiences and post-college outcomes. The present analyses yielded four overarching findings from these research questions.

Table 3 Selected results of regression analyses exploring racial/ethnic moderation of the link between college experiences and post-college outcomes

Key Independent variable	Intellectual growth	Civic growth
Good teaching	0.208*** (0.035)	0.194*** (0.035)
Academic challenge	0.479*** (0.035)	0.254*** (0.035)
Diversity interactions	0.014 (0.029)	0.298*** (0.029)
American Indian/Alaskan Native	-0.034 (0.095)	-0.083 (0.095)
Asian American/Asian	-0.188*** (0.043)	-0.069 (0.043)
Native Hawaiian/Pacific Islander	-0.533*** (0.151)	0.055 (0.150)
White/Caucasian	-0.147*** (0.034)	-0.043 (0.034)
Hispanic/Latinx	-0.071 (0.040)	-0.012 (0.040)
Not a U.S. citizen or permanent resident	-0.096* (0.048)	0.085 (0.048)
Multiracial	-0.117* (0.046)	-0.053 (0.046)
Race/ethnicity not reported	-0.185*** (0.041)	-0.093* (0.041)
Native × diversity interactions	0.012 (0.100)	0.063 (0.100)
Asian × diversity interactions	0.092* (0.041)	0.073 (0.041)
Pacific Islander × diversity interactions	-0.014 (0.161)	0.032 (0.159)
White × diversity interactions	0.062* (0.030)	0.084** (0.030)
Latinx × diversity interactions	0.071* (0.036)	0.080* (0.036)
International × diversity interactions	0.089 (0.047)	0.021 (0.047)
Multiracial × diversity interactions	0.051 (0.046)	0.114* (0.046)
Race/ethnicity not reported × diversity interactions	0.071 (0.037)	0.133*** (0.037)
R^2	0.500	0.505
N	20,524	20,459

Standard errors are in parentheses. White/Caucasian was the reference group; several other racial/ethnic groups and the interactions between these and good practices were also included in the models, but very few results were statistically significant, and no consistent patterns were observed. Dependent variables and continuous independent variables (i.e., good teaching, academic challenge, and diversity interactions) were standardized with a mean of zero and a standard deviation of one so that these results are identical to standardized regression coefficients, and the results for binary predictors can be interpreted as standardized mean differences or Cohen's d . Institutional fixed effects were used to account for all between-school variation. Analyses also controlled for gender, time since graduation, and undergraduate major. Given the large number of interaction terms by race and the paucity of statistically significant results for good teaching and academic challenge, only the moderation results for diversity interactions are shown

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

Good Teaching, Academic Challenge, and Diverse Interactions Exhibit Lasting Outcomes

First, when controlling for demographic factors and accounting for between-institution variance, engaging with good teaching, exposure to academic challenge, and interactions with diversity during college are all positively associated with perceived growth across intellectual and civic domains. For decades, higher education researchers have pointed to good teaching, high expectations from faculty, and exposure to respectful, inclusive and diverse environment as highly impactful for students' learning and development across a range

Table 4 Results of regression analyses exploring moderation by time after graduation of the link between college experiences and post-college outcomes

Key independent variable	Intellectual growth	Civic growth
Good teaching	0.193*** (0.021)	0.160*** (0.021)
Academic challenge	0.532*** (0.022)	0.254*** (0.021)
Diversity interactions	0.119*** (0.022)	0.439*** (0.022)
Fewer than 5 years after graduation	-0.024 (0.026)	-0.070** (0.026)
5–9 years after graduation	-0.028 (0.024)	-0.038 (0.024)
10–14 years after graduation	-0.036 (0.024)	-0.068** (0.024)
<5 years × good teaching	0.047 (0.025)	0.025 (0.025)
5–9 years × good teaching	0.021 (0.023)	-0.002 (0.006)
10–14 years × good teaching	0.012 (0.024)	0.006 (0.024)
<5 years × academic challenge	-0.003 (0.026)	0.056* (0.026)
5–9 years × academic challenge	-0.014 (0.024)	0.015 (0.023)
10–14 years × academic challenge	0.002 (0.025)	0.023 (0.024)
<5 years × diversity interactions	-0.052* (0.026)	-0.104*** (0.026)
5–9 years × diversity interactions	-0.046 (0.024)	-0.061* (0.024)
10–14 years × diversity interactions	-0.043 (0.025)	-0.038 (0.025)
R^2	0.499	0.505
N	20,524	20,459

Standard errors are in parentheses. Dependent variables and continuous independent variables (i.e., good teaching, academic challenge, and diversity interactions) were standardized with a mean of zero and a standard deviation of one so that these results are identical to standardized regression coefficients, and the results for binary predictors can be interpreted as standardized mean differences or Cohen's d . Institutional fixed effects were used to account for all between-school variation. Analyses also controlled for gender, race/ethnicity, and undergraduate major

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

of outcomes (Chickering & Gamson, 1987; Mayhew et al., 2016; Pascarella & Terenzini, 1991, 2005). Our results suggest that the value of such experiences extend well beyond the college years and remain influential as individuals transition into the labor market and cultivate their professional and civic lives.

Based on our results, experiencing good teaching, academic challenge, and interactions with diversity during college align with socialization models (Weidman, 1989; Weidman & DeAngelo, 2020), which subsequently influence perceptions of learning, development, attitudes, and values beyond college. The fact that these experiences (or processes) are positively and significantly associated with alumni views of intellectual and civic growth provides new evidence that such experiences during college yield human capital returns (Becker, 1993; McMahan, 2009) as a psychological construct, while also highlighting specific undergraduate practices (good teaching, academic challenge, and interactions with diversity) that account for these returns and may inform institutional programming. These results represent an important addition to the literature that, with very few exceptions, has lacked a focus on specific forms of academic and social engagement during college in relation to outcomes years after college.

In an era of frequent and often harsh critiques that higher education is failing to adequately prepare students, it stands to reason that if the college experience was not delivering the skills and dispositions needed to succeed in life after college, alumni attitudes would not reflect favorably on their perceptions of its contribution to personal growth. Our findings suggest otherwise. Given the large number of institutions and alumni contained in the data analyzed, the evidence we have uncovered may point to a general phenomenon in higher education, at least among the nearly six dozen institutions that participated in the HEDS Alumni Survey and whose data we analyzed.

Certain Majors Predict Post-College Civic Growth

As a second key finding, these outcomes exhibit variation across college majors, particularly in terms of cultivating civic mindedness, further reinforcing the role of academic contexts in the undergraduate socialization process (Weidman, 1989; Weidman & DeAngelo, 2020). For example, alumni who majored in health-related fields reported the highest levels of civic growth, while engineering and physical science majors reported some of the lowest levels of civic growth. The latter finding with respect to STEM majors is consistent with previous literature (Hillygus, 2005; Ishitani & McKittrick, 2013; Nie & Hillygus, 2001) and provides evidence from a more expansive set of alumni that civic engagement may wane as enrollment in these majors increase.

Good Practices May be Better for Some Alumni than Others

Third, the relationships for exposure to good teaching, challenge, and diversity are somewhat moderated by students' demographic identities. Notably, students with non-binary gender identities exhibit greater associations with good teaching in terms of intellectual growth. Given the challenges that non-binary students face, they appear to benefit even more so when instructors engage in a manner that conveys an interest in their learning and growth. Moreover, Black alumni had more modest relationships between diversity interactions and perceived intellectual and civic growth than did several groups of racially privileged and other minoritized alumni, which partially contradicts the findings of Bowman et al., (2015, 2016) that showed no consistent evidence of group differences by race or ethnicity. These differential relationships are likely attributable to the quality and nature of this diversity engagement, as Black students tend to experience a more hostile campus climate (e.g., Harper & Hurtado, 2007). Black students' interactions may not have met all or most of the ideal conditions of intergroup contact (see Allport, 1954; Pettigrew, 1998), so they did not yield the positive effects that often accrue from cross-racial interaction (Chang, 2011; Paluck et al., 2019; Pettigrew & Tropp, 2006). Specifically, Black students may frequently be the target of various types of microaggressions from White students, faculty, and staff (e.g., Mills, 2020; Solórzano et al., 2000), which makes it far less likely that positive outcomes will result from diversity interactions.

These findings point to the opportunities and challenges that institutions face in serving a range of students from myriad social and cultural backgrounds. The complexities uncovered in the present study have been found in other research as well. Examining outcomes associated with the engineering industry, Kinoshita et al. (2014) found that alumni participation in engineering specific clubs specifically for women and underrepresented minorities was positively associated with higher levels of teamwork, engineering design, communication, and leadership skills, whereas outcomes for more general club participation

were limited to positive associations with teamwork and communication. At the very least, it is important to note that the kinds of college experiences widely heralded as impactful for student growth and development do not serve all students equally in the years following college. These findings indicate the necessity for private colleges, and arguably all higher education institutions, to commit to cultivating an equitable and inclusive campus culture and climate.

Collegiate Experiences May Have an Enduring Role Well After Graduation

The fourth and final main finding points to the evolving perceptions of alumni as time passes beyond their undergraduate enrollment. Given that our sample contained alumni who graduated from college from one year to decades after college, we had the unique opportunity to explore whether and how attitudes towards college varied by cohort. One might anticipate that the link between college experiences and outcomes would weaken as more time passes beyond college. Such an assumption is consistent with the explanation provided by Guerra-Carrillo et al. (2017). However, the relationships between diversity interactions and both outcomes were strongest among the most senior cohort in the sample, similar to the findings of Ardel (2010) and Ardel et al. (2018). Finally, the strength of the relationship between diversity experiences and the civic outcome between the oldest and youngest alumni is particularly notable given the intense public discourse in recent years surrounding the critical importance of engaging in the political process and cultivating productive dialogue with individuals across different racial/ethnic identities (Dunn, 2019; Suls, 2016). As students and families ask the question, “is college worth it?”, these findings demonstrate the enduring human capital benefit of educational attainment in terms of one developing dispositions toward intellectual and civic growth.

Conclusion and Implications

This paper identified sizable relationships between several college experiences and post-college outcomes from private institutions. For the most part, the strength of the uncovered relationships is similar for recent graduates and for alumni who attended college decades earlier, thereby illustrating the lasting nature of the potential effects. These findings are useful given that the overwhelming majority of college impact studies only examine shorter-term outcomes (Mayhew et al., 2016; Pascarella & Terenzini, 1991, 2005), and virtually no research has systematically examined the role of time after graduation in shaping these relationships. Researchers and practitioners often assume (consciously or unconsciously) that any impact of student experiences on intellectual and civic outcomes lasts well beyond a semester, a year, or even a couple of years. The present study provides direct evidence of long-term outcomes for three broad types of postsecondary experiences: good teaching, academic challenge, and diversity interactions. Although some variation across groups was observed, the primary finding pertains to the overall strong and consistent relationships with alumni outcomes.

The current findings also illustrate the need to attend to student subgroups that are frequently overlooked in higher education research. As a result of a lack of sample size and/or attention to relevant issues, students who identify outside of binary constructions of gender and students from Native Hawaiian/Pacific Islander backgrounds are often not examined separately in quantitative research. Instead, students outside of the “traditional” gender binary are often categorized based on their biological sex or lumped into a referent group with women or men; Pacific Islander students may be combined with Asian students or with students from several identities within an “other” racial category. Whenever possible, this practice should be avoided to risk overlooking important variation in college experiences and outcomes. The present alumni dataset contained over 100 participants who identified as non-binary gender, which facilitated the examination of this subgroup. That said, the size of these groups was not particularly large even within this sample of over 20,000 alumni, so the findings observed here should be treated with caution and would certainly benefit from further exploration and replication.

The present findings also illustrate the importance of choosing comparison groups within higher education research. Scholars frequently use the numerically largest and/or the privileged demographic (e.g., White students, male students) as the reference group to maximize statistical power or to compare the privileged group with several minoritized groups. However, this approach can result in not only implying that the privileged group is the “norm,” but also not identifying some significant group differences of interest. By conducting analyses that focused on the groups whose moderation results differed most strongly from those of other participants (i.e., Black alumni and alumni who identify outside of the historical gender binary), this study sheds light on the disparities among minoritized groups as well as with the privileged group. It also provides an example of methods that align with aspects of critical quantitative inquiry (Stage, 2007).

From a practical perspective, this study suggests the importance of continuing to promote the student experiences on which we have focused. Given the increasing emphasis on institutional revenue that may accrue from students’ continued enrollment and graduation, some colleges and universities may be tempted to lower standards or more generally avoid facilitating experiences that may be challenging, difficult, or uncomfortable for students, since these may be viewed as increasing the likelihood of attrition. However, the findings of this study support an alternative perspective: Alumni perceive greater long-term outcomes when they have experienced these forms of challenge during their undergraduate years. While academic challenge constitutes its own construct in this study, some good teaching practices and many diversity interactions often reflect some level of challenge as well, so this conclusion is consistent with a broad array of findings. The experiences examined here are also clearly associated with favorable short-term outcomes (including retention) for a variety of good teaching practices (see Mayhew et al., 2016). Clearly, practitioners should differentiate between forms of challenge and discomfort that may ultimately lead to learning and growth versus those that are simply barriers that should be avoided, such as a hostile campus climate or a lack of relevant academic and/or social supports. That said, the goals of fostering both short-term and long-term outcomes as well as both retention and growth appear to be more aligned than some might perceive.

Appendix

Descriptive statistics for dependent and independent variables.

Variable	Mean	SD	Minimum	Maximum
Perceived intellectual growth	3.27	0.55	1	4
Perceived civic growth	2.85	0.77	1	4
Good teaching	4.30	0.65	1	5
Academic challenge	3.97	0.59	1	5
Diversity interactions	3.11	0.87	1	5
Woman	0.63	0.48	0	1
Non-binary gender	0.006	0.07	0	1
American Indian/Alaska Native	0.003	0.06	0	1
Asian American/Asian	0.04	0.19	0	1
African American/Black	0.03	0.16	0	1
Native Hawaiian/Pacific Islander	0.001	0.03	0	1
Hispanic/Latinx	0.05	0.22	0	1
Non-U.S. citizen	0.03	0.16	0	1
Multiracial/multiethnic	0.02	0.16	0	1
Race/ethnicity not available	0.07	0.26	0	1
Graduated fewer than 5 years ago	0.19	0.39	0	1
Graduated 5–9 years ago	0.45	0.50	0	1
Graduated 10–14 years ago	0.29	0.45	0	1
Graduated 15 or more years ago	0.08	0.27	0	1
Biological sciences major	0.13	0.34	0	1
Business major	0.11	0.31	0	1
Communications major	0.04	0.20	0	1
Education major	0.06	0.24	0	1
Engineering major	0.03	0.17	0	1
Fine arts major	0.10	0.30	0	1
Health sciences major	0.04	0.20	0	1
Humanities major	0.23	0.42	0	1
Physical sciences major	0.10	0.30	0	1
Other major	0.08	0.27	0	1

Continuous variables were subsequently standardized with a mean of zero and a standard deviation of one for inclusion in the analyses

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