Virtues of Academic Exploration: Impact of Major Changes on Degree Completion

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Most college students change their major at least once during their undergraduate career (Gordon & Steele, 2015). This study examined the impact of academic major changes on bachelor's degree attainment within six years. Using data from the 2012/17 Beginning Postsecondary Students Longitudinal Study (n = 13,800), we found a significant increase in the odds of degree attainment for students who changed their major one or more times. Accompanying our analyses and results, we offer implications for early advising and transition programming, including the role of meta-majors and consideration for student backgrounds as they seek advising and choose majors.
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The choice of academic major is a critical decision for college students. Approximately one-third of full-time beginner undergraduate students change their major within their first year (National Center for Education Statistics [NCES], 2017), and as many as 75% of college students change their major at least once during their undergraduate career (Gordon & Steele, 2015). Although students who change majors have higher graduation rates, particularly when students change majors early (Kreysa, 2006; Leuwerke et al., 2004; Micceri, 2001; Porter & Umbach, 2006; Wright, 2018), less is understood about the impact of multiple changes on student success (Firmin & MacKillop, 2008). Inadequate advising and support for students to enroll in relevant, credit-bearing courses early in their academic journey can lead to increased time to graduation or dropping out altogether (Foraker, 2012; Kadlec & Dadgar, 2020; Kramer et al., 1994; Moore & Shulock, 2009). It is also less understood how demographic and background characteristics relate to how and when students change majors (Sklar, 2018; Wang & Orr, 2022). Therefore, in this study, we sought to determine if there was a relationship between changing majors and degree attainment and if changes of academic majors impact students differentially based on their background characteristics. Additionally, we sought to fill the gap in understanding whether multiple changes contributed to successful outcomes for students. The following literature review provided insight for our study and helped frame findings and recommendations.

Literature Review

The choice of academic major is a critical decision for college students, and most report anxiety around their major choice (Gordon & Steele, 2003). While students generally report career earnings, parental influence, and individual preferences as the primary determinants for initial major choice (Altonji et al., 2012; Arcidiacono, 2004; Zafar, 2013), changing majors is common. Reasons for changing majors vary and may include parental pressure; misalignment with expectations, interests, or academic preparation; and lack of understanding about the connection between the choice of academic majors and careers (Gordon & Steele, 2003; Marcus, 2018).

INTEREST-FIT, ACADEMIC PREPAREDNESS, AND CHOICE OF MAJOR

Regardless of the motivations for deciding upon a major, satisfaction with a major is associated with positive educational outcomes. Allen and Robbins (2008) explored interest-major fit and first-year academic performance with a dataset of 50,000 undergraduate students. They found that academic performance and interest-major fit were key predictors of students' persistence in studying their academic majors. Leuwerke et al. (2004) and Porter and Umbach (2006) also found that students pursuing a major that coincides with their interests are likelier to persist in college.

Other studies on the retention of students who changed majors focused on the importance of a sense of belonging within the school or field of study. Strayhorn (2012) outlined several elements of students' sense of belonging, including perceived support on campus and the experience of feeling cared about by peers, faculty, and their personal connection with their studies. Related research on self-efficacy among students who do and do not change their major has found that perception of academic quality and a feeling of support and affirmation were significant predictors of the intention to change their majors (Xu, 2018). Developing a sense of belonging is essential for students who may feel disconnected or unwelcome within their school. This connection may be found through academic programming linked to student majors.

There is also a link between students who change majors and those who take remedial coursework. Half of all college students may be required to take remedial courses (Scott-Clayton, 2018), which are often gateway courses required for certain majors. The extra time required to complete remedial work and challenges associated with remedial coursework may impact student decision-making related to their choice of academic major. However, the literature on remedial coursework is clear: students who take remedial courses experience increased costs, increased time to graduation, and decreased likelihood of graduating (Bailey et al., 2010; Rodriguez et al., 2016). The problem is worse for underrepresented minorities, first-generation, and low-income students, who are more likely to enroll in remedial courses and less likely to progress past remedial courses (Bailey et al., 2010; Rodriguez et al., 2016).

When considering the effects of changes in majors, it is important to frame the change of a major as a dynamic decision-making process. Arcidiacono (2004) and Altonji et al. (2012) developed theoretical models that conceptualize the dynamics of the educational decision-making of students. Within these models, students arrive at school with ideas about themselves and their studies and generally make an initial choice among many options. As they attend classes and engage on campus, students self-reflect and may develop different interests, abilities, and preferences (Kepple et al., 2021). Gains or losses in self-efficacy and belief about their abilities can lead to changing academic majors. Furthermore, throughout the college experience and interactions with others, students constantly evaluate their choice of major relative to other majors (Altonji et al., 2012).

MAJOR FIELD AND PERSISTENCE

Understanding the mechanisms of choosing a major is essential to understanding and positively impacting degree attainment. The bulk of the literature on educational outcomes and majors focuses on science, technology, engineering, and math (STEM) fields. One avenue of research examines reasons subgroups of students are less likely

to persist in STEM majors. Over half of all students who enter with a STEM major switch to a non-STEM major or drop out after their first year (Chen, 2013). Further, there are significant disparities and structural barriers in place that affect which students persist in STEM majors. Although White, Black, and Latinx students declare STEM majors in similar numbers, there is a gap in degree attainment (Eagan et al., 2014). Fifty-eight percent (58%) of White students who declare a STEM major earn a degree in the field, compared to 43% of Latinx students and 34% of Black students (Riegle-Crumb et al., 2019). One of the identified explanations for this disparity is that students may not have equivalent academic preparation in high school, particularly in math (Chang et al., 2014).

Although there is robust coverage of STEM majors, there is less research that deeply explores non-STEM fields and their major change experiences. In one of the clearest examples, Riegle-Crumb et al. (2019) looked at the patterns of persistence, switching majors, or leaving school across STEM, business, humanities, and social sciences for White, Latinx, and Black students. While White students are more persistent in STEM fields, similar numbers of White, Black, and Latinx students persist in earning a degree in the humanities, with no significant differences between groups (Riegle-Crumb et al., 2019). Further, among business and social sciences, there were no significant differences across racial or ethnic groups in the likelihood of switching majors or persisting in the original field (Riegle-Crumb et al., 2019).

Matriculating with a declared major has not been shown as predictive of persistence (Cuseo, 2005). Although arriving with a declared major may not predict success, the impacts of changing majors have shown to be inconclusive within the literature. Researchers have found that changing majors can be risky for students, leading to increased time to graduation or dropping out (Moore & Shulock, 2009). Other studies have found evidence that changing majors is linked to higher graduation rates, particularly when students change majors early (King, 2015; Kreysa, 2006; Micceri, 2001; Wright, 2018). Early changes of major may indicate well-informed decisions, while changes later than sophomore year may be linked to lower grades and graduation rates (Foraker, 2012). Late changes can increase remaining tuition, classes required, and time to graduation (Foraker, 2012; Kramer et al., 1994).

DEMOGRAPHIC FACTORS, MAJOR CHANGES, AND COMPLETION

Recent figures indicate that 60% of first-time, full-time undergraduate students seeking bachelor's degrees at 4-year institutions graduate within six years (NCES, 2021). When disaggregating by background characteristics, there are concerning equity gaps in college completion. Eleven percent (11%) of students from the lowest-income quartile earn bachelor's degrees within six years, compared with almost 60% of students from the highest-income group (Cahalan et al., 2018). Furthermore, while

about one in four White adults (25%) hold bachelor's degrees, only 14% of Black adults and 11% of Latinx adults have attained the same (Nichols & Schak, 2017). Because these gaps in degree completion impact groups that have been historically underserved in higher education, supporting students as they choose majors may be one way to help marginalized students persist and complete their degrees.

Regarding gender, much of the academic literature related to majors focus on the stratification of gender by majors and occupations after graduation (Baker, 2018; Gradin et al., 2015; Patnaik et al., 2020; Turner & Bowen, 1999). Historically, there has been a gap in STEM majors for men and women, with men majoring in STEM at higher rates (Patnaik et al., 2020; Zafar, 2013). Within the Social Sciences, Humanities, and Education proportions of men and women are similar (Patnaik et al., 2020). Sklar (2018) investigated the likelihood of changing majors based on gender, ethnicity, and pre-college preparation. Results showed that women had a greater risk of changing majors than men when initially enrolled in Engineering or Architectural Design colleges at the university/study site. This effect was not found among students enrolled in the other colleges sampled. Within the review of literature, age was largely not included as a factor for investigating the behavior of changing majors. No significant influence was found when student age was included (Sklar, 2018; Baker 2018).

Considering the many factors that can impact changes of major as well as persistence during a bachelor's degree program, we aimed to answer the following research question: Is there a relationship between changing majors one or more times and bachelor's degree attainment six years after entering a public or private 4-year institution, controlling for age, gender, race, first-generation status, enrollment intensity (full- or part-time), and remedial coursework?

Methods

DATA SOURCE

To evaluate the extent to which change of academic major is associated with bachelor's degree attainment, we utilized publicly available data from the 2012/17 Beginning Postsecondary Students Longitudinal Study (BPS:12/17), collected by the National Center for Education Statistics (NCES, 2021). BPS:12/17 is a nationally representative dataset that includes student demographic data, transition to employment, student persistence, and postsecondary education completion (Bryan et al., 2019). Data collection began in students' first year of postsecondary education (2011-12) and then continued with surveys at the end of their third (2014) and sixth years (2017) (Bryan et al., 2019).

The complete BPS:12/17 dataset included 22,500 students across all sectors of postsecondary education (Bryan et al., 2019). Based on our interest in examining the impact of academic major change on bachelor's degree attainment specifically, only students enrolled in bachelor's degree-granting institutions were included. Additionally, we eliminated for-profit institutions from the sample to further focus our analyses and contextualize results and implications. The resulting sample of approximately 13,800 respondents was comprised of male (43.6%) and female (56.4%) students, who were mostly traditional college age (15-23; 97%), and identified primarily as having White (62.7%), Hispanic or Latino (13.0%), and Black or African American (12.4%) racial identities (see Table 1).

Table 1.
Descriptive statistics for analytic sample overall

	Analytic sample
	(%)
Degree attainment (6 yrs)	
No degree attained	31.1
Bachelor's degree attained	68.9
Major changes	
Never	36.6
One time	34.4
More than one time	29.0
Age	
15-23	97.0
24-29	1.5
30 or above	1.5
Gender	
Male	43.6
Female	56.4
Race/ethnicity	
White	62.7
Black or African American	12.4
Hispanic or Latino	13.0
Asian	7.0
American Indian or Alaska Native	0.7
Native Hawaiian/other Pacific Islander	0.3
More than one race	3.9

First-generation status	
Yes, first in immediate family to attend PSE	11.1
No, not first in immediate family to attend PSE	87.8
Do not know entire immediate family's education level	1.1
Attendance intensity	
Always full-time	50.9
Always part-time	3.1
Mixed	46.0
Remedial courses	
Not taken	68.9
Taken	31.1
**Note: Analytic sample included students at 4-year nonprofit institutions (private & public); 48.5% of BPS 12/17 respondents.*	

MEASURES

Bachelor's degree attainment—the outcome of interest—was derived from a variable that captured students' educational attainment at any postsecondary institution within six years (e.g., certificate, degree). To focus on bachelor's degree attainment, we collapsed the item responses to include only two relevant categories for our subsample: Bachelor's degree attainment at any postsecondary institution through 2017 (coded 1) and no bachelor's degree attainment through 2017 (coded 0). Among our analytic sample, 68.9% of students obtained a bachelor's degree within six years, while 31.1% of students did not obtain a bachelor's degree (see Table 1).

Students' academic major change—the focal predictor variable in this study—was derived from a variable that quantified the number of times students reported changing their major at any postsecondary institution over the six years. Specifically, this variable included categories that reflected whether students reported: never changing their major (coded 0), changing their major only one time (coded 1), or changing their major more than one time (coded 2) at any postsecondary institution through 2017. Among our analytic sample, 36.6% of students never changed their major, 34.4% changed their major once, and 29.0% changed their major two or more times over the six-year period (see Table 1).

Several covariates were included in our model to isolate the extent to which academic major change related to bachelor's degree attainment. Covariate measures included student characteristics and experiences that, based on the literature review, may also play an important role in predicting bachelor's degree attainment. Student characteristics that were included as covariates were age, gender, race, and first-generation status. Student enrollment experiences included as covariates were completion of remedial coursework and courseload throughout college (defined by

BPS:12/17 as attendance intensity: either part-time, full-time, or a combination). Categories and descriptive statistics for all variables are reported in Tables 1-3, with Tables 2 and 3 reporting descriptive statistics pivoted on degree attainment and changes of major, respectively.

Table 2.
Descriptive statistics for analytic sample by 6-year degree attainment (dependent variable of interest)

	No degree attained	Bachelor's degree attained
	(%)	(%)
Overall sample		
Total	31.1	68.9
Major change		
Never	31.3	68.7
One time	26.0	74.0
More than one time	23.3	76.7
Age		
15-23	29.6	70.4
24-29	93.3	6.7
30 or above	78.3	21.7
Gender		
Male	35.9	64.1
Female	27.3	72.7
Race/ethnicity		
White	26.1	73.9
Black or African American	50.7	49.3
Hispanic or Latino	38.0	62.0
Asian	23.3	76.7
Other race/ethnicity	60.3	39.7
More than one race	36.5	63.5
First-generation status		
Yes, first in immediate family to attend PSE	49.1	50.9
No, not first in immediate family to attend PSE	28.5	71.5
Do not know entire immediate family's education level	59.4	40.6
Attendance intensity		
Always full-time	23.9	76.1
Always part-time	96.8	3.2
Mixed	35.1	64.9

Remedial courses		
Not taken	25.7	74.3
Taken	43.7	56.3

**Notes: Analytic sample included students at 4-year nonprofit institutions (private & public); 48.5% of BPS 12/17 respondents.*

Table 3.
Descriptive statistics for analytic sample by major changes through June 2017 (independent variable of interest)

	Never	One time	More than once
	(%)	(%)	(%)
Overall sample			
Total	36.7	34.4	29.0
Degree attainment (6 yrs)			
No degree	43.0	33.3	23.7
Bachelor's degree	35.4	35.5	29.1
Age			
15-23	36.3	34.4	29.3
24-29	63.5	31.7	4.8
30 or above	42.9	31.1	26.0
Gender			
Male	38.0	33.5	28.4
Female	35.6	35.0	29.4
Race/ethnicity			
White	35.6	34.6	29.8
Black or African American	38.0	35.6	26.4
Hispanic or Latino	37.1	34.3	28.6
Asian	41.7	29.3	29.0
Other race/ethnicity	40.5	34.0	25.5
More than one race	37.8	36.6	25.5
First-generation status			
Yes, first in immediate family to attend PSE	36.3	32.6	31.1
No, not first in immediate family to attend PSE	36.7	34.6	28.8
Do not know entire immediate family's education level	39.9	36.7	23.5
Attendance intensity			
Always full-time	39.1	33.8	27.1
Always part-time	53.5	28.0	18.5
Mixed	33.0	35.3	31.7

Remedial courses			
Not taken	37.8	33.8	28.4
Taken	34.0	35.7	30.3
**Notes: Analytic sample included students at 4-year nonprofit institutions (private & public); 48.5% of BPS 12/17 respondents.*			

DATA ANALYSIS PLAN

To analyze the relationship between academic major change and bachelor's degree attainment, we utilized the NCES PowerStats logistic regression function. Logistic regression allowed us to examine the potential role of academic major change in predicting degree attainment while accounting for other relevant student characteristics and experiences.

Standardized beta coefficients, odds ratios, and *p*-values were evaluated for all variables in the logistic regression model. Variables with a *p*-value less than 0.05 were considered to be statistically significant predictors of bachelor's degree attainment. For variables identified as statistically significant, odds ratios were then used to compare the relative odds of the occurrence of the outcome of interest (i.e., graduation after 6 years), given exposure to the variable of interest (e.g., changing majors once or more than once, and demographic factors).

ANALYTICAL LIMITATIONS

Statistical analyses will be limited when using extant data such as the public-use NCES surveys. For example, sophisticated methods such as multilevel modeling are not available in PowerStats, and variables of interest are constrained by sample size. General large-scale dataset limitations notwithstanding, there are several limitations to consider with the present analysis of the research question using the BPS:12/17. First, any students who may have dropped out of college before they declared a major are not accounted for in the outcome variable, as we cannot speak to their likelihood to change or not change their major. While those students represented a very small portion of the analytic sample (5.5%), the exclusion of their experiences—which are likely to be substantively different than that of students who remained in college long enough to ultimately select and declare a major—should be noted. Second, regarding the predictor variables, we had to collapse two of the racial/ethnic identities with small cell sizes into a single category. This was true of two distinct groups—American Indian/Alaska Native (0.7% of the sample) and Native Hawaiian/other Pacific Islander (0.3%). While not ideal to assume homogeneity of the experiences of any minoritized populations, collapsing such groups provided a more complete picture of students' college experiences than removing those cases altogether.

Results

We first evaluated the overall fit of the logistic regression model, then identified and interpreted any statistically significant predictors of bachelor's degree attainment.

MODEL FIT

Pseudo R squared estimates provide indicators of model fit, with values close to zero indicating minimal predictive ability of the model (i.e., explanation of little to no variation in the outcome of interest) and values close to one indicating high predictive ability (i.e., explanation of virtually all variation in the outcome of interest). Multiple pseudo R squared values were evaluated for the logistic regression model in this study (McFadden = 0.128; Cox-Snell = 0.139; Estrella = 0.148); those values indicated that between 12.8% to 14.8% of the variation in bachelor's degree attainment were explained by the model predictors—major changes, age, gender, race/ethnicity, generation status, attendance intensity, and remedial coursework. While these values may appear low, such values are to be expected in educational settings. In such settings, where a multitude of individual and environmental factors contribute to students' degree attainment, any single model can provide only a limited (yet still informative) view of the significant factors involved. Importantly, Wald F tests for the overall model and for all predictor variables were significant ($p < .05$), indicating that each variable contributed to significantly better prediction of the bachelor's degree attainment outcome when included in the model.

SIGNIFICANT PREDICTORS OF BACHELOR'S DEGREE ATTAINMENT

Variables that significantly predicted bachelor's degree attainment in six years were identified in the model results (Table 4). Consistent with prior research on degree attainment, several model covariates helped to explain the odds of students obtaining a bachelor's degree. The odds of obtaining a bachelor's degree decreased for students who were first-generation college students (OR = 0.59, $p = .001$), identified with particular racial/ethnic identities (Black or African American, OR = 0.36, $p < .001$; Hispanic or Latino, OR = 0.70, $p = .036$; Other race/ethnicity, OR = 0.30, $p < .001$; More than one race, OR = 0.68, $p = .019$), attended college at intermittent part-time and full-time intensities (OR = 0.55, $p < .001$), and engaged in remedial coursework (OR = 0.52, $p < .001$). Conversely, the odds of obtaining a bachelor's degree increased for students who identified as female (OR = 1.62, $p < .001$).

The primary variable of interest, major change, also offered explanatory value when it came to bachelor's degree attainment. Specifically, there was a significant increase in the odds of degree attainment for students who changed their major once (OR = 1.31, $p = .007$) and more than once (OR = 1.46, $p = .001$). Interpreted as a percentage, the

estimated odds of completing a bachelor's degree were 31% higher for students who changed their major once and 46% higher for students who changed majors multiple times, as compared to students who never changed their major.

Discussion and Implications

Our findings suggest that students enrolled at public four-year institutions who change their major one or two times have a higher probability of obtaining their bachelor's degree within six years than students who do not change their major. Students' choice to change their major may indicate a thoughtful exploration of one's own goals and values, as well as the college and career path. Our findings are consistent with existing literature on predictions of bachelor's degree attainment. Recent reports have shown higher enrollment and degree attainment rates for women as compared to men (Reeves & Smith, 2021). Our findings are also consistent with studies that investigate the impact of age and traditional versus non-traditional status. We found that each year older students in our sample were, their odds of graduating within six years decreased slightly. This is consistent with Kelly and Whitfield (2015), who found that bachelor's degree completion decreases with age. Regarding the changes of major and degree completion, our findings are consistent with King (2015) and Wright (2018) in that changing majors was associated with higher degree completion rates. Given our findings on changes of major, we offer the following implications for advising and student support.

CAREER EXPLORATION THROUGH META-MAJORS

Institutions, advisors, and programs should embrace the exploration of majors and interests rather than requiring students to choose a major as soon as possible. With pressure on students to declare their major early, exploration may be limited, and students may quickly feel tied to a major they do not connect with and continue down a path incongruent with their interests. Yet when students have space to explore, advisors can initiate intentional consideration of careers and opportunities within a general field of study and offer help during the decision-making process (Freedman, 2013; Venit, 2016). One promising example is the growth of broadened meta-majors (such as health sciences or STEM) and guided pathways for students at public 4-year and 2-year institutions, which can give students the freedom to explore potential options without losing a structured pathway (Baker, 2018; Schudde et al., 2020; Waugh, 2016). Examples include meta-majors, career clusters, or communities of interest at Arizona State University, Lehman College, and Georgia State University (Kurzweil & Wu, 2015; Waugh, 2016). These programs provide structure and support by grouping students on a broad area of interest and facilitating the completion of coursework in a general area before the students decide on a specific major (Waugh, 2016). Moreover, these programs provide extra support for students, such as tutoring, time management coaching, and career services aligned to each meta-

Table 4.
Logistic regression results (6-year bachelor's degree attainment as dependent variable)

		Odds Ratio	Probability	S.E.	Lower 95%	Upper 95%	t	p-value	b	S.E. for b
Intercept		27.797	96.5%	25.706	4.488	172.182	3.595	0.000	3.325	0.925
Major changes										
	One time	1.306	56.6%	0.127	1.079	1.582	2.750	0.007**	0.267	0.097
	More than one time	1.468	59.5%	0.158	1.187	1.814	3.566	0.001**	0.384	0.108
Age		0.902	47.4%	0.044	0.819	0.994	-2.098	0.037*	-0.103	0.049
Gender										
	Female	1.615	61.8%	0.120	1.395	1.869	6.459	0.000**	0.479	0.074
Race/ethnicity										
	Black or African American	0.357	26.3%	0.048	0.273	0.466	-7.615	0.000**	-1.030	0.135
	Hispanic or Latino	0.701	41.2%	0.118	0.503	0.976	-2.115	0.036*	-0.356	0.168
	Asian	1.090	52.2%	0.178	0.790	1.503	0.529	0.598	0.086	0.163
	Other race/ethnicity	0.304	23.3%	0.099	0.160	0.577	-3.661	0.000**	-1.192	0.325
	More than one race	0.678	40.4%	0.111	0.491	0.936	-2.374	0.019*	-0.389	0.164
First-generation status										
	First-generation student	0.587	37.0%	0.090	0.434	0.794	-3.482	0.001**	-0.533	0.153
	Unknown	0.514	34.0%	0.200	0.239	1.108	-1.709	0.089	-0.665	0.389
Attendance intensity										
	Always part-time	0.016	1.6%	0.042	0.000	2.501	-1.613	0.108	-4.113	2.551
	Mixed	0.546	35.3%	0.043	0.467	0.639	-7.644	0.000**	-0.605	0.079
Remedial courses										
	Remedial courses taken	0.523	34.3%	0.051	0.432	0.634	-6.661	0.000**	-0.648	0.097

Note: *< .05, **< .01

major. Evidence of success at Georgia State University includes an increased first-to-second-year retention rate, an increase in GPAs (8%), and a decrease in changes of majors (32%) within their Freshmen Learning Communities (FLC) (Calhoun-Brown, 2016). Ultimately, students are best served when they set about a path in which they belong and earn relevant credits that count towards a degree (Kadlec & Dadgar, 2020). At several institutions, meta-majors have shown evidence of decreasing the costs associated with multiple major changes.

SUPPORT FOR DIVERSE INTERESTS AND BACKGROUNDS

Student background characteristics can impact the choice of major and career trajectory. For example, students from lower-income households have been found to pick majors that lead to secure employment opportunities, such as education, nursing, and computer science, while students from higher-income households have an increased likelihood of choosing a major in the humanities and social sciences (Leppel et al., 2001; Metheny & McWhirter, 2013). Students from underrepresented populations may feel that their major must lead to a specific job, while other students may feel confident that their skills or personal safety net, beyond their major choice, can help secure a variety of jobs. With our finding that major changes are associated with increased rates of completion, academic advisors and faculty should help students explore a variety of pathways, majors, and careers, so students do not feel constrained or obligated to one field that may not reflect their personal interests.

FIRST-YEAR EXPERIENCES

If exploration of majors benefits students in their bachelor's degree attainment, there are significant implications for students' transitions to campus and First-Year Experience programming. For example, sessions on major and career exploration can be offered or even required during orientation programming, including a highlight of campus resources to support students along the way (Kepple et al., 2021). Furthermore, staff and faculty should collaborate with exploratory students throughout their first year. Partnering faculty, academic advisors, and career advisors can provide students with a full understanding of the academic and career opportunities on campus. Additionally, sections of the first-year experiences courses should be reserved for exploratory students, providing an emphasis on career assessments and majors, and occupational research (Kepple et al., 2021).

Colleges and universities should also consider undecided students' sense of belonging even though they do not have a chosen major. Advisors, student affairs professionals, and other university staff could ensure undecided students are in regular communication with advisors and proactively connected to career exploration opportunities along with declared students. Universities should also work to extoll the benefits of exploring to destigmatize being undeclared. Examples of this include

campus policies at the University of Chicago (Robinson, 2020) and Fort Lewis College, where they require their incoming students to be undeclared.

Our research contributes to the literature on the benefits of changing majors and the premise that students should be encouraged to change their major if they wrestle with their current choice (Venit, 2016; Wright, 2018). This support during the college experience – and communication thereof during orientation and even admissions recruitment – can help students see the connection between their interests, choice of major, and future careers. As institutions focus on retention, our research suggests that a focus on the link between advising and career exploration may hold promise toward persistence and graduation.

Among the many goals of higher education, institutions should seek to graduate students who are satisfied with their choice of major. A survey conducted by the Federal Reserve Board found that over one in three adults who had at least some college said they would change their major in hindsight (Federal Reserve Board, 2022). Our research suggests that students who are encouraged to explore, change majors, and settle on one that fits their interests and goals, may be more satisfied in the long run and complete their degree.

Future Research

Future studies might consider the specific conditions and/or circumstances under which changing majors may be fruitful for students' retention and degree attainment and whether sub-group differences (i.e., interactions of independent variables) vary the impact of changing majors. For example, missing from the academic major change literature is an in-depth look at specific populations, such as international students, transfer students, and community college students, and their experiences with changing majors. Few researchers like Liu et al. (2020) have studied the effect of academic major change in community colleges, which typically serve underserved communities, and they found that switching majors increases certificate completion rates but moderately decreases the probability of bachelor's degree completion for students who started with a declared major. Further studies might also seek evidence for possible diminishing returns for changing majors (three or more times) and incorporate an examination of the impact of changing majors on the time to degree. Finally, we recommend the examination of non-STEM major changes, in contrast to the extant literature that focuses heavily on STEM students' major changes.

Author Note

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