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Gender Identity and Academic Confidence Across College Major Fields

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INTRODUCTION

This study aimed to measure college students' sense of personal efficacy and sense of belonging among various majors, specifically concerning the differences across gender identities. The findings thus indicate whether gender experience and norms impact some majors more than others, demonstrating how a history of male domination in certain fields can be internalized on a population level. A total of 300 respondents from a large public university in the northeast United States completed an online survey. In this survey, questions pertaining to self-reported gender identity; school of the respondent's major, such as life sciences or liberal arts; and agreement with statements concerning one's success and sense of belonging were posed to measure the relationship between the variables. The statements "I feel like I belong in my major" and "I feel successful in my major" will be referred to in this paper as "academic attitude" variables.

Results from our survey, of which a majority of respondents were female, showed statistically significant relationships between major and academic attitudes and gender identity and major choice, as well as between gender and perceived personal success.

BACKGROUND

The basis of sociological study is social identities and groups, which are important categories individuals fall into because of their characteristics. These identities and groups in turn inform personal values and choices, as well as how others perceive them (Northwestern Searle Center). Historically, men and women were separated: men into public and leadership

roles, and women into domestic and subservient roles. Since the early 1980s, however, women have made great strides in college enrollment and completion. In 1960, men received 65 percent of all bachelor's degrees. Women reached parity in bachelor's degrees in 1982 and increased at higher rates compared to male counterparts; by 2010, women received 57 percent of bachelor's degrees, and made up over half of college students (Snyder & Dillow 2016). The "new gender gap" describes how women have higher rates of college enrollment and completion relative to men (Beutel, Burge, & Borden 2017). This new gender gap can further be studied to include women's participation in male-dominated fields.

As women moved into higher education and the workforce in larger numbers in the mid-twentieth century, male-dominated fields emerged–careers that value "traditional masculine" skills such as manual labor, analytical thinking, leadership, and decision-making (Dayton 2020). Some female-dominated careers that require a degree include nursing, social work, and teaching, which value interpersonal skills and care for others (Elkins 2015). This difference is called the care-technical divide. In recent years, women have been entering male-dominated fields at higher rates, as these careers are often high-paying and appear as a solution to the gender pay gap. However, despite this integration, a 2009 study found that when women began working in these male-dominated occupations, no matter the pay grade, the jobs started paying less, even when controlling for education, work experience and skills, race, and geography (Levanon, England, & Allison 2009).

How does the societal devaluing of women's work and importance impact college students and their choices of field? Are those identifying as women more likely to internalize gender norms and pursue the female-dominated fields of education, arts, humanities, social sciences, and health? (Beutel et al. 2017). Gender in-major desegregation has stalled over the

past forty years, with men overrepresenting in science, technology, engineering, and mathematics, or STEM (Dunlap & Barth 2019). This study aims to answer whether gender expression and identity affects students' choices of major, and consequently, their perceived success and sense of belonging in their major. Existing social roles and labels may motivate people to prioritize gendered conditions: making choices that coincide with tradition to avoid scrutiny, reduce chances of possible failure, or act on a subconscious aversion to defy their label.

Previous research is sparse in the exact attitudes relating to major choice and how one feels once the choice is made. Most related research available includes gender and major choice, but focuses more directly on gender norms, the impact of femininity or masculinity, and actual knowledge relating to specific majors, rather than personal feelings about self-assessment and confidence in knowledge. Beutel, Burge, & Borden (2017;2019) conducted two separate studies on effects of femininity and masculinity respectively on choices of college major. Studying the effects of gender essentialism and the possible paths away from this perspective, the researchers found that some school subjects are considered inherently female due to the care-technical divide (Barone 2011). The care-technical divide shows that male-dominated and related fields consist of objectivity and instrumentality, while female-dominated fields are associated with subjectivity and emotion, reverting to the supposed predisposition of women to nurturing and caregiving (Correll 2001).

Studies using mixed gender samples show that academic variables such as preparation, performance, and ability self-evaluation in high school years are significant predictors in future majors, but these samples are not sufficient proof of gender differences (Correll 2001). There may be gendered differences in preparation, performance, and ability that in turn impact gender major distribution, but existing scholarship does not consider gender as a variable. Social role

theory posits that traditional family labor division is responsible for gender imbalance in career choices; the historical female role as primary caregivers reflect nurturance, care for others, and social sensitivity, while the historical male role as strong providers coincides with analytical skills, economic prosperity, and competitiveness (Dunlap & Barth 2019). Science, technology, engineering, mathematics, economics, finance, and entrepreneurship require male-coded analytical skills and competitiveness, while nursing, health services, education, and humanities correspond with female-coded nurturance, social sensitivity, and empathy. Further, women may consciously or unconsciously choose fields that are less demanding and can be scaled-back for family. Meanwhile, the associative-propositional evaluation model proposes that belief in stereotypes relies on repeated cognitive validation, while implicit associations depend on repeated exposure to a reliable relationship between two concepts, such as men being consistently better suited and connected to STEM careers and spatial-analytical intelligence (Gawronski & Bodenhausen 2006; Dunlap & Barth 2019). These findings and theories posit that women who favor non-STEM and business fields–and men who choose STEM and business –do so because of repeated cognitive validation. Young women are repeatedly told their stereotypical caregiving and sensitivity skills lend to higher success in female-dominated careers by mentors, teachers, relatives, and even pop culture, and they may invest in this ideal and self-stereotype.

Lastly, Kelly & Beltz (2022) found that self-perceived masculinity is associated with greater spatial skills that pertain to STEM subjects, concurrent with Nash's (1979) sex-role mediation hypothesis. This hypothesis proposes that a masculine self-concept promotes male-type cognition, shaping male and female choices through their own personal perception (Kelly & Beltz 2022; Nash 1979). These findings support the notion that self-conception and -perception

impact cognition. Since career paths can be highly gendered, there is a question of whether mediation of self-perception and sex roles impact gendered college majors.

Although prior research paints a thorough sociological picture of male and female fields and why they are so separated, they do not cover personal attitudes and self-evaluation of success. Do women and men across both male-coded and female-coded majors feel they do not belong or will not succeed? Are there gender differences in personal academic attitudes and appraisals? Actual performance is an important statistic, but self-evaluation of success in major measures how stereotyping may emotionally or mentally impact people of different genders. Many past studies concerning the topics involved in this research also use major as the dependent variable, upon the independent variable of gender identity and its subsequent coding, norms, and stereotyping; the popularity of using these variables in studies could be caused by the wide acceptance of the sex-role mediation hypothesis. For this research, the independent variable is still gender identity, as well as major, and the dependent variable is academic attitude.

The null hypothesis would be represented by zero differences across gender identities in self-confidence and perception, and further, zero difference across majors and colleges as well. Because of the oppression and confinement of gender minorities, the directional research hypothesis would be lower self-confidence and sense of belonging for women and gender minorities, but especially within male-dominated majors. If research determined this hypothesis to be the case, colleges could use the data to prioritize support networks and programs to uplift gender minorities within STEM fields and male-dominated majors.

DATA & METHODS

My sample consisted of 300 students at a large public university in New England. The survey's creators were enrolled in an upper-level sociology research methods course at this

university. Sampling methods align closely with the snowball sampling approach, in which the students in the sociology class asked friends and classmates to complete the questions online anonymously. The survey was distributed through an anonymous link and QR code, and results were collected over a two-week period in late November. About 60 individual questions were asked on varying topics relevant to college students, including Greek life, student athletics, and study abroad. My hypotheses for gender, major, and attitude were as follows: men are more likely to be involved in business, economics, and STEM, while women are more likely to major in liberal arts (humanities and social science) and health sciences (human services, education, and nursing); and women and gender minorities are more likely to be less confident in their efficacy or belonging.

RESULTS

The final sample by class standing was 37% juniors, 30% seniors, 22% sophomores, and 11% freshmen. Of 234 responses, the gender distribution was 66.67% women, 24% men, and 9% non-binary or other. This survey is clearly skewed towards women, as the actual ratio at this college is 56% female and 44% male – gender minorities not measured (U.S. News and World Report 2021). The tabulation for gender distribution is below.

Gender Identity	**Frequency**	**Percent**	**Cumulative**
Woman	156	66.67%	66.67
Man	57	24.36%	91.03
Non-Binary	21	8.97%	100.00
Total	234	100.00%	

To measure major choice, college majors were measured on a nominal scale, with choices of Paul College of Business and Economics, College of Liberal Arts (including

undeclared), College of Life Sciences and Agriculture, College of Health and Human Services, College of Engineering and Physical Sciences (CEPS), and Thompson School of Applied Science. Academic attitudes were measured using a Likert scale to indicate levels of agreement with statements of perceived belonging and perceived success in one's academic major. There were 271 respondents for major, with the mode response being for Liberal Arts. The distribution for major is below.

Q3	Frequency	Percent	Cumulative
College of Engineering and Physical Sciences	28	10.33%	10.33
College of Health and Human Services	44	16.24%	26.57
College of Liberal Arts (including undeclared)	109	40.22%	66.79
College of Life Sciences and Agriculture	51	18.82%	85.61
Paul College of Business and Economics	38	14.02%	99.63
Thompson School of Applied Sciences	1	0.37%	100.00
Total	271	100.00%	

To understand how the above tabulated variables are distributed, a crosstabulation, shown below, shows how major choices are distributed across the gender spectrum. These results are statistically significant, with a p-value of 0.000. As expected, men are overrepresented in the school of business and economics, as well as engineering and physical science. A quarter of men major in business and economics, compared to 10.9% of women. Only 5% of women major in engineering and physical science, while 21.4% of men do. Also as hypothesized, the most selected major by women female respondents was liberal arts (46.79%), followed by health and human services (19.87%). Men are least likely to pursue health and human services, with only 7.14% represented in a college that includes common "caring" fields: education, nursing, public health, social work, and occupational therapy. Non-binary students and other gender identities are far more likely to be in life sciences, followed by liberal arts, health and human services, and

engineering. Under 5% of nonbinary respondents are in business and economics, the smallest percentage.

	Woman	Man	Non-Binary	Total
College of Engineering and Physical Sciences	5.13%	21.43%	14.29%	9.87%
College of Health and Human Services	19.87%	7.14%	19.05%	16.74%
College of Liberal Arts (including undeclared)	46.79%	28.57%	23.81%	40.34%
College of Life Sciences and Agriculture	16.67%	17.86%	38.10%	18.88%
Paul College of Business and Economics	10.90%	25.00%	4.76%	13.73%
Thompson School of Applied Sciences	0.64%	0.00%	0.00%	0.43%
Total	100.00	100.00	100.00	100.00

Two more statistically significant cross-tabulations are found in the relationships between the academic attitude questions and major. Even without considering gender identity, different majors have deeply contrasting outlooks on their success and belonging. Degrees of agreement in success and belonging are relatively similar for most respondents in business and economics, health and human services, life sciences and agriculture, and liberal arts: most agree or strongly agree that they belong and are successful, while some are neutral and just a few disagree. None strongly disagree across all questions and groups. However, the most jarring difference is in perceived success for engineering and physical science (CEPS) students, shown in the last column below. Across all other major categories, “strongly agree” percentages are between 26.6 and 32 percent. For engineering and physical sciences, this number is only 10.71 percent. The same pattern follows for all other responses for CEPS students on the Likert scale – this group is the least likely to agree, is over double the average for “neutral,” and is the only group in which over 2% disagree that they feel successful, with the same percentage of students–10.71%–strongly agreeing as disagreeing. For comparison, about 92% of all business students either agree

or strongly agree they are successful in their major, versus 64% for CEPS. Differences in self-reported success across majors are statistically significant, with a p-value of less than 0.01.

I feel successful in my college major.

	Total	Paul College of Business and Economics	College of Liberal Arts (including undeclared)	College of Life Sciences and Agriculture	College of Health and Human Services	College of Engineering and Physical Sciences
Total count	270	38	109	51	44	28
Strongly Agree	27.04%	31.58%	26.61%	29.41%	31.82%	10.71%
Agree	58.52%	60.53%	62.39%	54.90%	54.55%	53.57%
Neutral	8.15%	5.26%	3.67%	13.73%	9.09%	17.86%
Disagree	1.85%	0.00%	1.83%	0.00%	0.00%	10.71%
Strongly Disagree	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

P-value: <0.01

Further, there are statistically significant differences by major about belonging in one's major. As shown below, CEPS students are over twenty percentage points below the overall average of 39.26% strongly agreeing; only 17.86% of engineering and physical science respondents strongly agree that they belong in their major. Furthermore, 28.57% of CEPS respondents are neutral, compared to the average of 10%. The relationships shown are statistically significant with a p-value of 0.02.

I feel like I belong in my college major.

	Total	Paul College of Business and Economics	College of Liberal Arts (including undeclared)	College of Life Sciences and Agriculture	College of Health and Human Services	College of Engineering and Physical Sciences
Total count	270	38	109	51	44	28
Strongly Agree	39.26%	50.00%	33.94%	47.06%	47.73%	17.86%
Agree	44.81%	42.11%	50.46%	39.22%	40.91%	42.86%
Neutral	10.00%	5.26%	7.34%	11.76%	6.82%	28.57%
Disagree	1.48%	0.00%	2.75%	0.00%	0.00%	3.57%
Strongly Disagree	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

P-value: 0.02

When gender is considered with academic attitude, there are statistically significant gender differences, but only for success and not belonging. Women are far more likely to

strongly agree that they are successful – 32 percent compared to men's 19 percent. Men are 10% more likely to feel neutral. Meanwhile, nonbinary respondents are less likely than both men and women to strongly agree or agree, and more likely than men or women to disagree that they are successful. This crosstabulation is statistically significant, meaning women are more likely than men to believe in their own success, while nonbinary students are the least likely of the gender identity groups measured to believe in their academic success.

I feel successful in my college major.

	Woman	Man	Non-Binary	Total
Agree	61.54	64.91	57.14	61.97
Disagree	1.92	1.75	4.76	2.14
Neutral	4.49	14.04	19.05	8.12
Strongly Agree	32.05	19.30	19.05	27.78
Total	100.00	100.00	100.00	100.00

Pearson chi2 (6) = 12.0703 Pr = 0.060

CONCLUSION

Overall, there was statistically significant difference between college major, academic attitudes, and gender identity. Statistical significance is shown in gender distribution and major choice, self-reported success and major, belonging and major, major and perceived success or belonging, and success and gender identity; within all of these relationships, one can reject the null hypothesis. Significant relationships were not indicated in belonging and gender.

Although the null hypothesis could be rejected in most associations, one was unexpected in relation to the research hypothesis. Despite women's marginalization across the public sphere, they are most likely to agree that they are successful in their major. This sample is skewed towards older, female, and liberal arts students, which may affect the relationship. Also, women are more likely to be in liberal arts and human services, where agreement with personal success

is around average. Men are more likely to be in business, where feelings of success are the highest, or engineering and physical science, where feelings of success are by far the lowest.

This research has many implications for universities as well as for future research endeavors. Programs to motivate women in business and STEM, men in health and human services, and gender minorities in business and physical sciences should be highlighted and bolstered. Nonbinary respondents were much less confident in their success and belonging than men and women. Subsequently, more research should be conducted on nonbinary experience across higher education. Also, the extremely low rate of men in health and human services should be further analyzed. Another worthy research endeavor would be in whether the care-technical divide is truly a cognitive difference: are men less likely to be caring, and women less likely to think technically? Lastly, the motivations behind women's belief in their academic success should be studied, especially to understand whether there is a kind of incentive brought upon by a lack of privilege in male-dominated spheres requiring a "by her bootstraps" perspective. One limitation in this study that could be rectified by more research is the lack of understanding of interactions between all three variables of attitude, gender identity, and major. Further, a representative rather than snowball sample should be considered so as not to oversample women and female-dominated majors. Overall, gender identity plays a strong yet complicated role in major choice and relationship to one's academics in college.

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