

Navigating Intersecting Identities of Historically Excluded Groups and Post-Traditional Students in Engineering

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Abstract

The purpose of this WIP research is to examine the intersectionality of traditionally examined broadening participation in engineering demographics (i.e., race, socio-economic status) with post-traditional student status and categories. Engineering education has been historically exclusive to racial groups such as Black and Latinx students, and lower socioeconomic status students. While broadening participation often focuses on cultural marginalization of these student groups, there are other broader structural issues and life circumstances that affect their educational access and outcomes. In general, and in this study, we aim to further establish how Black, Latinx, and lower socioeconomic status students are more likely to study part-time, be older, be a parent, and support others while attending school—in short, they are more likely to be “post-traditional” students. While higher education literature has interrogated these post-traditional student categories more thoroughly, engineering education has done less to establish and interrogate this intersection.

More specifically, in this study, we focus on 1) classifying post-traditional students in terms of categories and extents of post-traditional status, 2) examine the intersectionality of the post-traditional population with other historically excluded demographic groups, and 3) assess the educational outcomes for this intersectional and underserved population. We draw on intersectionality theory and Choy’s [1] post-traditional student status classifications to operationalize the analytical categories and procedures for our quantitative study. We utilize the de-identified institutional data from undergraduate engineering students enrolled during the 2023-2024 academic year at a large Hispanic-Serving Institution in the Southeastern United States and employ descriptive statistics, mean difference tests, and linear and logistic regressions to address our research purposes.

Introduction and Literature Review

Engineering degree programs are largely defined by the cultural norms within the field and its multiple subfields, which have been in place for many years. These norms discourage many students from ever applying to study engineering. For those who can at least be admitted to engineering undergraduate programs, the culture within higher education has long pushed away individuals who are not aligned with the expectations of these degree programs. Consequently, students who are not considered normative or traditional may find themselves stereotyped or unfairly scrutinized by faculty or advisors who think less of them.

Although literature typically defines marginalized or minoritized groups in engineering based on race, gender, sexual orientation, disability, or financial status, an understudied group that may also be unfairly characterized are post-traditional students. These students are assessed using norms that are largely aligned with traditional students who do not have to deal with the myriad of family or financial factors that this less-studied population faces. As such, we consider in this paper what it means to be post-traditional through a purely quantitative approach. Using a large dataset from a public four-year Hispanic Serving Institution, we look at the overall performance of students who meet one or more post-traditional definition. Drawing on the results of students analyzed in this dataset, we consider what “success” really means for this population.

Since engineering is long-term regarded as an elite field for White, male, and privileged students [5], [6], [7], it has been historically exclusive to racial groups such as Black and Latinx students, and lower socioeconomic status students. These groups of students refer to the Historically

Exclusive Groups (HEG) experiencing systematic discrimination and a lack of educational resources and opportunities [3]. Post-traditional student groups can overlap with HEG based on their racial and socioeconomic backgrounds. Understanding students' intersectionality is crucial for decentering their uniqueness, acknowledging privilege and oppression, and promoting tailed support for students in the educational system [2].

In higher education, academic grade (GPA), retention, and persistence are traditional measurements for evaluating students' academic success [4]. These standardized test scores are established in traditional college-age students, which could form deficit lenses without fully understanding post-traditional students' academic performance and experience. As post-traditional students have been a prominent subpopulation in higher education, scholars suggest a more inclusive and equitable approach to measuring students' academic success [4].

In this study, we define post-traditional students as those who are: "(a) Delaying college enrollment by one year or more; (b) attending college part-time (i.e., fewer than 12 credits per semester); (c) supporting themselves financially while enrolled; (d) working full-time while enrolled; (e) having dependents other than a spouse; (f) being single parents; and (g) having earned a GED or another equivalency certificate in place of a high school diploma" [8]. We also consider commuter students and students aged 25 or older at first matriculation [9] as post-traditional. Building on [1] classification system, we define three subcategories of post-traditional students: 1) Minimally post-traditional students, (i.e., one post-traditional factor associated with them); 2) Moderately post-traditional students, who are defined by two or three post-traditional factors; and 3) Highly post-traditional students (i.e., four or more post-traditional factors)

Research questions:

1. How do post-traditional characteristics intersect with racial minority status of historically excluded groups among engineering undergraduate students?
2. How are different categories of post-traditional engineering undergraduate students different in academic success?

Measures

We used the following measures or proxies for the eight characteristics of the post-traditional students identified in the literature.

The institutional data come from a large Hispanic-Serving Institution in the Southeastern United States. The total sample ($N = 7,089$) includes engineering undergraduate students' enrollment status being full-time or part-time, having dependents, and engineering undergraduate students' age at first matriculation. This information was used directly to measure whether engineering undergraduate students attend college part-time, whether they have dependents, and whether they were aged 25 or older at their first matriculation.

For other characteristics, we used proxies to represent them since direct measures were not available. Specifically, 1) we used student age at first matriculation to estimate whether students delay college enrollment by one year or more; 2) we treated all students who live off campus as commuter students; 3) we treated students who are not married but have children as single parents; 4) we used students' earned income of \$26,000 as the threshold for working full time based on the FAFSA guidelines [10]; 5) we used the combination of students' earned income of \$26,000 and Pell eligibility as a proxy for supporting students financially while enrolled or students' financial independence.

Results

RQ1: Intersectionality of Racial Minority Status and Post-Traditional Student Characteristics

Intersectionality between racial minority status and post-traditional student characteristics was observed in this sample (see Table 1). Racially minoritized students in historically excluded groups (HEG) altogether account for 91% of part-time students, 83.5% of students who matriculated at 25 years old or above, 83.7% of students who are working full time while enrolled, 84.6% of students with children, 92% of students who are single parents, and all students who have dependents. This supports the overlapping between students' HEG status and post-traditional characteristics at schools like this HSI and potentially other schools with similar demographics. This may also extend to PWIs that enroll both racially/ethnically diverse and larger post-trad student populations.

Table 1. Intersectionality of race and post-traditional student characteristics

	White	Hispanic	Black	Asian	Multiple Race	AA/AN	PI	Total
Part-Time	245	1,914	316	114	50	3	1	2,643
Matriculation at 25 & above	171	668	139	31	26	2	1	1,036
Fully Employed	33	137	28	2	3	0	0	203
Children	28	109	39	3	3	0	0	182
Dependents	0	42	11	1	0	0	0	54
Single Parents	6	53	18	1	2	0	0	74

RQ2: CGPA of Different Categories of Post-Traditional Students

For student groups with only one post-traditional characteristic (minimally post-traditional students), the highest CGPA is from students who live off campus, closely followed by students with financial independence, and students who first matriculated at 25 or older.

For student groups with two post-traditional characteristics (moderately post-traditional students), students who matriculated at 25 or older and students who live off campus, combining with another characteristic, have high CGPAs. For instance, students who matriculated at 25 or older and have financial independence have the highest CGPA, followed by those who matriculated at 25 or older and have full-time employment.

Many student groups with three post-traditional student characteristics (moderately post-traditional students) have the same number as student groups with two post-traditional student characteristics, showing the overlapping among different post-traditional characteristics. For the non-overlapping groups, the highest CGPAs are from the student group who matriculated at 25 years or older, have part-time enrollment, and financial independence (see Table 2).

Table 2. CGPA of Different Categories of Post-Traditional Students

	# (%) / 7,089	CGPA M(SD)
No PTS Characteristics	239 (3.37%)	3.13 (.59)
1 PTS Characteristic		
Live off campus	5,546 (78.23%)	3.05 (.68)
Students with financial independence	286 (4.03%)	3.04 (.70)
Older-age matriculation	864 (12.19%)	3.01 (.72)

Students with full time employment	452 (6.38%)	3.00 (.72)
Single parent students	74 (1.04%)	2.93 (.81)
Part-time students	2,392 (33.74%)	2.89 (.74)
Students with dependents	54 (0.76%)	2.83 (.86)
2 PTS Characteristics¹		
Older-age matriculation AND Financial independence	165 (2.33%)	3.11 (.65)
Older-age matriculation AND Full-time employment	280 (3.95%)	3.06 (.70)
Financial independence AND Live off campus	284 (4.01%)	3.04 (.70)
Full-time employment AND Live off campus	519 (7.32%)	3.03 (.71)
Dependents AND Part time enrollment	32 (0.45%)	2.66 (.86)
3 PTS Characteristics		
Older-age matriculation AND Full-time employment AND Financial independence	165 (2.33%)	3.11 (.65)
Older-age matriculation AND Full-time employment AND Live off campus	279 (3.94%)	3.06 (.70)
Part time AND Work full time AND Single parents	31 (0.44%)	2.83 (.94)

Discussion

We have quantitatively investigated the experiences at the intersection of demographics associated with post-traditional characteristics, with an aim to uncover new insights about some less-discussed equity issues. The issue of post-traditional status has been primarily discussed in literature on adult learning and higher education. However, we have demonstrated the intersection of post-traditional status characteristics with traditional demographics of historically excluded racial groups. Our study was conducted at a particularly diverse Hispanic Serving Institution and is worth evaluating among engineering education institutions nationwide. However, this analysis is challenging to reproduce at a national scale due to the difficulty of finding measures and proxies for post-traditional status. By conducting an initial pilot analysis we hope to demonstrate the importance and potential for further and wider studies of post-traditional status as a correlating variable with historically excluded groups.

While some post-traditional characteristics share a family resemblance and correlate with one another, in that they are defined against a normative student they are inherently divergent. We find that the experiences of individuals with post-traditional status are more divergent than the literature may indicate. By keeping a focus on both post-traditional status as an overarching category and the potential for divergence between individual factors, we contrast with the field

¹ Only part of the results for student groups with 2 or 3 post-traditional PTS characteristics is presented here due to space limitations. All categories with repetitive information or with a small sample size are not presented.

that has tended to collapse post-traditional analysis into minimally, moderately, and highly post-traditional.

Our focus on cumulative GPA is worthy of consideration and problematization. First, we note that GPA is one of the only outcome variables that we can ascertain through institutional data that could reflect a meaningful and tangible component of student success or livelihood. We have a separate paper analysis focused on graduation data, but that analysis was not possible or pursued here because the institutions only compile traditional measures of academic success or retention, such as GPA and 4-year or 6-year graduation rate. Second, we note that GPA itself is a meaningful experiential variable, and it may be looked at similar to a variable like income or educational attainment, which could be looked at as independent, dependent, or correlational variables. If we liken to other quantitative discussions of critical analyses of demographic groups, many of these variables are first thought to represent privilege and oppression. Traditional students have more advantages and may have more privileges relative to post-traditional students resulting in a higher GPA, which also becomes a factor leading to greater subsequent success.

Within the analysis of GPA, we note that post-traditional factors are not all taxing or negative predictors. Some of the post-traditional factors work in the students' favor. Further, some student groups that were highly post-traditional (with more total factors of post-traditional status) were not any worse off in terms of GPA than their minimally post-traditional peers. This is an important finding in the consideration of post-traditional status as a hidden / correlated system of privilege (and oppression), or as a hidden identity group. Analysis of post-traditional status can stay attuned to the complex ways post-traditional status functions—not always as a benefit, not always as a deficit. By paying attention to the individual circumstance and educational consequences, researchers and practitioners can prevent essentializing and deficit lenses across the population, yet stay attuned to the ways this population is *different* and needing different support.

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