

Nontraditional students in engineering: Studying student support and success experiences to improve persistence and retention

This IUSE: Engaged Student Learning project will conduct a study of nontraditional students in engineering (NTSE) to better understand how to support their co-curricular activities so that they are better able to persist with engineering as a discipline.

Nontraditional students (NTS) are increasing both as a proportion of undergraduates and in overall numbers. This is especially the case within engineering as people in the workforce return to complete their degrees or are looking to finish school on a part-time basis. Online offerings across higher education institutions has further accelerated this trend. However, there is little research into engineering students that possess characteristics associated with nontraditional students. Engineering as an educational enterprise has been designed to support a traditional four-year residential degree (e.g. group projects, study halls) and NTS are disadvantaged. Prior work has demonstrated better effectiveness for teaching and pedagogy if co-curricular activities are supported and if proper awareness and access to student support mechanisms are in place students are more likely to be successful. Therefore, we need to understand the efficacy of support structures for nontraditional characteristics. The need for this proposed work is critical within engineering as the discipline traditionally has a low persistence and retention rate and this is also the case for NTSE. This work is especially pertinent in the current climate where NTS are additionally burdened due to COVID-19 – there is less support in time of greater need.

Aggregated across community, 2-year, 4-year colleges and universities nontraditional students' (NTS) made up approximately 75% of the undergraduate student population between 1995 and 2012, according to data from NCES [1]. There is an inconsistent way in which nontraditional students are defined across the literature, however Horn [2] has put forth a definition that includes seven characteristics associated with nontraditional students which focus on enrollment criteria, financial and family status, and high school graduation status. The characteristics shown in Table 1 include: (1) Delayed enrollment by a year or more after high school, (2) attended part-time, (3) having dependents, (4) being a single parent, (5) working full time while enrolled, (6) being financially independent from parents, and (7) did not receive a standard high school diploma. The seven characteristics do not include every aspect that may comprise someone who is nontraditional, or different than a residential student but focus on aspects that may increase the risk of attrition for a nontraditional student. A student is not just traditional or nontraditional, however, there are varying degrees to which a student is nontraditional. If a student has one of the seven characteristics they are considered minimally nontraditional, if they have two or three they are considered moderately nontraditional, and if they have four or more they are considered highly nontraditional. Approximately 74% of students nationally have at least one NTS characteristic. Those that have 'one' characteristic make up 19%, 'two or three' make up 31%, and 'four or more' make up 24% of the students nationally, and in engineering and engineering technology 64.5% of students have at least one characteristic (Table 1).

Compared to traditional students, nontraditional students pursuing a degree are less likely to complete their degree or continue to be enrolled after five years [2]. The NCES (2000) reported that those pursuing a bachelor's degree 12% of traditional students were no longer enrolled after

three years whereas 23% of minimally, 42% of moderately, and 50% of highly nontraditional students were no longer enrolled [3]. Compared to the five-year degree completion rates, nontraditional students lag their traditional counterparts 31% to 54% and are about double the likelihood (27% vs. 14%) to leave college within their first year [2]. Nontraditional students encounter many issues such as needed childcare, fitting class schedules into work schedules, and a lack of peer networking opportunities that traditional students do not have to worry about [4-6]. Nontraditional students are an important group to study because their enormous challenges can affect their well-being, stress levels, and overall satisfaction [7,8].

Table 1: Nontraditional Student Characteristics [1]

National Center for Educational Statistics Non-Traditional Students Distribution (2015)		
# of NTS Characteristics	Public 4-year institutions	Of Eng & ET Nationally
Zero	41.0%	35.5%
One	27.5%	32.0%
Two to three	18.2%	18.2%
Four or more	13.3%	14.3%
Individual Characteristics	Public 4-year institutions	Of Eng & ET Nationally
(1) Delayed enrollment (13+ months)	34.2%	43.3%
(2) Part-time enrollment	39.5%	44.4%
(3) Financial independence	34.4%	33.3%
(4) Full-time employment while enrolled	24.4%	22.0%
(5) Have dependants	32.4%	28.9%
(6) Single Parent	30.6%	25.9%
(7) Did not receive standard HS diploma	29.1%	40.6%

This research looks to answer one research questions: (1) What impact does NTS characteristics have on student integration and student success?

To answer the research questions, we will present and show findings from the engineering student support instrument [9]. The survey instrument contains 22 questions relating to four constructs of integration: (1) Academic, (2) Social, (3) Professional, and (4) University. The survey was administered during the Fall 2021 semester with 142 responses from engineering students in all years. The results will showcase differences between traditional and nontraditional students in regards to their experiences with co-curricular supports.

Survey Results

Table 2 shows the descriptive statistics for the engineering student support instrument for traditional (n=98), minimally nontraditional (n=23), moderately nontraditional (n=18), and highly nontraditional (n=3) students in engineering that participated in the survey at the end of the Fall 2021 semester.

Even though there were no statistically significant results, there are many findings which to draw attention to. First, Highly NTS had the highest mean (5.27) for Academic Integration which signifies they are focused on their studies as they had the lowest for each of the other three

constructs. Traditional students had the highest mean (5.1) for Social Integration and highest mean (5.06) for University Integration compared to all NTS. However, Traditional students had the lowest mean (4.99) for Professional Integration compared to all NTS subsets. These results suggest that the traditional students who are on-campus more often are able to be more social with their peers and interact with university sponsored events and activities more than nontraditional students who are focused on their academics and careers.

Table 2: Descriptive Statistics for Engineering by NTS

	Mean	SD	skewness	Kurtosis	Mean	SD	skewness	Kurtosis	Mean	SD	skewness	Kurtosis	Mean	SD	skewness	Kurtosis
	None (n=98)				Minimally (n=23)				Moderately (n=18)				Highly (n=3)			
AI	5.05	0.84	-1.94	9.41	5.04	0.69	-0.11	2.08	4.58	0.83	-0.13	2.06	5.27	0.64	0.63	1.5
SI	5.1	0.9	-1.25	4.38	4.95	0.99	-1.34	4.32	4.96	0.92	-0.79	2.76	3.6	1.78	-0.55	1.5
PI	4.99	0.67	-0.94	4.6	5.2	0.51	0.42	1.78	5.37	0.7	-1.61	5.43	4.95	1	0.17	1.5
UI	5.06	0.89	-1.26	4.46	4.96	0.8	-1.41	5.98	4.73	1.15	-0.927	2.99	4.53	0.81	-0.71	1.5

Future work will need to focus on what support systems nontraditional students utilize the most and what would help them be more successful as they pursue their academics and careers.

Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant IUSE-2044347. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.

References

1. U.S. Department of Education, National Center for Education Statistics. (2015). *Demographic and enrollment characteristics of nontraditional undergraduates: 2011-12*. <https://nces.ed.gov/pubs2015/2015025.pdf>
2. Horn L. (1996). *Nontraditional undergraduates, trends in enrollment from 1986 to 1992 and persistence and attainment among 1989-90 beginning postsecondary students (NCES 97-578)*. U.S. Department of Education, National Center for Education Statistics.
3. Berkner, L., Horn, L., and Clune, M. (2000). *Descriptive Summary of 1995-96 Beginning Postsecondary Students: Three Years Later (NCES 2000-154)*. U.S. Department of Education, NCES. Washington, DC: U.S.
4. Ross-Gordon, J. M. (2011). Research on adult learners: Supporting the needs of a student population that is no longer traditional. *Peer Review*, 13 (1), 26 – 29.
5. Choy, S. (2002). *Nontraditional Undergraduates (NCES 2002-012)*. National Center for Education Statistics, U.S. Department of Education. Washington, DC.
6. Goncalves, S. A., & Trunk, D. (2014). Obstacles to success for the nontraditional student in higher education. *Psi Chi Journal of Psychological Research*, 19(4), 164-172. <https://doi.org/10.24839/2164-8204.jn19.4.164>
7. Giancola, J., Grawitch, M., and Borchert, D. (2009). Dealing With the Stress of College: A Model for Adult Students. *Adult Education Quarterly*, 59(3): 246-263.
8. Quimby, J., and O'Brien, K. (2006). Predictors of well-being among nontraditional female students with children. *Journal of Counseling and Development*, 84(4): 451-460.

9. Lee, W.C., Godwin, A., & Nave, A.L. (2018) Development of the Engineering Student Integration Instrument: Rethinking Measures of Integration. *Journal of Engineering Education*, 107(1), 30-55.