ASEE 2022 ANNUAL CONFERENCE
Excellence Through Diversity
MINNEAPOLIS, MINNESOTA, JUNE 26TH-29TH, 2022 ASEE
Paper ID #37216

Using Prompted Reflective Journaling to Understand Nontraditional Students in Engineering

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Abstract

This research paper is a study of the support needs of nontraditional students in engineering (NTSE). Nontraditional students in engineering are one segment of the student body that has traditionally not been a part of the conversation in engineering education– those students who do not go through a typical four-year college degree largely at a residential campus. It is only by better understanding the range of issues that NTSE face that we will be able to design interventions and support systems that can assist them. Recent work in engineering education particularly argues that co-curricular support is a critical factor in student success as it effects curricular progress but there has been no work looking specifically at co-curricular support for NTSE and their retention and persistence.

The population of NTSE is increasing across campuses as more students take on jobs to support their education and as those in the workforce return to complete their education. It is imperative that higher educational systems understand how to serve the needs of these students better.

Although there are a range of ways in which nontraditional students (NTS) are defined, the NCES has proposed a comprehensive definition that includes enrollment criteria, financial and family status, and high school graduation status. Overall, the seven characteristics specifically associated with NTS are: (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/or (7) did not receive a standard high school diploma.

We ground our research in the Model of Co-Curricular Support (MCCS) which suggests it is the role of the institution to provide the necessary support for integration. If students are aware and have access to resources, which lead to their success, then they will integrate into the university environment at higher rates than those students who are not aware and have access to those resources.

This research study focuses on answering one research question: How do NTSE engage with co-curricular supports as they progress through their degree programs? To answer this question, we recruited 11 NTSE with a range of nontraditional characteristics to complete prompted reflective journaling assignments five times throughout the Fall 2021 semester. Qualitative results showcase the nuanced lives of NTSE as they pursue their engineering degrees. In particular, results indicate students interact with faculty, classmates, and friends/peers the most, and only interact with advising when required. Students rarely reach out to larger student support for help or are involved with campus or other events happening. Classmate and friend/peer interactions are the most positive, while interactions with faculty had the largest negative outcomes.

Introduction

The future progress of the nation depends to a large extent on its ability to train graduates that can be productive in the workforce. In the United States there is lack of technical workforce and a range of scholars and institutions have called for training a more diverse student body to both address the need for more workforce but also to produce a workforce that is able to serve the needs of different stakeholders [1,2]. To be able to do so though it is essential that higher education institutions are prepared to support a diverse student body towards complete of their degrees [3]. One segment of the student body that has traditionally not been a part of the conversation in engineering education is nontraditional students in engineering (NTSE) – those students who do not go through a typical four-year college degree largely at a residential campus. The population of NTSE is increasing across campuses as more students take on jobs to support their education and as those in the workforce return to complete their education. It is imperative that higher educational systems understand how to serve the needs of these students better.

Although there has always been a small percentage of NTSE in any engineering program, as undergraduate education enrollment in engineering has increased this decade so has the proportion of NTSE. For these students, the notion of the typical college experience is not their experience. 'Traditional' students often attend college full-time directly after high-school, live on-campus, depend on parents for financial support, and may have a part-time job with no other worries except academic life. At 4-year public institutions 'traditional' students are now a minority and make-up only 46.3% of the student population [4]. Therefore, it is imperative that more research and practice focuses on NTSE to better understand how to support them towards completion of an engineering degree.

The ability to create proper support structures for undergraduate students relies, to a large extent, on the capacity of different stakeholders, teachers, advisors, and administrators – to simultaneously respond to different student needs and characteristics. For nontraditional students in general and NTSE particularly, success in their classes is often a function of being able to manage other elements of their lives such as finances, commitment to family, commitment to job, and the ability to find peer support. It is only by understanding the range of issues that NTSE face that we will be able to design interventions and support systems that can assist them. Recent work in engineering education particularly argues that co-curricular support is a critical factor in student success as it effects curricular progress but there has been no work looking specifically at co-curricular support for NTSE and their retention and persistence.

Literature Review

According to the most recent data from NCES (2015), nontraditional students' (NTS) comprised between 70% to 75% of the undergraduate student population between 1995 to 2012 [4]. Although there are a range of ways in which NTS are defined Horn [5] has proposed a comprehensive definition that includes enrollment criteria, financial and family status, and high school graduation status. Overall, the seven characteristics specifically associated with nontraditional students are: (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. Table 1 shows these seven characteristics for both public 4-year institutions and engineering and engineering technology undergraduates across all institutional types. In relation to the seven characteristics of NTS status, there are varying degrees to which a student is nontraditional. They are considered minimally nontraditional if they have one of seven characteristics, moderately nontraditional if they have two or three of the seven, and highly nontraditional with four or more characteristics. From the most recent NCES (2015) data the proportion of students across all institution types that have 'zero' characteristics are 26%, 'one' characteristic are 19%, 'two or three' characteristics are 31%, and 'four or more characteristics' are 24% [4]. Of the students in engineering or engineering technology bachelor degree programs, 64.5% have at least one NTS characteristic, and 14.3% have four or more characteristics (Table 1). The three most prominent characteristics are delayed enrollment (43.3%), part-time enrollment (44.4%), and did not receive a standard high-school diploma (40.6%), Table 1.

Nontraditional students who enroll in college to obtain a degree are less likely than traditional students to complete a degree or remain enrolled after five years [5]. Nontraditional students are also twice as likely (27% vs. 14%) to leave college within their first-year compared to traditional students [5]. There are many issues that nontraditional students encounter as they navigate jobs, families, and academics that their traditional student counterparts do not face including childcare, class scheduling because of work, and a lack of nontraditional student organizations and peer networking opportunities, among others [7,8,9]. It is important to examine nontraditional characteristics not only because of the high volume of students but also because they can be vulnerable to challenges that can affect their well-being, levels of stress, and satisfaction [10,11].

Table 1: Nontraditional Student Characteristics [4]

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) Finanical 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%

Persistence is a key concern with nontraditional students primarily because of the additional stresses such as finances, family obligations, and work [12,13]. However, family status has both a positive and negative effect on nontraditional students [14]. Having a positive support system gives nontraditional students increased intrinsic motivation over traditional students [15]. But if

time management is not a skillset for a nontraditional student, the added commitment to school may be too stressful for those with families [12,13]. Of the highly nontraditional students who thought of themselves as students first, many found that work was a limiting factor for class and scheduling options [6]. This diversity of concerns is one indicator that it is important to have the proper support structures in place to help nontraditional students to be successful.

The nonacademic barriers that nontraditional students face is a critical element to understand so that they can be best supported for success by providing the right support. Unfortunately, many nontraditional students feel isolated and unsupported when seeking academic assistance [9,16]. Having connections with faculty is important for nontraditional students [17] and those collaborations with faculty makes the learning more enjoyable for nontraditional students [18], yet those enrolled part-time will have fewer interactions with faculty and peers [13]. Faculty felt the same way connecting with nontraditional students as they reported positive perceptions of nontraditional students [19]. However, faculty have limited time and are not always aware of all the support available to students. Therefore, leveraging institutional resources, providing access, awareness, and encouragement may impact nontraditional student success regardless of the specific NTS characteristics of the student.

Theoretical Framework

We ground our work in the Model of Co-Curricular Support (MCCS) [20] which posits that there exist four main areas in which students become integrated and educationally engaged within college and university support systems. More importantly, the MCCS suggests it is the role of the institution to provide the necessary support for integration. If students are aware and have access to resources, which lead to their success, then they will integrate into the university environment at higher rates than those students who are not aware and have access to those resources. The MCCS (Figure 1) builds off Tinto's model of institution departure [21] and contains four main areas which are Academic, Social, Professional, and University Integration (AI, SI, PI, and UI). The model represents the process by which students participate in inputs (e.g., programs, services, activities) to experience outputs (e.g., academic performance, faculty/staff interactions, extracurricular involvement, peer-group interactions, professional development, special circumstances) and obtain outcomes (e.g., AI, SI, PI, UI) so they can achieve objectives (e.g., degree progress, academic achievement, career attainment).

Academic integration includes academic performance and faculty/staff interactions. Students experiencing positive academic performance and interactions with faculty and staff achieve positive academic integration. Social integration includes extracurricular involvement and peer-group interactions, leading to positive social integration. Professional integration refers to the professional development activities, which students participate in that lead to successful professional integration. University integration refers to the services provided by the university which students utilize and leads to becoming a part of the university.

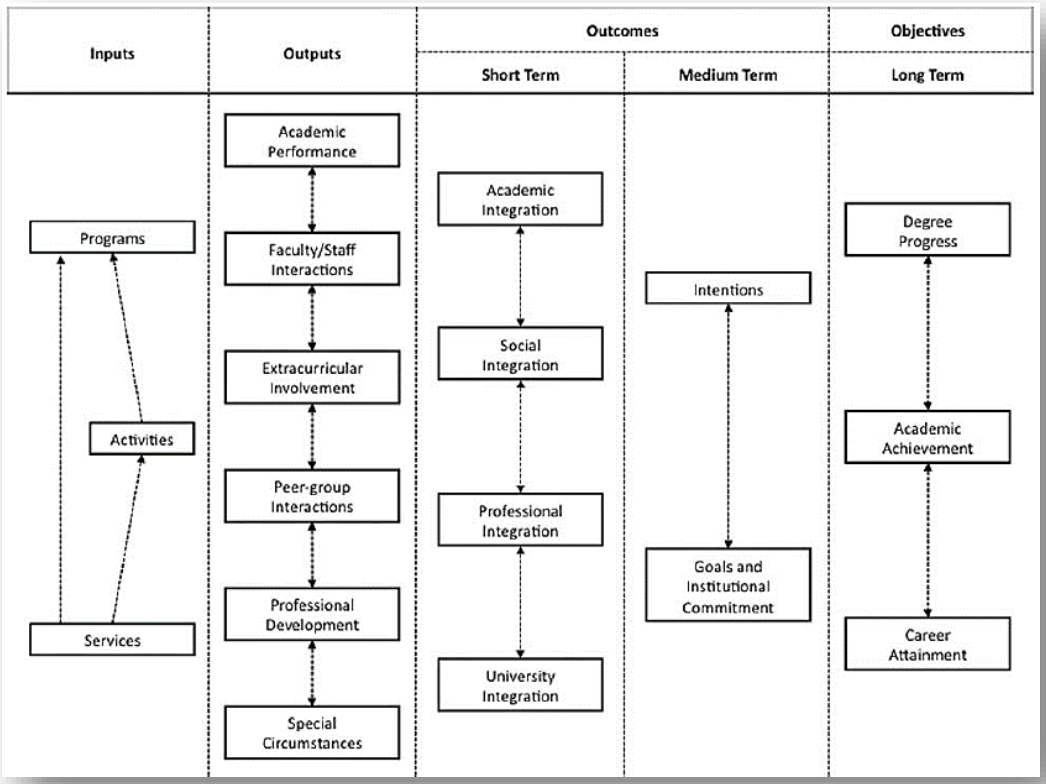


Figure 1: Model of Co-Curricular Support [20]

Tinto's model of institutional departure was developed to understand why students, in general, depart from college: it is not specific to the engineering fields. Lee and Matusovich's MCCS adds increased insight about how to support students seeking engineering degrees and how that support helps to achieve graduation. Developed through multi-case studies supported by qualitative investigations, Lee and Matusovich [20] have been able through the MCCS to add two valuable short-term outcomes – professional and university integration – valuably extending Tinto's model (of Academic and Social integration). However, there has been no systematic review and understanding of whether nontraditional students in engineering receive the same or varying levels of support, and how that support, or lack thereof, influences their path to successfully integrate into the university environment thus we begin the work to understand the interactions of nontraditional students in engineering.

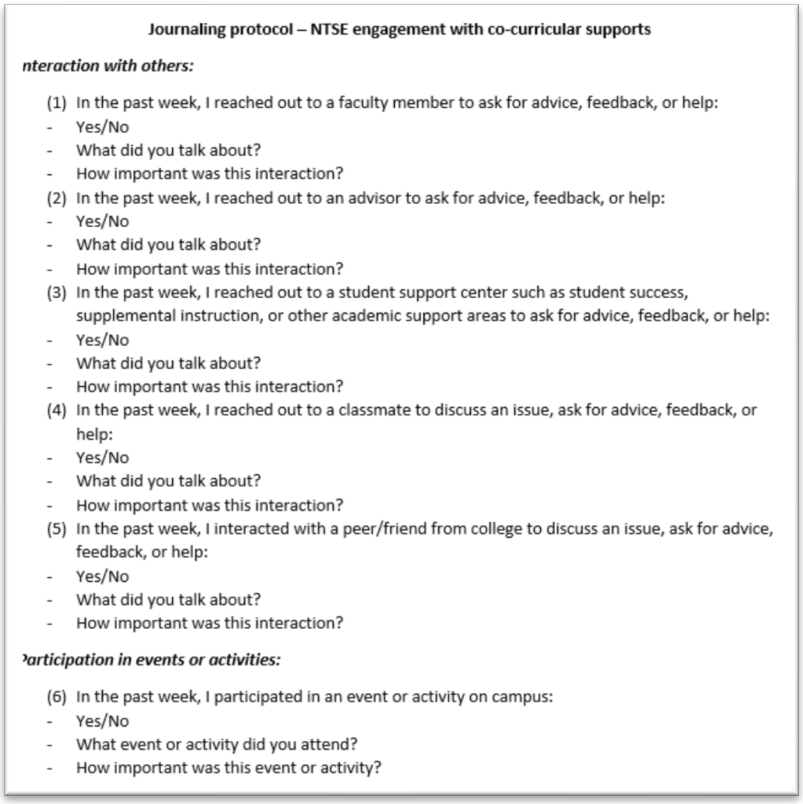
This research study focuses on answering one research question: How do NTSE engage with co-curricular supports as they progress through their degree programs?

Research Study

Methods

To better understand students ongoing need for support, we used a reflective journaling method, akin to a diary method for data collection. Our goal was to understand students' need as well as actions for seeking help throughout the semester. To create our reflective data collection instrument, we leveraged the MCCS model discussed earlier to come up with the prompts for the participants. Each of the 'Outputs' in Figure 1 were used to create the journaling prompts to understand how students engage, or not, with various supports. In Figure 2, the reflective prompts asked whether or not students engaged within a particular support mechanism during the past week and to provide more details on the interaction, or why they did not participate in such an interaction.

The advantages of using such an instrument allow for students to recall within a specific timeframe if they engaged in any type of support and to give deep insights as to the outcomes of those interactions. By providing the instrument multiple times throughout the semester we are able to obtain a snapshot into the life of a NTSE not just one instance and not having to ask students to recall long durations. The main limitation of the instrument is the dependence on the details of the reflections that students provide. If students provide limited details about their engagement with co-curricular supports then the analysis and results will also be severely limited.



Journaling protocol – NTSE engagement with co-curricular supports

nteraction with others:

(1) In the past week, I reached out to a faculty member to ask for advice, feedback, or help:
- Yes/No
- What did you talk about?
- How important was this interaction?

(2) In the past week, I reached out to an advisor to ask for advice, feedback, or help:
- Yes/No
- What did you talk about?
- How important was this interaction?

(3) In the past week, I reached out to a student support center such as student success, supplemental instruction, or other academic support areas to ask for advice, feedback, or help:
- Yes/No
- What did you talk about?
- How important was this interaction?

(4) In the past week, I reached out to a classmate to discuss an issue, ask for advice, feedback, or help:
- Yes/No
- What did you talk about?
- How important was this interaction?

(5) In the past week, I interacted with a peer/friend from college to discuss an issue, ask for advice, feedback, or help:
- Yes/No
- What did you talk about?
- How important was this interaction?

articipation in events or activities:

(6) In the past week, I participated in an event or activity on campus:
- Yes/No
- What event or activity did you attend?
- How important was this event or activity?

Figure 2: Reflective journaling prompts

Data Collection

For this research study we recruited students to participate in reflective journaling entries throughout the Fall 2021 semester. The study site is a mid-size university in the Midwest with 8 ABET accredited engineering and engineering technology programs where a majority of students commute. The first step in recruitment was to send out a survey form for students to opt-in if they wanted to participate. The survey form asks questions pertaining to their academic level, engineering or engineering technology major, and to check any boxes pertaining to their nontraditional characteristics. The survey form was sent to over 800 undergraduate students in engineering and engineering technology in which 86 completed the form. We narrowed down the selection to 12 students who had nontraditional student characteristics. One student dropped out of the study less than halfway through thus we report our findings on 11 nontraditional students in engineering. Students received a monetary incentive to participate in the study. Table 2, below, depicts the description of the study participants including a range for their GPA instead of the actual value to leave some anonymity.

Table 2: Description of study participants

ID	Identity	Academic Level	Major	Fall 2021 GPA Range	Delayed	Part-Time	Fin Ind	FT Employ	Dependents	Single Parent	Non-HS	NST Sum
8	Female	Freshman	First-Year Engineering	3.5-4.0			1					1
20	Male	Junior	Engineering Technology (Associate Degree)	3.5-4.0	1		1	1				3
22	Male	Senior	Electrical Engineering	3.0-3.49				1			1	2
31	Female	Sophomore	Civil Engineering	2.50-2.99			1	1	1			3
37	Male	Sophomore	Chemical Engineering	3.0-3.49			1	1	1			3
46	Male	Junior	Mechanical Engineering	3.0-3.49				1				1
48	Male	Sophomore	Electrical Engineering	0-1.99	1		1	1				3
50	Male	Sophomore	Engineering Technology (Associate Degree)	3.5-4.0	1	1	1	1	1			5
61	Female	Junior	Civil Engineering	3.5-4.0			1		1			2
77	Female	Senior	Electrical Engineering	3.5-4.0			1					1
86	Female	Junior	Mechanical Engineering	2.0-2.49			1					1

During the Fall 2021 semester study participants completed five journal reflections during the following times: (1) Week 1 Oct 10th, (2) Week 2 Oct 24th, (3) Week 3 Nov 7th, (4) Week 4 Nov 21st, and (5) Week 5 Dec 5th. The first reflective journal included prompts asking students about their expectations for the semester overall and in regard to their expected interactions and/or challenges engaging with the following categories: (1) faculty, (2) advisors, (3) student support,

(4) classmates, (5) peers/friends, and (6) campus events or activities. The following four weeks of prompts asked students if they reached out to or participated with any of those six categories listed previously, and then to expand upon the interaction or lack thereof, as well as detail the importance of the engagement, or not engaging. Figure 2 below, shows the reflective journaling protocol used for weeks two through five.

Data Analysis

For the analysis of this study, we focus on the engagement of the study participants within the six categories listed above and if there was an interaction whether it was positive, neutral, or negative. To determine if the interaction was positive, neutral, or negative one researcher coded each interaction as such and the additional researcher checked for agreement. The process continued until there was 100% agreement on the response code. Nonetheless, we are aware that there is some subjectivity in the coding process and in future work we plan to ask the participants themselves to mark their interpretation of the interactions.

Findings

Table 3 shows a list of the participants along with each of the four weeks grouped by the six co-curricular support categories and if they engaged that week, marked by a yes or no, with the support mechanism. The majority of study participants consistently interacted with classmates and faculty the most, and to a lesser extent but still often peers and friends. Advisor interactions mostly occurred within Week 3, which was when students were required to visit their advisor for course scheduling purposes. Student support and campus activity involvement were by far the least utilized resource used by the participants.

Table 4 shows when an interaction occurred, if it was considered *positive*, *neutral*, or *negative*. Of the limited campus and event involvement that the study participants participated in, all eight were considered a positive outcome. The classmate and friend/peer interactions were mostly positive with some considered neutral, such as when they were purely transactional. The student support involvement and advisor interactions were mostly positive, with some neutral, and one negative outcome. The interactions that was most controversial with an even spread of positive, neutral, and negative were when the study participants engaged with faculty members outside of the classroom, either via email, office hours, or other instances.

Table 5 shows three sample quotes, one each of the positive, neutral, and negative coded responses. Our future work will analyze the responses to give greater context to how interacting with the different support systems was important or not to students. But showing these samples will give a glimpse to how students responded to the open-ended portion of the reflective prompts. Table 5 is indicative of responses across all participants.

Table 3: Heat map of study participant co-curricular support interactions

	Faculty Interactions			
	Week 2	Week 3	Week 4	Week 5
ID 8	No	Yes	Yes	Yes
ID 20	Yes	Yes	Yes	Yes
ID 22	Yes	No	Yes	Yes
ID 31	No	No	No	No
ID 37		No	Yes	Yes
ID 46	Yes	Yes	Yes	Yes
ID 48	Yes	Yes	No	Yes
ID 50	Yes	No	Yes	No
ID 61	Yes	Yes	Yes	Yes
ID 77	Yes	Yes	Yes	Yes
ID 86	Yes	Yes	Yes	No

	Advisor Interactions			
	Week 2	Week 3	Week 4	Week 5
ID 8	No	Yes	No	No
ID 20	No	Yes	No	No
ID 22	No	Yes	No	Yes
ID 31	Yes	Yes	No	No
ID 37		Yes	Yes	Yes
ID 46	Yes	No	No	No
ID 48	No	Yes	Yes	No
ID 50	No	Yes	No	No
ID 61	Yes	No	No	No
ID 77	No	Yes	No	Yes
ID 86	No	Yes	No	No

	Student Support Involvement			
	Week 2	Week 3	Week 4	Week 5
ID 8	No	No	No	No
ID 20	Yes	Yes	No	Yes
ID 22	No	No	No	No
ID 31	No	No	No	No
ID 37		No	No	No
ID 46	No	No	No	No
ID 48	Yes	No	No	No
ID 50	No	No	No	No
ID 61	No	No	No	No
ID 77	No	No	No	No
ID 86	No	Yes	No	No

	Classmate Interactions			
	Week 2	Week 3	Week 4	Week 5
ID 8	No	No	No	Yes
ID 20	Yes	Yes	Yes	Yes
ID 22	Yes	Yes	Yes	No
ID 31	No	Yes	No	Yes
ID 37		Yes	Yes	Yes
ID 46	Yes	Yes	Yes	Yes
ID 48	Yes	Yes	Yes	Yes
ID 50	No	No	No	No
ID 61	Yes	Yes	Yes	Yes
ID 77	Yes	Yes	Yes	Yes
ID 86	Yes	Yes	Yes	Yes

	Friend/Peer Interactions			
	Week 2	Week 3	Week 4	Week 5
ID 8	Yes	Yes	No	No
ID 20	Yes	Yes	Yes	Yes
ID 22	Yes	Yes	Yes	Yes
ID 31	No	No	No	Yes
ID 37		No	No	No
ID 46	Yes	Yes	Yes	Yes
ID 48	Yes	Yes	Yes	Yes
ID 50	No	No	No	No
ID 61	No	Yes	Yes	No
ID 77	Yes	Yes	Yes	No
ID 86	Yes	No	Yes	Yes

	Campus/Event Involvement			
	Week 2	Week 3	Week 4	Week 5
ID 8	Yes	Yes	No	No
ID 20	Yes	No	No	No
ID 22	Yes	No	No	No
ID 31	No	No	No	No
ID 37		No	No	No
ID 46	No	No	No	No
ID 48	Yes	Yes	No	No
ID 50	No	No	No	No
ID 61	No	Yes	Yes	No
ID 77	No	No	No	No
ID 86	No	No	No	No

Table 4: Response codes if an interaction occurred

	Faculty Interactions			
	Week 2	Week 3	Week 4	Week 5
ID 8		Positive	Positive	Positive
ID 20	Positive	Neutral	Positive	Neutral
ID 22	Negative		Negative	Negative
ID 31				
ID 37			Neutral	Neutral
ID 46	Neutral	Neutral	Positive	Positive
ID 48	Neutral	Positive		Negative
ID 50	Positive		Positive	
ID 61	Neutral	Negative	Positive	Positive
ID 77	Positive	Positive	Positive	Positive
ID 86	Neutral	Negative	Negative	

	Advisor Interactions			
	Week 2	Week 3	Week 4	Week 5
ID 8		Positive		
ID 20		Neutral		
ID 22		Neutral	Neutral	Positive
ID 31	Neutral	Positive		
ID 37		Neutral	Neutral	Neutral
ID 46	Positive			
ID 48		Positive	Neutral	
ID 50		Positive		
ID 61	Negative			
ID 77		Positive		Neutral
ID 86		Neutral		

	Student Support Involvement			
	Week 2	Week 3	Week 4	Week 5
ID 8				
ID 20	Positive	Positive		Positive
ID 22				
ID 31				
ID 37				
ID 46				
ID 48	Neutral			
ID 50				
ID 61				
ID 77				
ID 86		Negative		

	Classmate Interactions			
	Week 2	Week 3	Week 4	Week 5
ID 8				Positive
ID 20	Positive	Positive	Positive	Positive
ID 22	Neutral	Positive	Neutral	
ID 31		Positive		Positive
ID 37		Neutral	Neutral	Neutral
ID 46	Neutral	Neutral	Positive	Positive
ID 48	Neutral	Positive	Neutral	Positive
ID 50				
ID 61	Positive	Positive	Positive	Positive
ID 77	Positive	Positive	Positive	Positive
ID 86	Positive	Positive	Positive	Positive

	Friend/Peer Interactions			
	Week 2	Week 3	Week 4	Week 5
ID 8	Positive	Positive		
ID 20	Neutral	Positive	Positive	Positive
ID 22	Positive	Positive	Positive	Positive
ID 31				Positive
ID 37				
ID 46	Neutral	Neutral	Neutral	Positive
ID 48	Neutral	Positive	Neutral	Positive
ID 50				
ID 61		Positive	Neutral	
ID 77	Positive	Positive	Neutral	
ID 86	Positive		Positive	Neutral

	Campus/Event Involvement			
	Week 2	Week 3	Week 4	Week 5
ID 8	Positive	Positive		
ID 20	Positive			
ID 22	Positive			
ID 31				
ID 37				
ID 46				
ID 48	Positive	Positive		
ID 50				
ID 61		Positive	Positive	
ID 77				
ID 86				

Table 5: Sample quotes from students

Positive Interaction--Classmate	Neutral Interaction--Advisor	Negative Interaction--Faculty
I reached out to one of my classmates to study with them for an upcoming test. I think this is very important because hearing someone else's perspective on something is very beneficial. I honestly feel like this is one of the most beneficial things that can be done while attending college.	Yes, i have reached out through email with the 'Major' Engineering advisor for advisement on classes next semester and classes moving forward. I wanted to be sure that I was on track to graduate in Spring X and if I was taking the right classes next semester.	I was reaching out to seek a substitution for a 'Major' elective, so I could fit my schedule better next semester, and take class more pertinent to my career. This interaction was very important and very disappointing, since I was given no reason for denying my request.

Discussion

The Model of Co-Curricular Support [20] depicts academic performance, faculty/staff interactions, extracurricular involvement, peer group interactions, professional development, and other circumstances as critical areas of engagement for institutions to take into consideration for supporting students. However, as the model was developed based off research from traditional universities, it may not be indicative of the support needed for nontraditional students in engineering. Below we highlight areas of interest pertaining to the results of analyzing the reflective journaling prompts of 11 nontraditional students in engineering and how they engage with co-curricular support mechanisms, which answer our research question posed.

Who students interact with the most

We found that students interact most with faculty, classmates, and their friends and peers. Given that many NTSE students relate to their academic institutions primarily through the courses they take, it is not surprising that the constituents they interact with most are those who are also part of their courses. In particular, if students work in group projects as part of their coursework, they are highly likely to interact with those students for group work, and also on other academic matters.

Lack of interaction with campus events, student support, and advisors

One of the major investments that many universities are currently making is in support staff and structures for students. These include student support services, advising support, and even coaching. Findings from our study show that NTSE students rarely use these services and the availability of these services, especially if they are on campus, are not necessarily beneficial to this student population.

Negative outcomes with faculty members

In terms of the quality of interactions, participants reported many negative outcomes as a consequence of their interaction with faculty members. Primarily, they did not receive the help or supported they expected to get from the faculty. Although we do not have enough data to make any generalizations, this finding alerts us to the fact that there is an incongruency, at least, in what students expect from faculty interactions and the reality of those interactions. As shown in Table 5 above students want to be treated as a professional and given clarity on important decisions effecting their academic pathway.

The limiting factor—time

Not surprisingly, one of our findings confirms what has previously been shown to be a major issue with student success for NTSE – the lack of time. What we find though, looking at our student characteristics, is that it is not the lack of time per se but their ability to manage different aspects of their lives that is difficult for students [22]. There is a cost to switching from one task to another, as has been well established in the literature, and we see a similar pattern. Our sample is too small to draw any major conclusions but the lack of participation by students in events on campus or just their overall lack of identification with campus is an indicator of their need to manage other aspects of their lives. Students mainly want to do what they need to do and be on their way.

Using theory and models from traditional student support for NTSE

Finally, findings from this research alert us to the deficiencies of applying models from research on traditional students' support systems, such as the Model of Co-Curricular Support, to those of NTSE. We found that for many students who were performing well in their studies, the use of support systems was low or absent. Therefore, we hypothesize that more than the student support and other opportunities that are present, the ability to manage their time as well as to select the right kind of support is more important. Prior work has shown that engineering students use of

time is an important factor in their success [23,24]. The opportunity cost of using support systems might be too high for some NTSE students and therefore they might need a different kind of support.

Limitation: The study was conducted during the COVID pandemic and therefore some of the findings are influenced by that. During the time we collected the data though, teaching was on campus.

Conclusion

We present findings from a study of nontraditional students in engineering where we examined their interactions with faculty, peers, classmates, and support services in their institution. Our primary goal was to identify what kind of supports NTSE use and what is the nature of their interactions. We found that participants in our study primarily reached out to faculty, peers, and classmates for help and not to formal support services. We hypothesize that given the time constraints under which these students undertake their studies, it is important to think beyond traditional support systems and related infrastructure to more strongly support NTSE. More research is needed to identify what kinds of theories and models might be more appropriate for NTSE support.

Acknowledgment

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

References

1. National Academy of Engineering (NAE) (2005). Educating the engineer of 2020: Adapting engineering education to the new century. National Academies Press, Washington D.C.
2. Lowell, B. L., & Salzman, H. (2007). Into the eye of the storm: Assessing the evidence on science and engineering education, quality, and workforce demand. Washington, DC: Urban Institute.
3. AAAS (2017). The Future of Undergraduate Education: The Future of America. Available at: https://www.amacad.org/sites/default/files/publication/downloads/Future-of-Undergraduate-Education.pdf
4. *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
5. *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.*

6. 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.
7. 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.
8. Choy, S. (2002). Nontraditional Undergraduates (NCES 2002-012). National Center for Education Statistics, U.S. Department of Education. Washington, DC.
9. 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
10. 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.
11. 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.
12. Forbus, P., Newbold, J. J., & Mehta, S. S. (2011). A study of non-traditional and traditional students in terms of their time management behaviors, stress factors, and coping strategies. Proceedings of the Academy of Leadership, 15(2), 67–71.
13. Taniguchi, H., & Kaufman, G. (2005). Degree completion among nontraditional college students. Social Science Quarterly, 86(4), 912–927. https://doi.org/10.1111/j.0038-4941.2005.00363.x
14. Crone, T., Babb, S., & Torres, F. (2020). Assessing the relationship between nontraditional factors and academic entitlement. *Adult Education Quarterly,* 70(3) pgs.277-294.
15. Taylor, J., & House, B. (2010). An exploration of identity, motivations, and concerns of non-traditional students at different stages of higher education. *Psychology Teaching Review*, 16(1), 46–57.
16. Meuleman, A., Garrett, R., Wrench, A., & King, S. (2015). "Some people might say I'm thriving but . . .": Non-traditional students' experiences of university. *International Journal of Inclusive Education*, 19(5), 503–517. https://doi.org/10.1080/13603116.2014.945973
17. Lundberg, C. A. (2003). The influence of time-limitations, faculty, and peer relationships on adult student learning: A causal model. *Journal of Higher Education*, 74(6), 665–688. https://doi.org/10.1353/jhe.2003.0045
18. Bye, D., Pushkar, D., & Conway, M. (2007). Motivation, interest, and positive affect in traditional and nontraditional undergraduate students. *Adult Education Quarterly*, 57(2), 141–158. https://doi.org/10.1177/0741713606294235
19. Brinthaupt, T. M., & Eady, E. (2014). Faculty member's attitudes, perceptions, and behav-iors toward their nontraditional students. *Journal of Continuing Higher Education*, 62(3), 131–140. https://doi.org/10.1080/07377363.2014.956027
20. Lee, W. C., & Matusovich, H. M. (2016). A model of co-curricular support for undergraduate engineering students. *Journal of Engineering Education, 105*(3), 406-430.
21. Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: The University of Chicago Press.
22. Karim, S., & Kandy, M. (2011). Time management skills impact on self-efficacy and academic performance. *Journal of American Science*, 7(12), 720-726.

23. Brozina, C., Knight, D.B., Kinoshita, T., & Johri, A. (2019). Engaged to succeed: Understanding first-year engineering students' course engagement and performance through analytics. *IEEE Access*, 7,163686-163699.
24. Brozina, C., Johri, A., & Naderi, N. (2019). Engineering time: Learning analytics initiative to understand how first-year engineering students spend their time. *ASEE Conference, Tampa FL.*