A Quantitative Exploration of Geographic and Demographic Variance Transfer-Student Capital Assets and Support for Pre-Transfer Engineering Students

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A Quantitative Exploration of Geographic and Demographic Variability in Transfer Student Capital Assets and Supports for Pre-Transfer Engineering Student

1. Introduction

Students beginning their higher education at community colleges transfer and graduate at alarmingly low rates despite the fact that over 80 percent intend to transfer [1]. In fact, on average, of every 100 degree seeking community college students only 31 actually transfer to a four-year institution and of those students only 14 earn a bachelor's degree in six years [1]. And as alarming as these numbers appear, they are lower for low income and students of color who are less than twice as likely to transfer and are more likely to experience credit loss post-transfer [1], [2], [3]. These numbers and disparities have become even worse since the pandemic where vertical transfer rates have decreased by 11.5 percent and students older than 21 and in underrepresented minority groups continue to struggle with transfer at disproportionate rates to their White student counterparts [1]. In addition, location can also impact transfer outcomes because geographic location directly impacts income, assets, educational attainment and individual life outcomes which can create a geography of limitation or a "geography of opportunity" for transfer students living throughout different regions [4], [5].

Within the field of engineering, the challenges are even more pronounced, and the transfer students are fewer due to tight curriculum programs and prerequires [6], [7]. While research on engineering transfer students is emerging, most of the research focuses on post-transfer students and there is a gap in understanding of pre-transfer engineering students. In addition to this gap, there is little understanding of the geographic and demographic variability in transfer assets of pre-transfer engineering students. Transfer student capital (TSC), a framework which identifies constructs designed to improve transfer student success, is the theoretical framework which guides this research study [6], [8], [9], [10]. This quantitative study sought to understand how pre-transfer engineering students perceived the extent to which they possessed the factors or attributes required to improve TSC. Specifically, the research questions in the study were:

- RQ1: What are assets, factors, and strategies that enable access for community college students to engineering transfer pathways?
- RQ2: Do assets, factors, and strategies vary in magnitude and/or presence across student demographics, location, institutions, or intention to transfer?

Exploring these research questions has the potential to broaden participation in engineering education and provide important pathways and transfer student capital supports for all students desiring to earn a bachelor's degree in engineering.

2. Review of Literature

The disparity between the large number of community college students desiring to transfer (80 percent), the number of students actually transferring (31 percent), and the number of students graduating (14 percent) is beguiling to researchers and practitioners alike [1]. Although much

research has been done in the area of vertical transfers (transfers from a two- to four-year institution [11]), these studies fail to satisfactorily answer why this disparity is occurring. Previous vertical transfer research has focused on post-transfer students [11], [12] failing to investigate underlying factors contributing to greater transfer success at the pre-transfer stage [9].

Regardless of transfer stage, pre- or post-transfer, prior studies have examined factors which make transfer to a four-year institution more challenging. Many nontraditional students, students who are older than 21 and/or have atypical student responsibilities, face balancing family obligations (including children and/or aging parents), work requirements (many working between 20 and 40 hours per week), financial demands, and many other dynamics which make higher education attainment more difficult especially when considering transfer to a baccalaureate institution [13]. Many studies have further identified areas of friction for all vertical transfer students which include longer commuting distances, since four-year institutions are not regionally placed for community access in the same way that community college are, cost of attendance, the transfer credit process and potential loss of credits post-transfer, and acclimating to a larger institution where they are unsure if faculty, staff, or students will make them feel welcome [14]. While many friction points have been identified for students transferring to four-year institutions, more research needs to be done which focuses on the assets that are available to transfer students and helps researchers and practitioners alike to aid students in better utilizing local assets which may be available to support their transfer success.

Students desiring to make a vertical transfer need strong support and advising to navigate the complex process [8]. Students who are studying in the engineering discipline transfer differently and benefit even more from pre-transfer preparation, yet existing research fails to provide adequate information on how to best support and increase engineering transfer success [7]. Engineering fields of study have curricular pathways that are more rigid and sequenced and students transferring into these fields need additional information, networks, and support to be successful in transferring [15].

3. Theoretical Framework

The theoretical framework utilized in this study is Laanan's theory of Transfer Student Capital [6]. This theory aims to explain how factors such as knowledge, resources, information, and support help to make students more successful in the transfer process and increase transfer student success [6]. The theory grew out of a need to move beyond the "transfer shock phenomenon" and to more deeply understand how to meaningfully measure transfer student knowledge, processes, and motivations during the transfer process [16]. The theory has been broadly and widely used and also adapted by new researchers in such a way that it has been accepted by the original research team [9], [10].Fundamentally, the theory seeks to operationalize and measure the complex social, academic, and transfer experiences of transfer students through examining multiple constructs which include: perceptions of the transfer process, academic advising support/experiences, learning and study skills, experiences and collaboration with faculty at the community college, faculty and staff validation, financial knowledge, motivation and self-efficacy, and social support [8], [9], [10], [17]. This theory is unique in its integration of various forms of capital which include human capital, social capital, community and cultural wealth, and experiential capital to name a few [9], [10], [18], [19], [20],

[21]. Prior research has unfortunately assumed that unsuccessful, disadvantaged, and/or underrepresented transfer students are absent or lacking in knowledge, qualities, experiences, and/or resources needed to be successful in the transfer process [18], [22], [23]. The shift from a deficit-based focus to weaving together forms of capital highlights one of the most significant strengths of this framework, which is the facilitation of an assets-based approach.

4. Methods

4.1 Participants

Three community college sites, located in a southeastern state, were included in this study. These colleges were selected because combined, they represent 90 percent of the community college transfer students in the state. Also, the combined counties (11) that these colleges serve make up 25 percent of all counties in the state. As shown in the table, the selected sites provide variability in enrollment size, location and rurality, economic makeup, and regional educational attainment. Additionally, all 11 counties served by these community colleges are below the national average for median household income, 10 counties are below national educational attainment averages, and seven counties are more racially diverse than the national average.

Table 1. Research Sites

Site	Enrollment	Counties Served/ Rural Counties[1]	Median Household Income[2]	Educational Attainment[3]	Percent Non-White[4]	Usable Survey Responses
A	~15,000	1/0	$61,162	44.3%	26.5%	26
B	~4,500	7/4	$47,215	29.11%	36.44%	13
C	~6,000	3/1	$50,354	35.43%	14.70%	22

[1]statsamerica.org, [2]National average $68,703, [3]Educational attainment represents percent of the population with some type of postsecondary degree (40.7% national average), [4]National 27% non-white, SC 33% non-white

Administrators at each community college were contacted and asked to identify students to survey who were in an engineering-related pipeline with intentions to transfer to a four-year institution and were in their first year of enrollment. Given the variability of degree offerings between the three community college sites, various engineering-related programs were selected. In total, 171 participants responded to this study's survey. After removing those who did not respond to the survey, failed one or more attention checks, and/or had less than 100 percent completion, there were 61 usable responses for analysis. Of these responses, 42 were White (68.9%), 18 were non-White (28.5%), and 1 did not disclose their race. As for the gender distribution, 36 respondents were male (59.0%), 23 were female (37.7%), and 2 were non-binary. In addition, 13 respondents were classified as first-generation college students (21.3%) because they identified both of their parents (or their single parent) as having less than some college, and 34 were classified as non-traditional students (55.7%) because they were either outside of the 18-22 age range, working more than 40 hours a week, or identified as a part-time student.

4.2 Instrumentation

The instrument for this study was developed through integrating three empirically validated surveys. The Laanan-Transfer Students' Questionnaire (L-TSQ) was the first instrument

developed to introduce the concept of and to measure transfer student capital [6]. This instrument contains 133 items and is organized into four major areas: background information, community college experiences, university experiences, and open-ended questions [6]. The second instrument is The Engineering Transfer Survey, developed as part of the National Science Foundation funded Understanding and Diversifying Transfer Student Pathways grant (EEC 1428502), [14], [20], [24]. The third instrument, was the Moser Transfer Student Questionnaire (M-TSQ) which includes new constructs (accepted by Laanan) of faculty and staff validation, financial mediators, and transfer motivation [9], [10]. However, none of these instruments examined the pre-transfer perspective as all were administered to post-transfer students. Also, only the engineering transfer survey provided the specific focus on the nuances of engineering transfer pathways. Thus, the combination of these instruments provided a strong basis to answer the specific research questions of this study. After combining items to create the new instrument, it was piloted with engineering education specialists and revised immediately following feedback from the pilot study. Significant survey changes included shortening the survey, clarifying confusing statements, and removing unnecessary or duplicative questions.

The final instrument for this study consisted of 82 items. The instrument begins with 14 demographic questions to collect data on participant location, age, gender, income, work experiences, and academic history (e.g., intent to transfer, number of credits earned, degree and/or certificates, and intended major). In addition eight constructs were included: transfer challenges (11 items), perceptions of the transfer process (13 items), course learning (6 items), experience with faculty (6 items), learning and study skills (10 items), faculty validation (7 items), staff validation (6 items), and financial mediators (3 items). These constructs were measured using 5-point Likert scale items ranging from 1 = Strongly Disagree to 5 = Strongly Agree. (1) Two attention check items were included to ensure that participants were fully engaging with the survey items. The survey concluded with a question ranking motivations for beginning at a community college and three open-ended questions asking what students need for transfer success, advice they would provide to other transfer students, and a question soliciting any additional information on the transfer process that the participant would like to share.

4.3 Data Collection

The research team entered all survey items into the online survey platform Qualtrics and then constructed an email which included the survey link. Administrators at each community college distributed the survey request email to the students at their institution who were identified as potential study participants. Students clicked the link in the email to complete the Qualtrics survey. Two weeks after the initial request to participate was sent, the administrators received an email to be sent to the students to encourage and remind them to participate in the survey. The research team monitored completion of the surveys using the Qualtrics online survey platform.

4.4 Analysis

To address RQ1, responses were aggregated across items in each of the eight assumed factors. Descriptive statistics were used to compare the mean responses across the factors on a 5-point scale. Ideally, inferential comparisons across factors would also be made; however, even though these subscales originated from previously validated surveys in

engineering education, their factor structure when operating as one scale for TSC has not been tested. Without an adequate sample size for a factor analysis, comparisons across the assumed factors made here were restricted to being descriptive in nature.

To address RQ2, differences in the item response distributions across five student characteristics were considered: gender, race/ethnicity, first-generation college student status, traditional vs non-traditional student status, and type of institution. Again, because of uncertainty in the assumed factor structure, inferential comparisons were done item-by-item rather than at the factor level. Tests of association appropriate for ordinal-level data were used to determine significant differences in item response distribution by the five student characteristics listed above, and results were grouped across the eight assumed factors. In cases where the associated two-way table had more than 20% of cell counts less than 5, Fisher's Exact Test was used to obtain *p*-values in place of the typical parametric chi-squared test of association. Results that were statistically significant at the 5% level are reported in the findings section.

5. Findings

5.1 Transfer Student Capital Factors

All of the assumed transfer student capital factors had a mean score above neutral (>3; Figure 1). Across all factors, the highest mean (M = 4.47, SD = 0.54) was course learning. Students mostly strongly agreed with items across this factor which describes actions transfer students took within their courses at their two-year institutions. The transfer challenges had the lowest mean (M = 3.25, SD = 0.69), with students only slightly agreeing with items pertaining to challenges they experienced in their time transferring.

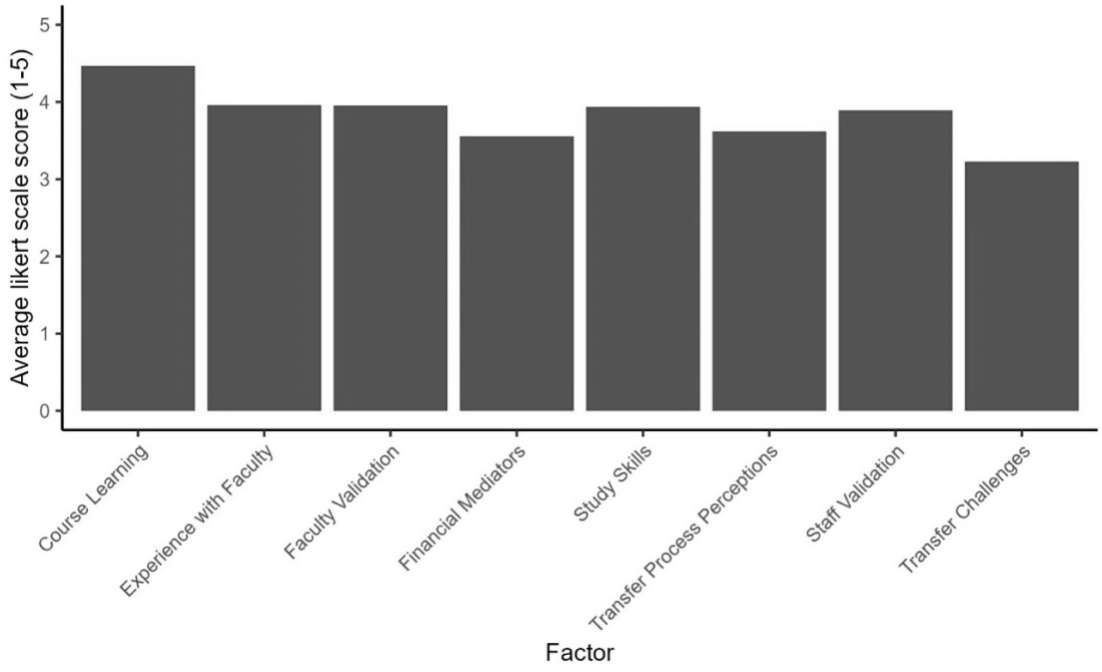

Figure 1. Average Likert scores between Transfer Student Capital factors

5.2 Transfer Challenges

As seen in Table 2, within the transfer challenges factor, one item (long commutes to the transfer institution) showed statistically significant differences in proportions of responses by two-year institution (p = .023), gender (p = .037), and traditional student status (p = .034). Males, individuals from Site B, and non-traditional students indicated proportionally stronger levels of agreement with long commutes as barriers. Students at Site B and non-traditional students also indicated proportionally higher levels of agreement with the need to quit or reduce working hours as a barrier to transferring (p = .039, p = .002; respectively).

Table 2. Item Breakdown for Transfer Challenges Factor

	Response Distribution					Test of Association p-value				
Transfer Challenges Item	SA	A	N	D	SD	Gender	Race	First-Gen	Trad. Stud.	Type of Inst.
Long commutes	17	5	14	15	10	**.037**	.490	.748	**.034**	**.023**
Need to reduce work hours	15	11	11	12	12	.811	.712	.410	**.002**	**.039**
Family obligations	23	12	9	11	6	.437	.401	.591	.182	.069
Work/life balance	21	8	11	16	5	.226	.536	.917	.090	.165
English language skills	51	2	6	1	1	.843	.303	.104	.581	.649
Attendance cost	7	6	6	15	27	.500	.391	.447	.267	**.048**
Academic expectations	8	4	16	26	7	.523	.610	.913	.491	.171
Transferring credits	4	5	14	30	8	.609	.443	.741	.819	**.047**
Large school size	17	18	18	7	1	.503	.892	.375	.325	.171
Feeling welcome by faculty/staff	20	10	15	11	5	.138	.171	**.030**	.739	.308
Competition between students	19	10	19	8	5	.618	.180	.584	.230	.945

SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree. Numbers within the Likert scale columns indicate the number of responses. P-values for either chi-squared analyses or fisher's exact tests are reported for each categorical variable. Bolded items indicate significant results.

5.3 Perceptions of the Transfer Process

Significant differences in the proportion of responses by gender existed for three items within the perceptions of the transfer process construct (Table 3). These included research about the environment and academic expectations of the four-year institution (p < .001), visiting the four-year institution (p = .023), receiving consistent information between two-year institution and four-year institution advisors (p = .034), and knowing what to expect academically from the four-year institution (p = .028). For all four items, females indicated proportionally higher levels of agreement than males. Significant differences in the proportion of responses by first-generation student status also existed for finding information on the general transfer process at the four-year institution (p = .038), with non-first-generation students having stronger level of agreements than first-generation students.

Table 3. Item Breakdown for the Perceptions of the Transfer Process Factor

	Response Distribution					Test of Association *p*-value				
Perceptions of the Transfer Process Item	SA	A	N	D	SD	Gender	Race	First-Gen	Trad. Stud.	Type of Inst.
Understanding transfer requirements	24	21	8	5	3	.132	.459	.913	.807	.367
Researching environment/ academic expectations	23	20	8	8	2	**<.001**	.452	.550	.252	.726
Understanding academic expectations	25	19	7	7	3	**.029**	.406	.872	.255	.444
Visiting four-year campus	30	12	8	5	6	**.020**	.575	.071	.115	.097
Visiting four-year admissions office	19	13	11	10	8	.549	.578	.293	.300	.370
Advisors identifying essential courses	23	15	7	6	10	.091	.809	.380	.908	.100
Advisors providing helpful transfer information	27	18	2	5	9	.115	.769	.348	.651	.391
Speaking to academic counselors about transferring	15	12	10	13	11	.275	.093	.101	.903	.567
Understanding transfer advice from advisors	26	19	12	3	1	.244	.137	.235	.883	.426
Speaking to former transfer students	13	12	12	7	17	.088	.222	.131	.507	.298
Consistent information between advisors	15	14	19	7	6	**.039**	.668	.885	.434	.302
Ease of finding transfer information	14	22	10	10	5	.110	.382	**.038**	.379	.090
Ease of finding engineering transfer information	13	21	16	7	4	**.036**	.806	.091	.156	.691

SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree. Numbers within the likert scale columns indicate the number of responses. P-values for either chi-squared analyses or fisher's exact tests are reported for each categorical variable. Bolded items indicate significant results.

5.4 Experience with Faculty

For the experience with faculty factor, two items contained significant differences in the proportions of responses by gender (Table 4). These two items included visiting informally and briefly with an instructor after class (p = .012) and asking an instructor for information related to a course (p = .032). The proportion agreement for both items were higher for females than males.

Table 4. Item Breakdown for the Experience with Faculty Factor

	Response Distribution					Test of Association *p*-value				
Experience with Faculty Item	SA	A	N	D	SD	Gender	Race	First-Gen	Trad. Stud.	Type of Inst.
Visited faculty & sought advice	16	20	7	8	10	.373	.636	.639	.529	.955
Felt comfortable approaching faculty	28	16	13	4	0	.068	.817	.546	.244	.442
Asked instructor for course info	36	17	3	3	2	**.032**	.114	.874	.576	.369
Informally visited instructor	29	20	5	2	5	**.012**	.138	.912	.835	.840
Discussed career plans w/ instructor	23	17	9	7	5	.737	.102	.604	.625	.792
Asked instructor to critique work	28	18	6	8	1	.756	.202	.980	.702	.922

SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree. Numbers within the likert scale columns indicate the number of responses. P-values for either chi-squared analyses or fisher's exact tests are reported for each categorical variable. Bolded items indicate significant results.

5.5 Learning and Study Skills

As seen in Table 5, one item in the learning and study skills factor (mathematical skills) displayed significantly different proportions in responses by gender (p = .005), race/ethnicity (p = .017), and first-generation student status (p = .008). First-generation college students had proportionally stronger levels of agreement than non-first-generation students; male students had proportionally stronger levels of agreement than female students.

Table 5. Item Breakdown for the Learning and Study Skills Factor.

	Response Distribution					Test of Association *p*-value				
Learning and Study Skills Item	SA	A	N	D	SD	Gender	Race	First-Gen	Trad. Stud.	Type of Inst.
Computer skills	27	15	11	6	2	.305	.072	.724	.540	.817
Mathematical skills	26	18	9	8	0	**.005**	**.017**	**.008**	.636	.554
Note taking skills	20	16	18	6	1	.203	.073	.064	.609	.381
Problem solving skills	30	22	7	1	1	.454	.277	.063	.555	.180
Reading skills	21	21	14	1	3	.108	.187	.601	.173	.179
Research skills	21	25	12	1	2	.212	.118	.223	.514	.713
Speaking and oral presentation	26	16	12	6	1	.885	.052	.916	.833	.079
Test taking skills	13	21	17	6	4	.855	.054	.762	.144	.706
Time management skills	20	28	8	4	1	.066	.810	.330	.737	.678
Writing skills	19	21	17	1	3	.100	.899	.821	.336	.595

SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree. Numbers within the likert scale columns indicate the number of responses. P-values for either chi-squared analyses or fisher's exact tests are reported for each categorical variable. Bolded items indicate significant results.

5.6 Faculty Validation

Within the faculty validation construct, the only item with significantly different proportions by one of the categorical variables was course instructors valuing student contributions to their courses (see Table 6). Females tended to have higher levels of agreement than males (p = .010).

Table 6. Item Breakdown for the Faculty Validation Factor.

	Response Distribution					Test of Association *p*-value				
Faculty Validation Item	SA	A	N	D	SD	Gender	Race	First-Gen	Trad. Stud.	Type of Inst.
Care about student success	21	22	9	7	0	.462	.312	.362	.296	.227
Allow diversity of views	23	26	6	3	1	.080	.750	.256	.743	.623
Respect different opinions	23	20	10	5	1	.181	.648	.075	.664	.773
Value contributions from students	24	21	9	4	1	**.010**	.976	.060	.418	.450
Show interest in student goals	22	19	12	4	2	.141	.485	.625	.186	.245
Personally care	18	16	16	7	2	.100	.709	.529	.456	.707
Support me in my transfer prep	21	21	10	2	5	.313	.050	.329	.206	.963

SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree. Numbers within the likert scale columns indicate the number of responses. P-values for either chi-squared analyses or fisher's exact tests are reported for each categorical variable. Bolded items indicate significant results.

5.7 Financial Mediators

As seen in Table 7, one item in the financial mediators construct, ensuring that the student is aware of available financial aid, had proportionally higher levels of agreement for students who were not first-generation college students (p = .045).

Table 7. Item breakdown for the financial mediators factor.

	Response Distribution					Test of Association *p*-value				
Financial Mediators Item	SA	A	N	D	SD	Gender	Race	First-Gen	Trad. Stud.	Type of Inst.
Ensuring I am aware of transfer student financial aid	28	19	6	6	0	.560	.131	**.045**	.804	.891
Researching scholarships for transfer students	14	29	9	4	3	.455	.920	.799	.514	.800
Consulting with financial aid advisor	6	9	18	13	13	.338	.416	.300	.579	.088

SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree. Numbers within the likert scale columns indicate the number of responses. P-values for either chi-squared analyses or fisher's exact tests are reported for each categorical variable. Bolded items indicate significant results.

6. Discussion and Implications

6.1 Discussion

Although there has been prior research on transfer students, this prior research has primarily focused on post-transfer students, examined the phenomenon of "transfer shock" and has failed to disaggregate data to examine the influence of demographic variables and location. This section describes the findings which were disaggregated to examine constructs of transfer student capital by demographic variables and location.

6.1.1 Gender

The largest area of statistical differences among the elements of transfer student capital were found in gender. Overall, females had much more positive perceptions of many of these elements. These elements included higher perceptions of the transfer process which includes researching the environment, understanding academic expectations, visiting four-year campus, consistent information between advisors, and ease of finding engineering transfer information. Females also reported more positive perceptions of interactions with two-year faculty which includes informally and briefly visiting with an instructor after class and asking instructors for information related to the course. Finally, in the related area of faculty validation, females felt more strongly that course instructors valued contributions they (or other students) made to the course. This finding is pleasantly surprising because prior research has suggested that faculty engagement with women has been characterized by low expectation, passive feedback, and perceptions of lack of ability [8]. This study confirms the importance of students, especially female students, engaging with inspiring faculty [25]. Conversely males only differed statistically in their perceptions of learning and study skills in mathematics. Males more strongly agreed that the two-year institution prepared them for the mathematical skills they would need in engineering at the four-year institution. This finding is consistent with prior research that suggests that due to social perceptions that science and mathematics are male domains, females self-concept and perceptions related to these fields is impacted negatively [8]. Males also tended to identify long commutes as a significant challenge in transferring to a four-year institution.

6.1.2 First-generation Students

Another area of large statistical difference when evaluating transfer student capital was for students who identify as first-generation students. When asked about the largest barriers or challenges to transferring to a four-year university, first-generation students reported more challenges related long commutes, the need to quit a current job or reduce the current number of hours they are working, and concern related to feeling unsure that the faculty, staff, or students will make them feel welcome. The presence of these challenges highlights the higher education concerns that first-generation students face and aligns with prior research that suggests that they face a “dual culture shock” resulting from these transfer related concerns and being the first in their family to attend college [26]. An additional area of concern was found in financial mediators. First-generation students tended to report lower confidence that they were aware of financial aid available to them as a transfer student. Unfortunately, since low-income students are typically also first-generation students research suggests that due to less generational knowledge of higher education finance these students are less likely to complete the Free Application for Federal Student Aid (FAFSA) and more likely to borrow and take out larger loans than their peers [27]. Interestingly, first-generation students reported feeling more prepared in mathematical skills. First-generation students more strongly agreed that their community college gave them the mathematical skills they needed to be prepared for an engineering degree at a four-year university. In examination of perceptions of the transfer process, the only area of significant difference was that first-generation students had a more difficult time accessing information about the transfer process into engineering that the four-year university that is clear and easy to find. Across the board, for all students, issues with access to accurate and easy to find information about the transfer process is problematic [17], [28]. However, first-generation

students have access to even fewer family knowledge assets as their parents do not have information and experiences about college, attendance processes, institutional settings, operations, and access to human can financial resources [29].

6.1.3 Non-traditional Students

In prior research studies, non-traditional students have been classified as those students who are older, working adults, or who have not entered college directly after high school due to other responsibilities and life circumstances [13]. Similarly, in this study they were designated as non-traditional students if they were outside of the age of 18-22, worked more than 40 hours a week, or were a part-time student. The non-traditional students only differed in their report of transfer challenges. Their largest are of perceived challenge was in long commutes (or concerns related to needing to relocate) and the need to quit a job or reduce hours at work. This result is not surprising as the very characteristics of non-traditional students include working (full- or part-time) with additional family, community, and employment factors which may prevent this population of students from being able to move closer to educational opportunities [30].

6.1.4 Location

Interestingly, location was only significant in challenges. Perceived transfer challenges such as long commutes, the need to reduce work hours, attendance cost, and concerns related to transferring credits varied by location. Of the community colleges participating in this study, the students reporting these perceived challenges were from the community college Site 2 which is most rural serving, located the farthest from a state supported four-year institution, has the lowest median household income, and the lowest service area (the seven counties) educational attainment of all three sites included in this study. These results align with research on students from rural areas which reports that students are generally from lower income backgrounds (necessitating additional work hours), are more likely to be first-generation college students, and are more isolated from educational opportunities [31].

6.2 Implications for Practice & Research

Students who are entering engineering fields of study transfer differently [7] and given this, engineering transfer students need more support. Just as advisors and faculty support and engage with students from distinctive disciplines differently, they also need to consider a varied approach which recognizes the diversity among the engineering transfer student population. A one-size-fits-all approach to supporting engineering transfer students is insufficient and practitioners need to develop unique supports and strategies based on disaggregated characteristics such as gender, first-generation and non-traditional student statuses, and location. Additional research needs to be done to better understand how to tailor transfer supports to each of these characteristics. Better understanding of the impact of demographic characteristics and geographic location needs to be developed in future studies. Additionally, future students need to ensure that they are focusing on the assets and not deficits of engineering transfer students once they have been disaggregated by demographic and geographic location.

6.3 Limitations

This research study is not without limitations. First, identifying pre-transfer students desiring to transfer specifically into an engineering major is challenging and limits the initial pool of students which may participate in the survey. To address this, the research team worked closely with the three community college sites to identify these students and received a strong response of 171 participants. Unfortunately, only 61 of those responses were complete enough to be used. The smaller number of usable responses in this study does not provide as wide generalization as the research team had hoped. However, there were enough responses to run statistical analyses to answer the posed research questions which provide important insight in under researched areas such as focus on pre-transfer students and focus on disaggregation of data by demographics and location. This work suggests a model for similar future research studies.

7. Future Directions

This research study has prompted future studies that this research team is planning to undertake. First, the original versions L-TSQ and M-TSQ each have over 133 items. Although only 82 items were included in this version of the survey it was still too long to support strong completion. The research team plans to develop a shorter version of this survey by validating the factors and conducting an analysis at the factor level, rather than the item level, to identify additional items which may be removed. Following this, the survey will be redistributed. In addition, the research team is scheduling follow-up interviews with students to ask probing questions to add additional understanding to the survey results. The research team will then mix the data to create a wholistic understanding to more fully answer the posed research questions. With this information, and data from other studies conducted in this project, the researchers plan to develop an interactive, digital Engineering Transfer Student Dashboard, based on constructs identified by transfer student capital, to provide individualized support for engineering transfer students.

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