Board 423: What Drives You? Exploring the Motivations and Goals of Low-Income Engineering Transfer Students for Pursuing Engineering

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Introduction

The diverse group of students served by community colleges holds great potential in contributing to the desired diversification of the engineering workforce[1]. However, transfer students commonly experience a "transfer shock" when transitioning from community colleges to four-year bachelor-degree awarding institutions. They need to learn to navigate a new environment [2] and often struggle to gain access to departments, people and guidance to help them with this transition [3,4]. Due to the fact that they are also joining already existing social networks, they often also experience a lack of personal relationships with faculty and a lack of social integration into their peer group [3,4]. All these extra challenges can affect their academic achievement, retention, and degree attainment negatively [5,6,7].

Thus, more effective support for community college students transferring to four-year institutions is needed to ensure their success [8]. One way to address this situation and secure the success of transfer students is the creation of programs that provide institutionalized support to transfer students post-transfer. The NSF funded S-STEM scholarship programs are one example of such institutionalized support programs.They not only provide financial support to the students, but also have students engage in co-curriculum cohort activities including mentoring, academic advising, tutoring, social activities and career development activities [9].

However, to develop the best support system possible, we need to have a clear understanding of what drives students to engage in engineering in the first place, what obstacles they might be perceiving in their path to success, and what unique assets and experiences they bring to engineering. In line with the call to a more asset-based approach in designing education for minority students instead of a deficit perspective [10,11], the fact that transfer students' lived experiences and culture provide them with valuable skills and knowledge that can help them succeed in engineering should be utilized. By better understanding the assets that transfer students bring to engineering, we will be able to find ways to utilize their strengths and unique assets to ensure their success in engineering.

In addition, according to the situated expectancy-value theory of achievement motivation and extensive empirical research, the value that students attach to the subject they are studying is related to their continued engagement and persistence in that subject [12,13]. Students perceptions' of how interesting the subject is, how relevant it is to their own identity and how it is useful in relation to their career and life goals along with their perceptions of emotional, mental or physical costs that come along with engaging in the subject are all relevant for determining how students engage [12,14]. By learning about transfer students' underlying goals and purposes for pursuing engineering, the costs they might be perceiving in their pursuit of an engineering degree, and the expectations they might have for engaging in support program such as the NSF S-STEM program, we will be able to better adapt and improve offered supports, help students make connections, and provide appropriate opportunities. Better meeting students' needs, motivations and goals will, in turn, ensure their persistence and success.

Thus, the current study aims to investigate the goals and motivations of transfer engineering students applying to and enrolling in an NSF S-STEM scholarship program that aims to help low-income community college students from diverse backgrounds to successfully transfer to and persist in the engineering program of a four-year university. More specifically, we analyzed essays from 122 engineering transfer students enrolled in this NSF funded S-STEM scholarship program about their engineering career goals and their impetus for joining the scholarship program to answer the following research questions:

R1. What goals and future interests do engineering students transferring to a 4-year university from community college aspire to?
R2. What expectations do engineering transfer students have for enrolling in an NSF funded S-STEM scholarship program?
R3. What obstacles do engineering transfer students enrolling in an NSF funded S-STEM scholarship program encounter in their career path?
R4. What personal assets do engineering transfer students enrolling in an NSF funded S-STEM scholarship program have to support them in their career path?

Methods

Sample and Setting

The current study used data from 122 engineering transfer students (27% Female, 48% Hispanic, 26% Asian, 18% White, 8% Other/Declined to report, 55% First-generation college-going) that are scholarship recipients in the NSF funded S-STEM scholarship program at a 4-year hispanic serving university in the Southwest of the U.S.. Scholarship recipients are an average of 24.4 years old with 9% of students above the age of 30 years. For 60 % of the students, neither parent completed a college education. They transferred from 50 different community colleges and study a variety of engineering majors at the 4-year university: 10% Aerospace Engineering, 11% Biomedical Engineering, 11% Chemical Engineering, 8% Civil Engineering, 10% Computer Engineering, 13% Electrical Engineering, 2% Environmental Engineering, 1% Material Science and Engineering, 34% Mechanical Engineering.

The scholarship program that students are enrolled in targets the population of students who have the ambition to pursue engineering degrees, but often lack the resources or exposure to engineering opportunities. The goal of the project is to increase the number of community college students who successfully transfer to an engineering major at a 4-year institution and to improve the transfer student experience in engineering by providing co-curriculum cohort activities to prepare for STEM careers or graduate studies. Co-curricular activities include a mentoring program as well as academic advising, tutoring, summer bridge programs, academic and career workshops, and industry and research internships. Transfer students join the scholarship program after their transition and stay enrolled throughout their tenure at the university [9].

Measures

As part of the scholarship program application process, students submitted two essays discussing their career goals and their motivation for joining the scholarship program. More specifically, students answered the following essay prompts: a.) *Provide a brief summary of your career goals, your interest in engineering.*, b.) *The S-STEM program provides low-income students*

from various backgrounds a cohort experience with scholarships, support, and resources to help them thrive in engineering. Why are you interested in the S-STEM Program and why would you like to participate?. Students were asked to provide about 250 word long responses for both essay prompts. Essays were then coded and analyzed as described in the data analysis section.

Data analysis

Data was analyzed using the qualitative coding program Dedoose [15]. Essays were coded using a deductive approach, which is defined as coding based on predetermined themes from a specific theory [16]. Given the focus of the current study and nature of the prompts, we used a deductive approach by coding for four specific themes: goals, perceived/expected benefits, perceived challenges and perceived assets. A description of the themes and examples can be found in Table 1. For all themes, no specific subthemes (e.g., specific goals) were predetermined to ensure that subthemes would emerge naturally from the data. Three coders were involved in the coding of the essays. After initial training on the themes to be coded, subsets of essays were coded by all three coders as part of the coding process to ensure consistency in coding. In a reiterative process, any inconsistencies in coding were discussed amongst the coders and agreed upon changes were implemented in previously coded essays and applied in the coding of any future essays. Average interrater reliability amongst coders showed high agreement (κ =.88, [17]).

Table 1. Description of coded themes

Themes	Description	Examples
Goals and future interests	Students' description of their goals and interests for their future (i.e., for their career, their time at the 4-year university)	*My goal is to get a master's degree after I earn my bachelor's at UCI.*
Perceived/expected benefits	Students' description of what they are hoping to gain from enrolling in the scholarship program	*I also appreciate the opportunity to attend tutoring.*
Perceived challenges	Students' descriptions of any challenges that they already have or are expecting to encounter during their studies and future career path	*I do face hardship with financial needs with paying my school and tuition*
Perceived assets	Students' descriptions of the traits and assets they perceive to have that will support their success in their studies and further career path	*One thing to know about me, I will not quit.*

To further analyze the data, the current study aimed to a) qualitatively describe findings and b) quantify findings by investigating the frequency with which students mentioned coded themes using descriptive statistics. To this end, coded data was imported to IBM SPSS [18] to calculate the percentage of students that mentioned coded themes at least once and the average number of mentions of coded themes. To further describe and explore the diverse sample under study, descriptive differences in these metrics by key socio-demographic characteristics (i.e., Gender, Ethnicity, First-Generation College-going status and Engineering major) were also explored.

Potential significant differences in the average number of mentions of coded themes by socio-demographic background characteristics were tested using univariate analyses of variance tests.

Results

Descriptive statistics for coded themes can be found in Table 2. Overall, the majority of students discussed all four themes in their essays at least once with goals being discussed by 99% of the students and perceived assets being discussed by 77% of the students. Descriptively, students also mentioned goals most often on average (M = 2.91, SD = 1.71) and perceived assets the least often on average (M = 1.54, SD = 1.56). Table 1 also shows descriptive statistics for coded themes by socio-demographic background. No systematic differences in the quantity with which students discussed the coded themes emerged for the sociodemographic variables under study (i.e., Gender, Ethnicity, First-Generation College-going status and Engineering major) and coded themes. In the following, findings for each coded theme will be described qualitatively in greater detail.

R1. What goals and future interests do engineering students transferring to a 4-year university from community college aspire to?

Overall, all but one student mentioned at least one of their goals or interests for their future as expected given the nature of the essay prompts. In relation to their overall career plans, some students planned to pursue further higher education after receiving their bachelor degree (e.g., male Hispanic mechanical engineering student: *I also plan on attending graduate school and would like to obtain guidance in applying and succeeding in a master's program.*). Other students described their career plans for a future job in industry with varying degrees of specificity. For instance, one male Asian mechanical engineering student already developed a very specific job goal stating that **"***I see my future as a mechanical engineer working for Toyota, designing and building an engine with more than 50% efficiency.",* whereas another male Hispanic chemical engineering student described that he was still developing his job goal: *As of yet I have not selected a specialization, but I am partial to environmental applications, such as analytical chemistry, which might assist in understanding our impact, and limiting our destruction of this fantastic and delicate planet.*

In addition to a description of their overall career goals, students also wrote about their more immediate plans for their undergraduate studies. Firstly, students were expressing a wish for hands-on experience during their undergraduate studies as they believed that this would strengthen their career. Some aimed to accomplish this goal through undergraduate research experience. For instance, one female Asian chemical engineering student stated: "*...I hope to participate in undergraduate research while attending UCI. I want to gain experience and apply my knowledge while conducting research, which will prepare me for a professional career in engineering. To have the chance to participate in undergraduate research will provide invaluable hands-on experience that will simultaneously strengthen my education.*" Others were keen on gaining hands-on experience through internships (female Asian electrical engineering student: *In these next two years, it is very important for me to continue to build my resume and find internships and job opportunities.*). Secondly, a number of students expressed interest in building a network as one tool to strengthen their career in the long term. As one male Hispanic mechanical engineering student expressed: **"***One skill that I want to work on is networking and forming relationships with faculty to have connections within the field I wish to study in and people to go to for advice.*"

Table 2. Descriptive statistics for coded themes overall and by socio-demographic characteristics

	Goals			Perceived Benefits			Perceived Challenges			Perceived Assets		
	% of students	M (SD)		% of students	M (SD)		% of students	M (SD)		% of students	M (SD)	
Total (n=122)	99	2.91 (1.71)		98	2.22 (1.05)		88	1.77 (1.36)		77	1.54 (1.56)	
By Gender												
Female (n=33)	97	2.79 (1.82)	-	97	2.09 (1.07)	-	91	2.30 (1.79)	F=6.955, p=.009	67	1.52 (2.02)	-
Male (n=89)	100	2.96 (1.68)		99	2.28 (1.06)		87	1.58 (1.13)		81	1.55 (1.37)	
By Ethnicity												
Asian (n=32)	97	2.91 (1.97)		100	2.16 (1.17)		94	1.84 (1.02)		69	1.34 (1.66)	
Black or African American (n=3)	100	4.00 (1.00)	-	100	2.67 (2.08)	-	100	2.00 (1.73)	-	100	2.00 (1.73)	-
Hispanic or Latino (n=61)	100	3.05 (1.69)		97	2.26 (1.00)		84	1.72 (1.48)		82	1.79 (1.69)	
White (n=22)	100	2.59 (1.47)		100	2.05 (0.84)		91	1.68 (1.25)		73	1.09 (0.87)	
By First-Generation College-Going status												
First-Generation College-Going (n=65)	100	3.07 (1.85)	-	97	2.25 (1.06)	-	81	1.74 (1.61)	-	86	1.98 (1.84)	F=9.150, p=.003
Continuing-Generation College-Going (n=57)	99	2.77 (1.58)		100	2.22 (1.07)		94	1.82 (1.13)		69	1.15 (1.14)	
By Engineering Major												
Aerospace (n=12)	100	3.25 (1.96)		100	2.67 (1.15)		100	1.75 (0.97)		83	2.25 (1.48)	
Biomedical (n=13)	100	2.39 (1.04)		100	2.39 (1.19)		85	1.54 (1.51)		69	1.08 (1.04)	
Chemical (n=12)	100	3.00 (1.76)		100	2.00 (0.95)		83	1.67 (1.30)		50	0.67 (0.78)	
Civil (n=11)	100	3.45 (1.57)		100	2.45 (1.03)		100	2.36 (1.03)		82	0.90 (.54)	
Computer (n=12)	100	2.92 (1.96)	-	92	2.00 (1.21)	-	92	1.58 (0.90)	-	67	1.75 (1.71)	-
Electrical (n=16)	100	3.19 (1.76)		100	2.25 (0.68)		94	2.19 (1.42)		94	1.38 (0.89)	
Environmental (n=3)	100	4.00 (2.65)		100	1.67 (0.58)		100	1.33 (0.58)		100	1.00 (0.00)	
Material Science (n=1)	100	2		100	2		100	3		100	1	
Mechanical Engineering (n=42)	98	2.64 (1.71)		98	2.17 (1.15)		79	1.64 (1.63)		79	1.95 (2.05)	

Note: % of students = percent of students that mentioned respective theme at least once; M (SD) = average number of mentions of respective theme; Univariate analyses of variance were conducted to test for significant differences between socio-demographic groups of interest and the average number of mentions of coded themes. Relevant parameters are reported for significant tests only.

Thirdly, students also expressed a clear wish to make the most of their opportunity of being in their undergraduate program by developing their skills to the best of their abilities. This included not only the desire to optimize their knowledge with regards to their specialty (male African american mechanical engineering student: **"***In terms of academics I plan on earning my Master's degree in mechanical engineering, and dedicating myself to learning everything that I can while I'm still in the education system.*"), but also the (inter)personal skills necessary to become a successful engineer (female Asian chemical engineering student: **"***When I start attending UCI in the fall term, it is my goal to refine and gain new skills to make myself an exceptional engineer. Teamwork, communication, and critical and logical thinking are a few specific skills that I believe are important as an engineer to continually improve and build on.*").

Students also wrote about the underlying interests and motivations that are driving their career choices. Students expressed that they are looking to make a change and leave an impact in the world by advancing technology and society through their work. For instance, one male Hispanic aerospace engineering student clearly stated that "*My goal isn't simply to be an engineer, but to push humanity as a whole. Seeing the ever increasing dependency on technology, history shows the future is molded by those who understand it. Those people who should make decisions, and I want to be one of them."* More specifically, students were describing their desire to support societal change and improvement through their work by supporting causes close to their heart. For instance, one female Hispanic biomedical engineering student revealed: "*My goals as a future biomedical engineer are to help low income communities have access to the latest medical discoveries and technological inventions. At the same time, I would be contributing to further the technological industry while preserving the environment and diminishing the consumption of natural resources*". Moreover, some of the students, particularly female students, saw their own career success as part of a needed societal change and a worthwhile goal in itself. For instance, one female Asian mechanical engineering student, stated her aim to "*[s]how everyone back home that being a girl doesn't mean I can't work on cars and not let the worry about what everyone would say keep you from your goals"*. Another common thread in students' writing was their desire to be a role model for others and to give back to their communities during their future careers. For instance, one male Hispanic engineering student asserted that "*I want to be a role model that I never had for people in my situation*". Another male African American computer engineering student plans on dedicating part of his career to this cause: "*For the latter half of my career, I want to give back to the community I was raised in as well as the communities I've joined.*". For some students specifically giving back to their own family who supported them along the way was a key goal: *I chose engineering because I felt that coming from a low-income background, I believe that through engineering I can guarantee my single mother a better life while trying to make the world a better place* (male White mechanical engineering student). Lastly, students also had very clear ideas about the type of working environment they were looking for in their careers that would support their personal inclinations and values. This applied to a general match to values and interests (male Hispanic environmental engineering student: "*My goal is to work with a company that shares my values, particularly in the context of environmental sustainability and justice.*") as well as the wish to work in environments that support certain preferences. For instance, one male Asian mechanical engineering student was clear on his desire to be in a leadership position ("*Lastly, I'm looking forward to being able to take on leadership positions*"), while another male White mechanical engineering student expressed his wish for a certain independence within the working environment (**"***My ultimate*

career goal is to have enough experience and knowledge to launch my own consultancy or project managing firm. Working with a team of great engineers to solve problems and create solutions for industries or companies seeking specific projects development.").

R2. What expectations do engineering transfer students have for enrolling in an NSF funded S-STEM scholarship program?

Ultimately, all but two students illustrated their expectations and how they could potentially benefit from the program as expected given the nature of the essay prompts. Many students explicitly highlight the financial benefits of the program, hoping the scholarship would subsidize any part of their expenses. One female Asian electrical engineering student expresses, *"I would love to participate in the program because the scholarship would help me pay my tuitions, my bills, my school supplies. I would use that money for my study in UCI."* Several students work one or multiple jobs while simultaneously attending classes in order to support themselves and wish they could invest more time into their education, as mentioned by one male White electrical engineering: *"I hope that I would be selected for this program in order to receive a financial support to decrease my work hours and put more time on my major."* Another white Male civil engineering student adds a personal perspective, stating, "*I could have achieved more if I didn't need to spend time compensating for my cost of living and education. This program can possibly assist me in erasing those worries.*" Some students reflect on their experience with other NSF-related or scholarship based programs at community colleges and how they were able to benefit from these programs. For example, one male Asian mechanical engineering student explained that, *"I attended the EOPS program in my community cost [sic] and the program helped me tremendously in subsidize in [sic] the schooling and equipment cost so I hope this program would do the same.*" Others see the scholarship as providing reassurance to confidently pursue engineering (e.g., male Asian mechanical engineering student: ***"****I want to receive this scholarship because the aid would provide me financial comfort and confidence as I nurture my academic abilities.")*

Another expectation many students have for the program entails career-based opportunities such as internships and networking with faculty or industry professionals to further their journey's as students and engineers. For example, one male White electrical engineering student emphasizes *"Most importantly the research/ internship and development workshops would play a huge role in helping my resume and become a greater student with many achievements under my belt.",* as well as, another male Hispanic student states, *"I am interested in the S-Stem Program because I see it as an opportunity for me to increase my success as a student and one day an engineer. I could use the program to network with other students and faculty members in material science"*. Some students hope to rely on faculty members as mentors, providing career and industry advice. One male Hispanic mechanical engineering student expresses, *"Coming from a family where a college education is a privilege, I am not as familiar with the university system as others may be and I do not have many people to turn to for help besides counselors and faculty. The S-STEM Program would be very helpful in this aspect through the guidance and mentoring they offer to students in an effort to help them succeed in the field of engineering."*

Students also wrote about hopes to build a community of like-minded peers, as one male White environmental engineering student states, *"I also hope this program can help introduce me to like-minded individuals going into engineering-related fields. I would love to help build upon the*

STEM community at UCI and positively impact my campus." Several students believe a diverse community can provide immense support as they transition into a new and overwhelming environment as, one male White mechanical engineering student highlights it will,*"...provide an invaluable opportunity to network with other transfer students, hear their stories, learn from each other, and work together toward that important goal. Navigating an institution the size of UCI can be daunting at times, and the workshops and other available resources from the program would be of immense benefit,"* whereas for another female Asian biomedical engineering student states: *"knowing that there could be someone I can talk to and who can help me through the change is comforting."*

R3. What obstacles do engineering transfer students enrolling in an NSF funded S-STEM scholarship program encounter in their career path?

Many obstacles engineering transfer students face often relate to their status as first-generation college students, who are unfamiliar with the college system, financial aid processes and what resources are available to them, but ultimately, many do not have someone reliable to guide them. As one female White biomedical engineering student states, *"As an immigrant that moved to the U.S three years ago to have more opportunities to succeed in my life and achieve my goals, I have many challenges in my path. Most students here in my age have their parents support and help in their education. For example, they get help about how to enroll in different programs or what opportunities exist for them, but for me, I had to figure out everything on my own and if anything, I was the one to help my parents because they do not speak English and they needed help to do many of their tasks."* Some students struggle to find confidence in their career paths due to their lack of connections to higher education or the engineering industry such as, one male Hispanic student who expresses, "*I will be the first person in my family to have citizenship, let alone go to college, so I do not know many people who work as engineers."* One male African American mechanical engineering student also recognizes that this program can offer support for *"…my current lack of connections to UCI. As a first-generation student, I wasn't as knowledgeable about support programs as I'd like to be with no family members to help me out."*

One of the more prominent challenges many students write about is financial hardship from having to support their families while attending classes. One male White computer engineering student explains, *"I'm head of household with a family of three. I have a beautiful three-year-old boy that I must support. Because of this, I must work full time to cover all the family expenses: rent, vehicles, insurances, utility bills, etc. The other half of my time is used to go to school and do school-related activities such as homework, reading, and studying."*. Some students must support themselves and their families financially by working multiple jobs, such as, one female Asian chemical engineering student who describes how her father*"...was the main source of income at home but since he lost his job, my family has been struggling tremendously to make ends meet. We are a family of 6, my father, my mother, my three younger brothers, and I. My brother and I are both attending college which adds onto all the expenses my father already has. Currently, I am a full time student working 3 jobs to help support my family as much as possible. I am a kindergarten teacher at a local Sunday School, part-time McDonald's worker, a private math/science tutor, and most importantly, a full-time student."* Many students write that the overwhelming costs of higher education lead them to contemplate and hesitate pursuing higher education as one male African American mechanical engineering student attests,*"Financially*

speaking I am in a position where I cannot afford a college tuition, as well as housing, and I do not qualify for government based financial aid. According to FAFSA my parents are expected to pay the majority of my educational fees, but due to other debts and having another child attending college next semester they simply can't afford to give much towards my educational expenses. This has put me in a difficult situation when deciding how to pursue my educational goals, and weighing the costs versus the benefits."

For some students, their choice to study engineering is heavily discouraged by society and even their families, because it falls outside of what is expected of them. Students wrote about feeling apprehension towards becoming an engineer because of their gender or other socio-demographic characteristics as is the case for one female Asian mechanical engineering student who recalls,*"My parents always believed 'Females shouldn't study Engineering, there is no point because you will get married.' I listened, and I was determined to change that narrative."*, and for another female American Indian mechanical engineering student who states,*"As a Hispanic, bi, and colored daughter of immigrants, my representation in the engineering field has been minute and stagnant in growth. Growing up there was a struggle for me to pursue my major, for there was a lack of support and unforeseen obstacles that stood in my way."* Some students pursue what many of their parents could not, a chance at higher education and an opportunity to advance their careers further than before. One male Hispanic mechanical engineering student mentions, *"My parents are immigrants from Mexico. They worked at dead end jobs most of their lives. Though now they have some semblance of control over what they do. Even then, due to the lack of education and a degree, they will only be able to get so far when it comes to employment. Here lies the chance for me to obtain resources that can help me propel forward, to have opportunities that were not available to me as a child or a teenager."*

Interestingly, female scholarship students described statistically significantly more perceived challenges on average than male scholarship students (see Table 2). No other significant differences by socio-demographic characteristics emerged.

R4. What personal assets do engineering transfer students enrolling in an NSF funded S-STEM scholarship program have to support them in their career path?

Engineering transfer students possess a number of assets, developed from their unique experiences but ultimately, from the overwhelming desire to succeed. Students write about their most prominent characteristics such as drive and dedication. For instance, one male White mechanical engineering student states, *"Growing up as a child who went through this, you have two options: you could either be upset and blame others or you could do something that will change this situation and use it as motivation. That is how I learned to live my life, by taking every opportunity and maximizing it."*. Another male White computer engineering student wrote: *"The hard part is prioritizing and balancing my time in order to take care of all those aspects without neglecting any of them. To accomplish this, I use every little chance I get to get homework done when my son is not around."*. Students write about their role in team environments such as, one male Hispanic computer engineering student: *"I'm also more than happy to go out of my way and help others, and I'm a team player who others can depend on getting the job done."* In addition, students write about how they set an example for the younger people around them, becoming the role model that they personally struggled to find for themselves. One female White aerospace engineering student emphasizes, *"As a fulltime*

undergraduate engineering student, I have been able to sustain my grades while raising my son and daughter. I try to be an inspiration to them so that they can one day grow into engineers themselves and contribute towards the advancement of society."

Many students believe their primary assets lie in their technical skills, relating to industry-related practices and projects. Additionally, these experiences reflect bits of their curiosity and passion for engineering. For example, one female White chemical engineering student wrote: *"Rather than spend the day taking apart and rebuilding the engine, I was able to rewire the sensor making it more accessible for future tune ups. The car runs great now and has become a reliable means of transportation. Simple fixes like this one and more challenging ones like building a computer are projects that require creativity and what I enjoy—engineering."* Another female Asian chemical engineering student wrote: *"Throughout the years, I participated in many projects from a precise catapult to a motor scooter. Though these inventions already exist, it was very fascinating to create something myself and a team of people. These projects taught me how to effectively communicate and learn under pressure of time constraints."* .

Interestingly, first-generation college-going students mentioned their own perceived assets statistically significantly more often on average than continuing-generation college-going students (see Table 2). No other significant differences by socio-demographic characteristics emerged.

Discussion and Future Work

These student essays provide rich and nuanced perspectives on the experiences of students in this supportive scholarship program. Our initial analysis highlights the breadth of these experiences, including significant assets that these students possess and challenges that they have already overcome and continue to face. By better understanding these assets and challenges, we can improve and create better support programs to help engineering students from diverse backgrounds persist in their degree programs and future advanced study and engineering careers.

These students possess incredible assets that should be further cultivated and celebrated in engineering. They are driven to support and give back to their communities. They are happy to help their peers. They are experts in professional skills like time management, and they are mature and responsible. Moreover, they are ambitious and aspire to do challenging things. Their career goals are related to these assets and often include goals that will positively impact their families, society, and the environment.

One of the main purposes of this scholarship program is to address these students' financial hardship, which is one of the most prominent challenges that these students face. The program also seems well-aligned to address other commonly described challenges, such as lack of resources, particularly in mentors and role models who can help students navigate the university and their degree programs, demystify graduate school and career options, and learn how to make connections and get started on a particular career path.

Future analyses will explore sub themes within existing coded themes further to investigate whether certain sub themes were mentioned at a greater frequency and are associated with certain socio-demographic characteristics, such as gender, ethnicity, first-generation college-

going status or major. The sub themes will also complement the breadth of this initial analysis by providing a depth of understanding particular goals, challenges, and assets, thereby informing new and improved programs to support these students in engineering.

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