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How Community College Transfer NSF S-STEM Scholars in Engineering Spend Scholarship Funds to Enhance Their Academic Success

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Abstract

This paper presents preliminary findings from a study investigating the impact of the National Science Foundation (NSF) Scholarships in STEM (S-STEM) program on community college transfer students pursuing engineering degrees at a four-year university. S-STEM funds scholarships to support academically talented low-income undergraduate students. In addition, S-STEM facilitates evidence-based curricular and co-curricular activities to enhance recruitment, retention, and student success in STEM fields. Four focus groups (16 participants) and 23 interviews with community college transfer S-STEM scholars revealed that S-STEM offers a myriad of financial benefits students believe will lead to a degree and a career as an engineer. Analyses employ qualitative methods such as thematic coding to identify recurring themes, patterns, and key insights from transcribed interviews and focus groups.

S-STEM scholarships provided students with a sense of security and a cushion in case of emergencies or unexpected expenses. The S-STEM scholarship was a turning point at which the increased financial stability allowed students to explore their academic and career interests, study more individually and in study-groups, and devote themselves to their engineering education by regularly meeting with faculty and staff outside the classroom.

Scholarships offset rising gas prices for commuters and allow other students to live close to campus. Students worked fewer hours (often 10 to 20 hours a week) compared to working full-time in community college. Students spent this additional time on campus and pursued internships and career opportunities in their field of study. In effect, S-STEM scholarships enabled students to treat their engineering education as a job, rather than having to work outside of school to pay for their education.

Our findings highlight how S-STEM program elements manifest in the lives of low-income community college transfer engineering students. The findings underscore the need for increased support for students from low-income backgrounds and demonstrate that financial and co-curricular support positions them for greater success. These insights not only inform scholarship programs but should also urge educational institutions to actively provide holistic support for students on their academic and professional journeys.

1. Introduction

This paper presents initial findings on the impact of the National Science Foundation (NSF) Scholarships in STEM (S-STEM) program on community college transfer students pursuing engineering degrees at a four-year university. Transfer Undergraduate Rural/Nontraditional Student Pathways through Identity, Knowledge & Engagement (TURNPIKE) project is an S-STEM partnership between Polk State College (PSC) and University of South Florida (USF) Engineering. TURNPIKE aims to help primarily rural, non-traditional, and underrepresented minorities (URM) community college students successfully transition from Florida community colleges to the urban USF Tampa campus.

This project is dedicated to fostering equity in engineering education, actively addressing the equity gap. This initiative aligns with the broader national goal of producing well-educated individuals in science, mathematics, engineering, and technology. It actively supports the retention and graduation of high-achieving students with financial needs at community colleges, the University of South Florida, and other institutions, contributing to the development of a proficient workforce in the STEM disciplines. In accordance with this overarching goal, this paper examines the practical application of the project. It explores how community college transfers utilize the up to $10,000 S-STEM scholarship toward overcoming financial challenges they believe would otherwise stunt their progress toward an engineering bachelor's degree.

2. Research Questions

The research aims to address the following two questions:

a. How do S-STEM scholarships allow low-income community college transfer engineering students to prepare for success at a four-year university?

b. How do S-STEM scholarships contribute to the work-life-school balance of low-income community college transfer engineering students?

3. Methodology

Qualitative methods: This study seeks to understand the challenges and experiences of community college students who have transitioned to a four-year university and how S-STEM scholarship money impacts their overall academic journey. Qualitative methods, such as interviewing and focus groups, were chosen to obtain this objective to capture the nuance of everyday experience and highlight student voices.

Participants: The participants of this study are students enrolled in engineering major programs in the University of South Florida who transferred from community colleges. In total, 39 students participated in the study, 23 of them in one-on-one interviews and 16 in four focus groups. These S-STEM scholars received a $25 gift card for their participation.

Data collection: Data was collected during the Fall semester of 2023 at the University of South Florida. The research team recruited students at a TURNPIKE event and students signed up online for interview or focus group spots. Interviews were approximately 30 minutes and focus group sessions lasted an hour, both using semi-structured interview guides. Students answered questions about their personal and educational backgrounds, decisions to major in engineering, transition from the community college to the university, and how the S-STEM scholarship and activities aid their academic and personal growth.

Data analysis: All data were recorded with the informed consent of the participants. The recorded data were transcribed using Rev. The transcribed data was entered and analyzed using Atlas.ti data analysis software.

4. Literature Review

Community college (CC) transfer students often experience high levels of personal and economic precarity. Forty-four percent of low-income students pursue a community college degree immediately after high school [1]. Community college students are at for, as Half of all community college students struggle with houselessness and food insecurity [2]. These factors can contribute to low graduation rates or longer time to graduation. One way that students combat this instability is by "managing income flow," or engaging in paid work and pursuing financial aid resources [3]. Community college students are also more likely to work full time while attending school. Nearly half the population of working students pursues a community college degree [4]. Many students feel pressure to amend their academic plans to their work schedules, making it difficult to maintain regular academic progress [4], [5], [6].

Financial barriers pose a significant challenge for community college students aspiring to pursue STEM four-year university degrees. Students who work outside the university often face a dual commitment that splits their focus, energy, and time between education and employment, impacting their ability to concentrate on academics [7], [8]. Due to the difficulties that balancing an outside job can present, many institutions discourage students from working outside their degree [9]. Often, professors and administrators perceive students who work as lacking commitment to the program or as being unrealistic about the rigorous demands of their degree [9].

The consequences of financial obstacles extend beyond student retention rates; they also compromise the quality of education received by students. Baltaci et al. (2015) identified two primary challenges arising from financial barriers [8]. First, such barriers hinder students' initial participation in college, limiting their ability to afford tuition costs. Second, students facing financial constraints are compelled to work either part-time or full-time, leaving insufficient time for studying, lab work, or participation in study groups. Consequently, academic performance suffers, leading to course failures and decreased retention rates. Multiple studies have demonstrated that working under 15 hours per week has a neutral to positive effect on student

persistence, while working full time has been found to correlate with lower rates of success [10], [11]. Despite this, many students have no choice but to work due to their socioeconomic backgrounds and family commitments [9]. Transfer students from community colleges are even more at risk in this dynamic, as they may enter more rigorous four-year institutions with greater financial need and outside responsibilities.

a. Benefits of the S-STEM program

One way that institutions help students find a solution to their socioeconomic needs without increasing their outside work commitments is scholarship funding through programs such as S-STEM. This scholarship offers up to $10,000 per year to underrepresented students transitioning from community colleges to STEM degrees at selected four-year institutions. Providing financial assistance is an important way that S-STEM programs promote student retention and graduation, allowing students to reduce outside workload and stress [12], [13]. A study by Ford et al. (2015) highlights the positive impact of S-STEM scholarships. Approximately 87% of scholarship recipients reported either not working or working less than 10 hours a week [14]. This reduced financial burden alleviated stress and empowered students to focus more on their studies, demonstrating the potential of financial support programs to enhance academic engagement.

The effects of S-STEM awards have been investigated in multiple contexts, such as its utility as an incentive for enrollment in the degree and participation in the program [15], the impacts of increasing or decreasing student awards [16], and the specific financial precarity experienced by transfer students [17]. Kar et al. (2021) found that a $7,000 S-STEM annual scholarship did not meet the financial needs of most students which resulted in increased work hours, with some individuals working up to 30 hours per week. Seven of 39 S-STEM scholars could not continue in the program due to insufficient academic performance as they were working extra hours to pay for living expenses. Kar et al. (2021) recommended increasing the scholarship amount to bolster academic focus, ensure program continuity, and facilitate timely graduation. Within this literature, there is still space to explore how low-income students use S-STEM grants to complement their education, a gap this paper seeks to address [18].

5. Findings

Interviews and focus groups with S-STEM scholars reveal four interconnected themes, each showcasing the multifaceted influence of scholarship support on progress toward an engineering bachelor's degree. First, scholarships allow students to optimize their work-school-life balance by liberating students from demanding work schedules, thus fostering an environment conducive to academic success. Second, scholarships are a crucial financial safety net, providing flexibility to meet essential needs, pay bills, and navigate unforeseen emergencies. Third, scholarships help students with financial burdens associated with commuting to campus, allowing students to stay more connected to their professors, advisors, and peers. Finally, scholarships are lifelines for engineering students navigating family medical and financial challenges, empowering them to

persist toward a degree despite formidable personal circumstances. These findings contribute nuanced insights into the multifaceted impact of scholarships on engineering education, emphasizing their pivotal role in shaping academic trajectories and overall well-being.

a. Optimizing Work-School-Life Balance

Many students with high ambition, merit, and a passion for engineering come from low-income backgrounds, making it challenging for them to afford the cost of education at a four-year university. So, engineering students often see work away from campus as part of student life. Many students choose to enroll in a community college to complete lower-level courses and perhaps an associate's degree due to its comparatively lower tuition costs. However, when these students transfer to a university, the tuition costs become significantly higher, and more rigorous upper-level university courses demand more study time and effort than lower-level/introductory community college courses, creating additional financial strain and demands on their time.

Community college transfer students find themselves compelled to work full-time away from campus, and perhaps even overtime, limiting their availability to attend class, study, and participate in co-curricular and extracurricular activities. Despite their dedication and hard work, full-time employment often prevents them from being full-time students, which increases time to degree and, ironically, makes it take longer for students to reap the financial benefits of earning an engineering degree. Engineering faculty and advisors recommend that students working full-time should enroll part-time, "[I]f you're working 30 hours, 40 hours, don't be crazy and try to take 12 credits. It's just not going to happen. It's physically impossible".

The S-STEM scholarship covers tuition costs, effectively reducing their need to work long hours, thus allowing students concentrate more on their studies. Of the 23 students interviewed, 14 worked part-time and seven were not employed (two worked but did not specify how much). Students see a direct correlation between work time and study time. One participant shared, "I work part-time. Thanks to the scholarship that I get for S-STEM, I don't have to work as much anymore, so I usually do 20 hours a week or sometimes even less. That's great. I have a lot of time to study." Eighteen students worked fewer hours than they had before becoming an S-STEM scholar. These students specifically credited S-STEM for allowing them to work fewer hours than they worked as community college students before earning the scholarship and fewer than they would be working as university engineering students without the scholarship.

The transformative impact of scholarships on decision-making processes is evident in that S-STEM scholarships allow students to pursue ambitious educational and career goals. One student mentioned that before S-STEM, she had contemplated switching out of chemical engineering to a less intensive major that would allow her to work more hours. "Should I do something that takes less years to complete, something that would get me to work faster?" But the scholarship allowed her to stick with chemical engineering. Scholarships not only alleviate financial strain

but also empower students to pursue their chosen fields without compromising their passion and career aspirations.

When asked how their lives would be different without have the S-STEM scholarship, 18 of 23 students interviewed said they would have to work more hours without the scholarship, primarily going from not working to at least part-time work or going from part-time to full-time work (five did not mention work hours in relation to the scholarship). With reduced external work and diminished financial worries, students could focus on academics with less stress due to educational expenses. One student who was not employed compared his situation to S-STEM scholars who still work. “I don't know how they do it. It seems impossible for me.” He described a “domino effect” in which if he had to work, it would take time away from school and cause him to stress about having to work, affecting his sleep, all of which would cause his grades to drop. Other students who did not work reflected on how the stress of trying to find a job would negatively impact their studies. In this respect, the S-STEM scholarship helps students maintain a healthier study-work-life balance.

Students also described how the scholarship freed them up to pursue jobs and internships aligned with their academic and career interests. For example, one student had worked at a public utility company in a field outside of his interests. S-STEM allowed him to become an undergraduate researcher in a field of interest while also allowing him more free time. Students explained that working fewer hours opens up more choices that allow them the freedom to explore and make mistakes in their academic careers. Paid research assistantships and paid internships were a major draw for students even beyond the scholarships and such opportunities would not be available if not for the scholarship.

b. Financial Safety Net

S-STEM scholarships are purposefully designed by NSF to be discretionary funds with no stipulations. As such, students have the flexibility to use the assistance to address their greatest needs. Students used scholarship funds to cover a wide range of expenses. According to one student, “A lot of that money goes straight into my bank account, which could be used for utilities, essentials, bills, what not, stuff that I actually need to buy, and even books in the future.” S-STEM scholarships allow scholars to be financial stewards with both a level of financial security and independence.

Many students use S-STEM money as a backup when their educational costs are not fully covered by other means. Respondents spoke of using combinations of financial aid, family support, loans, and income from outside work to cover the costs of their education. Pulling together the money from multiple sources or facing the option of taking on student debt was a stressful situation that many students faced during their time at USF, leading some students to consider delaying progress through their degree so they could work or even introducing the

possibility of not finishing at all. In a focus group, one student explained that S-STEM helps alleviate some of the strain of running out of traditional forms of financial aid such as FAFSA and loans. “I had a financial aid but now I’m running out of the money for financial aid. So, I was thinking [S-STEM] is going to help me finish my degree.” Another student echoed this challenge, explaining that before S-STEM he was also running out of financial aid and had to pay out of pocket or rely on inconsistent help from his employer that does not fully cover tuition. Both students experienced a deficit in the amount of financial aid they are awarded and fall back on S-STEM to cover the remaining cost.

The flexibility of the S-STEM grants allows students to save the scholarship money and establish financial discipline when they did not have an immediate need for the funds. One student in a focus group explained, “I save most of the money sometimes when I don’t use it. I don’t tend to spend it on things that I don’t need,” to which other students agreed, “Yeah,” or “Yeah, good idea.” This suggested that saving is a common or aspirational practice. One student who worked part-time explained that he only uses his scholarship funding for emergencies and saves money from his paycheck to match what he took out of his scholarship. For S-STEM scholars from low-income backgrounds, having access to a lump sum of money in the form of S-STEM grants allows them to get ahead financially in a way that would otherwise not have been attainable.

S-STEM scholars treated their grants as safety nets in a variety of ways. The money they were awarded helped them in their personal lives, as they were able to respond to emergencies, unexpected costs, and changing circumstances with more ease. One student described his scholarship as “some money to fall back on if something does hit the fan.” Many of these students transferred to USF from outside the immediate university area, so scholarship funds also helped them with unexpected moving expenses. They also used the scholarship as an educational safety net, allowing them to stay on track to finish their degrees even when they encountered financial barriers. While S-STEM does not provide enough money to completely take away students’ financial worries, these funds help scholars feel more financially secure. As one student stated, “[S-STEM] has been the best backbone I’ve had yet.” In this way, students have support to meet their financial needs and encouragement to continue along their educational trajectory with reduced economic discomfort.

c. Reducing Commuting Costs

Before enrolling at USF, community college transfer students often lived with their parents or near their job. As they transitioned into the university, they had to choose to commute from where they lived as community college students or move on campus or close to campus. This decision is often complicated by financial strain. S-STEM scholarships allow students to afford to maintain a vehicle with less worry about gas and maintenance costs or choose to live closer to campus.

The topic of commuting surfaced in one focus group in which students agreed that commuters face distinct financial difficulties. Participants specifically mentioned the high price of gas, the large cost of buying a car, the amount of time it takes to drive to campus, and the risk of needing car repairs. “That’s very helpful to have that money to pay off the gas. It’s also, I think I have a car repair thing I need to.” Students recognize that gas and auto maintenance are significant educational cost that could derail academic progress. Students turn to S-STEM to ease the burden of this aspect of their commute.

S-STEM allows some students to live on-campus or closer to campus. While this decision is more costly than living at home or in a less expensive area, many students consider it as an option to reduce travel time, increase study time, and feel more enmeshed in the USF campus community. One student described how the S-STEM scholarship encouraged him to move on-campus. “So, before the transferring, I decide to live with my parents at Clearwater. So, I have to drive one hour every day to attend the courses at USF Tampa. But after I received the scholarships, I can find an apartment next to the campus and feel more engaged with school life.” S-STEM allowed him to reevaluate his options, so he chose greater engagement with his school community. Another student lived two hours away from campus and decided with her family to use S-STEM scholarship money to rent a place near campus.

Despite the cost associated with owning and maintaining a car, students most frequently cited the time it takes to commute as their main reason to live on campus. This pattern suggests that while gas and car maintenance is expensive, the scholars’ time is the most valuable. Overall, the S-STEM scholarship lets students weigh the costs and benefits of living on or off campus differently, allowing them to prioritize their need for study time and community over the obligation to minimize their living costs.

d. Family Medical and Financial Emergencies

Engineering students facing family medical and financial challenges find crucial support through scholarships, enabling them to navigate complex personal situations that might otherwise hinder their academic pursuits. Students kept their family's struggles close to their hearts. One student reflected on his childhood trying to comprehend his family’s financial challenges: “I was younger back then, but I always kept thinking to myself, ‘What is something I can do to help out with the situation?” The enduring impact of living through family instability motivated students to seek opportunities to improve their family’s situation. The S-STEM scholarship was a key step toward the long-term stability of an engineering degree.

Students expressed gratitude for their parents’ financial help in paying for college. Despite limited financial resources, students acknowledge support from family members, evidence of the interplay between familial support and external assistance through scholarships. The

interconnectedness of financial stability, academic success, and family support is evident in a student's reflection on her academic journey:

> I'm a 4.0 student. And there's a reason why. Because I did not come from financial stability growing up. And so, I had to figure out what is the best way for me to be able to get myself into a place that will bring my future and my family's future better.

This highlights the transformative potential of academic success fueled by familial love and the desire to break the intergenerational cycle of economic constraints for students and their families. She went on to candidly share that her parents were not able to support her because of her father's disability. Participants articulated this intersection of family medical challenges and financial strain. The complexity of these family dynamics interconnected challenges students face and how scholarships are a key component of the holistic support structures S-STEM provides. Another student described how the scholarship helped him manage his own mental health while dealing with quitting a stressful job and his father's cancer diagnosis. Scholarships address immediate financial needs and provide students with the stability required to cope with unforeseen personal challenges, such as family health crises.

The role of scholarships as a lifeline during unforeseen crises is highlighted by a student whose house burned down. She planned to work 30 hours outside of campus that semester while taking a very difficult course. Her professor told her she should not work because she would fail the class. But she insisted on working to put her family first. She described how this professor understood her situation and offered help, "And then he said, 'Okay, I'm going to give you another opportunity." And then he recommended me the [S-STEM] program." Through S-STEM, she got to network with industry leaders, and she was hired as a research assistant on a research project, which persuaded her not to work outside of campus that semester.

These narratives underscore the critical role of S-STEM scholarships in mitigating the impact of family medical and financial challenges on students' academic journeys. Scholarship support acts as a catalyst for academic success, resilience, and the pursuit of engineering careers despite formidable personal circumstances.

6. Discussion

Our findings reveal that S-STEM scholarships spark a compelling transformation in students' lives, particularly by helping them balance work, school, and life responsibilities. Scholarships are a crucial component that helps students manage their income flow [3] while reducing the need for extensive work commitments away from campus. The testimonials from S-STEM scholars reveal a tangible correlation between reduced work hours and increased study time, aligning with research indicating that financial barriers and work schedules hinder academic progress [5], [6].

The second theme emphasizes the S-STEM scholarship as a crucial financial safety net for engineering students. The discretionary nature of the scholarship funds allows students to address various essential needs, from paying bills to covering unexpected personal needs. This financial flexibility not only supports students in their educational pursuits but also alleviates the stress associated with managing multiple funding sources and potential student debt. The student testimonies indicate that the amount of S-STEM funding in the program helps them alleviate financial stress and allow students to contend with challenges in their personal lives without threatening their educational progress [14], [18]. The scholarship emerges as a tool that empowers students to navigate the financial challenges of pursuing an engineering degree with a greater sense of security and independence in line with prior research on S-STEM scholarships [17].

The third theme explores the impact of S-STEM scholarships on students' decisions regarding commuting to campus. The scholarships provide students with the financial means to maintain a vehicle, easing the burden of commuting costs. Additionally, the flexibility offered by the scholarships allows some students to choose to live closer to campus, enhancing their engagement with the academic community, a resource that previous scholarship has shown to have positive implications for students' educational trajectory [14]. The challenges faced by community college transfer students extend beyond financial barriers, including commuting costs. Time spent outside academia can divert time and energy away from studies, impacting academic performance and retention rates [8]. This theme underscores the broader implications of financial support in shaping the physical and psychological aspects of students' educational experiences.

Finally, engineering students shared how the S-STEM scholarships were key lifelines that helped them facing family medical and financial challenges, which transfer students have historically been more vulnerable to than traditional students [2], [5]. In this respect, scholarships became key components of holistic family support structures, aiding students in navigating complex personal situations that might otherwise hinder their academic pursuits. Student narratives highlighted the transformative potential of scholarship to breaking intergenerational cycles of economic constraints and providing family stability during unforeseen crises. This finding demonstrates how S-STEM programs contribute to a more resilient and supportive environment for students, in agreement with current research on the impacts of other S-STEM programs [14], [15].

7. Conclusion

Our study contributes a rich, qualitative dimension to the existing literature on community college transfer students pursuing engineering degrees. The four identified themes provide a deeply personal understanding of the multifaceted impact of S-STEM scholarships, offering

specific insights that complement and extend the broader trends heretofore uncovered in the literature.

Our findings support recommendations from previous research, particularly regarding the adequacy of scholarship amounts to meet the diverse financial needs of students. NSF and S-STEM grants should loosen constraints on S-STEM funding due to perceived need which would allow programs to award the max scholarship regardless of prior need. Students and their families may encounter unforeseen circumstances during the academic year that may derail progress toward degree before changes show up in financial documents. S-STEM scholarships contribute to student and family financial stability. This study not only reaffirms the positive impact of S-STEM scholarships on academic progress, decision-making processes, and overall well-being but also highlights the need for continued exploration of how targeted financial assistance programs can effectively address the challenges outlined in the literature. NSF recently increased the max scholarship from $10,000 to $15,000. NSF should also consider regularly increasing the max award to correspond to the rate of inflation, especially tuition inflation.

Moving forward, institutions and policymakers should leverage the insights from this study and existing literature to comprehensive support mechanisms that holistically address the financial barriers faced by community college transfer students pursuing engineering degrees. The narratives shared by S-STEM scholars serve as a valuable contribution to the ongoing discourse on the role of financial support programs in engineering education and higher education more broadly, emphasizing the need for tailored strategies to foster student success in the face of economic challenges.

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