Supporting First-Generation Refugee Families' STEM Aspirations and College Navigation

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Abstract

The challenges faced by first-generation students, particularly within refugee communities, can be formidable as they aspire to attend an American university and pursue a professional career. These challenges include uncertainties in navigating the path from high school to college, limited awareness of various STEM career fields, and a lack of acquaintances who have successfully navigated similar paths. Complexities such as high school graduation and university admission requirements, coupled with few higher education connections, contribute to the frustrations experienced by parents and students.

To address these issues, we present the results of a project aimed at promoting STEM aspirations, and enhancing the understanding of college navigation among refugee families residing in the United States. The project focused on parents and their children in grades 7-12 and was a collaboration between a large public university and leaders of several ethnic community-based organizations (ECBOs) representing local Burundian, Congolese, and Syrian communities. Results indicate the project positively affected students and parents' STEM capital and college social capital, as well as students' expectations regarding how fulfilling a STEM career might be.

While the United States considers itself a nation built by immigrants and has welcomed 3.5 million refugees in the past 50 years (Refugee Processing Center, 2022), refugees often face discrimination and are perceived as outsiders within the school setting, where they usually lack the close-knit social support commonly found among minority groups with higher representation (McBrien, 2005). The combination of limited language skills and unfamiliarity with social norms leads K-12 personnel to sometimes mistakenly believe refugee children have learning disabilities, even in the absence of evidence (Graham et al., 2016). These challenges contribute to a significantly higher dropout rate among refugee students, with rates three times higher than those of White students and twice as high as those of Latinx students (Krebs, 2013).

Introduction

The transition from high school to college poses notable challenges for refugee youth. In particular, the college admissions process can be a deterrent for refugee students, primarily due to its inherent assumption that applicants have completed a conventional four-year education in an American high school (Higgins & Misawa, 2022; Loo, 2021). In addition to navigating the terrain of college admissions, refugee youth may confront unique obstacles such as language complexities and uncertainties surrounding the transferability of credits earned in home countries. These hurdles,

in turn, may adversely impact a sense of belonging to college environments (Garcia et al., 2019).

Regarding STEM, refugee students have received limited attention. While significant research and efforts have focused on identifying effective practices for promoting STEM learning among major minority groups in the U.S., such as African Americans and Latinx students, there is a lack of educational research and support designed for refugee populations. Among the limited studies that have addressed the involvement of refugee students in STEM, it has been observed that grouping refugee students of the same culture, who share similar migration experiences, can foster a comfortable environment for STEM engagement and facilitate productive discussions about the subject (Ryu et al., 2019; Ryu & Daniel, 2020).

In this study, we report on findings from a project in which leaders of local Burundian, Congolese, and Syrian communities collaborated with university faculty and staff to develop and facilitate a series of workshops for refugee parents and their students in grades 7-12. Primary objectives of these workshops were (a) to assist families in cultivating familiarity with and comprehension of college application and enrollment processes, and (b) to foster awareness and enthusiasm for a wide range of STEM career opportunities.

Design/Procedures

Theoretical Basis. Our work was based on Social Cognitive Career Theory (SCCT), which suggests individuals are more likely to pursue career aspirations when they believe they will face minimal obstacles and receive sufficient support. SCCT highlights three interconnected variables: *self-efficacy, outcome expectations*, and *interests*. Self-efficacy refers to the belief in one's ability to take action and perform effectively, which is particularly important when considering career choices. Outcome expectations involve beliefs about the likely consequences of different actions. In our project, the SCCT model was modified to focus on STEM interests, which are influenced by identity, self-efficacy, and outcome expectations. By fostering interest, aligned career goals can be developed through experiences that enhance self-efficacy and outcome expectations.

Three additional modifications were made to the SCCT model. The first involved integration of *STEM identity*. The second and third modifications added the concepts of *STEM capital* and *college social capital* as environmental influences. Research suggests that STEM identity and STEM capital significantly influence aspirations for STEM learning and careers, while social capital, particularly in relation to higher education (college social capital), predicts engagement in educational pursuits.

Project Design. To meet objectives concerning the transition from high school to college, including career exploration and goal setting, an established "college knowledge" program implemented in high schools was modified. The program, known as the American Dream Academy (ADA), had been previously delivered to families by the university's outreach office through partnerships with high schools. In its previous iterations, families opted to participate in the program outside of regular school hours, and the only common factor among participating families was that their children attended the same high school.

The ADA curriculum underwent significant adaptations to better serve our participants. One key

adjustment involved training community leaders to assume the role of primary facilitators. While university experts still contributed by leading presentations on topics like financial aid and admissions, families were informed that these experts were guest presenters visiting the community leaders' classrooms. Moreover, the curriculum was specifically tailored to align with the unique characteristics of each community. For instance, simple modifications were made, such as replacing the phrase "find someone who likes sushi" with "find someone who likes fufu" (a food commonly found in African cuisine) during icebreaker activities for African families. Additional adaptations included incorporating college-student panels consisting of current college students from the partner communities and integrating discussions on role model videos featuring young STEM professionals who were also community members.

To address STEM-related goals, faculty created STEM Career Activities. These included hands-on and career-talk components. Hands-on components included engaging participants in brief lab activities and playing decision-making board games. The career-talk portions of the STEM Career Activities focused on practical matters such as relevant high school subjects, related careers, outlining college pathways (i.e., applicable associate, bachelor's, and master's degrees), and projected salaries for various STEM professions.

The community leaders recruited the family participants and families were grouped into classrooms based on community. Community leaders provided translation for participants, as needed, and families attended five Saturday workshops that combined the ADA curriculum and STEM Career Activities. At a typical workshop, families engaged with community leaders facilitating ADA curriculum in the morning, ate lunch in a campus dining facility alongside resident college students, and returned to class to participate in a STEM Career Activity.

Research Design. On the first day of the program, parents and children completed pre-surveys, while post-surveys were completed at the end of the final workshop day. The project was piloted by Burundians in the first year, and in the second year, all three communities participated. Data were aggregated from both years and all three communities, resulting in a clean dataset of 49 parents and 110 students in grades 7-12. These participants were refugees residing in the United States for varying periods, from less than one year to 19 years.

The youth survey, aligned with our SCCT model, consisted of 25 Likert-scale items covering constructs of self-efficacy, STEM outcome expectations, STEM interests, STEM identity, college social capital, STEM capital, and aspirations. Students rated their agreement levels on statements such as "I know people who I can talk to who have jobs in STEM fields" (STEM capital) and "If I had a career in a STEM field, I would find the work enjoyable" (outcome expectation).

The parent survey contained 17 Likert-scale items, addressing confidence in children's higher education success, familial STEM identity, college social capital, STEM capital, and aspirations for their children. While the youth survey focused on personal beliefs, the parent survey took into account perspectives on behalf of one's family. For instance, parents indicated the extent to which family members consider themselves "science and math people" (STEM identity).

Survey items were sourced from validated instruments, primarily the STEM Career Interest Survey (STEM-CIS) and the Student Science Capital Survey (SSCS). STEM-CIS assesses self-efficacy, outcome expectations, and interest, while the SSCS addresses science identity and capital, adapted to encompass STEM. Items from the Career Maturity Inventory and the STEM Career Interest Questionnaire were used to gauge college social capital and STEM aspirations. Internal validity testing of the surveys indicated the youth survey to have a high internal reliability (Cronbach's coefficient $\alpha = .932$) and the parent survey to have acceptable internal reliability ($\alpha = .786$).

The parent survey was translated into Arabic, Swahili, and Kirundi languages, and participants had the option to complete it in English or their home language. For parents with low literacy, community leaders assisted by reading the surveys and transferring their responses. To analyze the data, aggregate mean scores for each construct (e.g., STEM identity) were calculated. The Shapiro-Wilk test was utilized to assess the normality and to determine the most suitable statistical test to apply. As opposed to t-tests, the more conservative Mann-Whitney U tests were used to determine if there were statistically significant differences from pre to post.

Analysis and Findings

Student Results. Students demonstrated statistically significant positive changes ($p < .05$) in their dispositions towards STEM outcome expectations, college social capital, and STEM capital. These changes indicated an overall improvement in students' perceptions of STEM careers and their confidence in navigating a successful college journey. Table 1 provides an overview of the changes observed across all measured constructs on the student survey.

The significant changes in outcome expectations suggest that students developed enhanced beliefs about their future involvement in STEM careers. Survey items related to the outcome expectations construct included statements such as "If I had a career in a STEM field, I would find the work enjoyable" and "If I had a career in a STEM field, I would find the work fulfilling."

Table 1. Pre and Post Means, Student Survey *$p < .05$

	Pre		Post		
	Mean	Std. Dev.	Mean	Std. Dev.	*p*
Self-efficacy	3.57	.65	3.61	.51	.654
STEM outcome expectations	3.84	.74	4.15	.61	.002*
STEM Career Interest	3.61	.75	3.76	.64	.209
STEM Identity	3.23	.82	3.34	.85	.346
College Social Capital	3.80	.56	4.16	.60	<.001*
STEM Capital	3.51	.63	4.06	.61	<.001*
STEM Aspirations	4.21	.68	4.33	.78	.238

In relation to STEM perspectives, students experienced a significant increase in their STEM capital by the end of the workshops. This indicates a growing "wealth" of assets, such as connections with individuals in STEM fields and parental emphasis on the value of STEM-related skills. For instance, survey items within the STEM capital construct asked students to indicate their level of agreement with statements like "I know people who I can talk to who have jobs in STEM fields."

The overall improvement in college social capital among students suggests they believe their resources and knowledge related to college, as well as comfort in navigating the college path, significantly increased. The increased college social capital also implies improved support and higher expectations from family members regarding college attendance. Survey items within the college social capital construct included statements like "My family and I are comfortable discussing my college plans and the future careers I may pursue."

While the statistically significant changes in the three aforementioned constructs are noteworthy, it is important to acknowledge that the gains, though positive, were not substantial. However, it is worth noting that there were positive improvements across all constructs. The effect sizes for STEM outcome expectations, college social capital, and STEM capital were calculated to be 0.21, 0.29, and 0.38, respectively, indicating that participation in the program had small but statistically significant effects on students in these areas.

Parent Results. The analysis of the parent survey, which covered five constructs, revealed statistically significant changes in the areas of college social capital and STEM capital ($p < .05$). The significant changes observed among parents mirrored results seen in their children (Table 2). Similar to their children, parents displayed increased comfort in their family's ability to support their children's college journey, reflected in the improvement of college social capital. Survey items within the college social capital construct encompassed various aspects, such as college knowledge (e.g., awareness of career options and college application processes) and the skills and determination to navigate the college experience. For instance, parents rated their agreement levels with statements like "If my child asks, I am capable of helping them choose their future college major." The effect size for the change in college social capital was calculated to be 0.43, indicating a small to moderate effect resulting from program participation.

Parents also indicated significant gains in their STEM capital, particularly their family interest in STEM and their connections with individuals in STEM careers. For instance, parents indicated increased agreement with the statement, "I emphasize to my children that knowledge in science, math, and technology is beneficial for their future." Effect size calculation indicated a significant but small impact (r = 0.38) of participation on parents' STEM capital.

Table 2. Pre and Post Means, Parent Survey *$p < .05$

	Pre		Post		
	Mean	Std. Dev.	Mean	Std. Dev.	*p*
Self-efficacy	4.40	.72	4.50	.56	.671
STEM Identity	4.01	.72	4.31	.48	.171
College Social Capital	3.89	.85	4.38	.53	.002*
STEM Capital	4.16	.58	4.47	.47	.008*
STEM Aspirations	4.80	.41	4.84	.31	.880

Discussion / Conclusions

The increased college social capital and STEM capital reflect improvements in student beliefs

regarding their family's interest in STEM, comfort discussing STEM careers, and expectations related to college. These enhanced dispositions also indicate greater competence in areas such as college applications, career-finding, and building connections with people in college and/or STEM. We suggest students' improved STEM outcome expectations were influenced by these increased capitals. Conversely, it is possible the students' perceptions of the fulfilling nature of future STEM careers (i.e., outcome expectations) mediated their STEM and college social capitals. That parents and children demonstrated similar improvements in college social capital suggests refugee families participating in this project viewed their college-related resources as expanding and valuable.

Parents, like their children, also reported a significant improvement in their families' STEM capital after completing the workshops. It is speculated that the continuous interaction with STEM faculty and college students with a focus on STEM fostered familiarity and personal connections. For refugee families, who often have limited connections, especially in higher education and STEM fields, these types of connections hold significant value. Another notable observation, requiring further investigation, was the crucial role played by community leaders, most of whom were refugees themselves upon arriving in the United States. It would be an oversimplification to merely consider these community leaders as intermediaries between refugee families and the university. In addition to program planning and design, the community leaders served as teachers and facilitators, exemplified interactions with university personnel, and provided valuable insights to enhance the program's effectiveness. This culturally-responsive approach to programming, as highlighted by Ladson-Billings (1995), is considered a strength of this project. Despite the unique leadership of each community, there was a shared commitment to organizational leadership, community capacity, and enthusiasm within these grassroots refugee organizations.

References

Garcia, H. A., Garza, T., & Yeaton-Hromada, K. (2019). Do we belong? A conceptual model for international students' sense of belonging in community colleges. *Journal of International Students*, *9*(2), 460-487.

Graham, H. R., Minhas, R. S., & Paxton, G. (2016). Learning problems in children of refugee background: A systematic review. *Pediatrics*, *137*(6), e20153994 https://doi.org/10.1542/peds.2015-3994

Higgins, P. J., & Misawa, M. (2022). A narrative study of refugee adult learners' experiences in a Southeastern US community college. *Community College Journal of Research and Practice*, *46*(3), 189-201. https://doi.org/10.1080/10668926.2021.1910596

Krebs, G. (2013, January 10). An American education: Refugees and new immigrants face challenges to graduation. *Deseret News National.* http://national.deseretnews.com/article/1041/an-american-education-refugees-and-new-immigrants-face-challenges-to-graduation.html

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, *32*(3), 465-491.

Loo, B. (2021). Admissions policy and practice regarding refugee students in U.S. higher education: What is known? *Refugees in Higher Education* 173-191. In J. Berg, M. Grüttner, & B. Streitwieser (Eds.) *Refugees in higher education. Higher education research and science studies*. Springer VS, Wiesbaden. https://doi.org/10.1007/978-3-658-33338-6_9

McBrien, J. L. (2005). Educational needs and barriers for refugee students in the United States: A review of the literature. *Review of Educational Research*, *75*(3), 329-364. https://doi.org/10.3102/00346543075003329

Refugee Processing Center (2022). Admissions & arrivals. https://www.wrapsnet.org/admissions-and-arrivals

Ryu, M., & Daniel, S. M. (2020). How did we engage resettled Chin youth in critical STEM literacy practices? *Asia-Pacific Science Education*, *6*(2), 319-345. https://doi.org/10.1163/23641177-BJA10008

Ryu, M., Tuvilla, M. R. S., & Wright, C. E. (2019). Resettled Burmese refugee youths' identity work in an afterschool STEM learning setting. *Journal of Research in Childhood Education*, *33*(1), 84-97. https://doi.org/10.1080/02568543.2018.1531454