

Board 338: NSF S-STEM: A Community College and University Partnership to Support STEM Student Success; Achievements and Challenges in the First Year of Implementation

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Dr. Lynn Albers is an Assistant Professor in Mechanical Engineering of the Fred DeMatteis School of Engineering and Applied Science at Hofstra University. Her previous academic contribution was as one of the founding five faculty/staff at Campbell University, helping the newly formed School of Engineering grow and establish roots in the community. A proponent of Hands-On Activities in the classroom and during out-of-school time programs, she believes that they complement any teaching style thereby reaching all learning styles. She earned her doctorate in Mechanical Engineering from North Carolina State University specializing in thermal sciences where her dissertation research spanned three colleges and focused on Engineering Education. Her passions include but are not limited to Engineering Education, Energy Engineering and Conservation, and K-20 STEM Outreach. Prior to matriculating at NCSU, she worked at the North Carolina Solar Center developing a passion for wind and solar energy research while learning renewable energy policy. She combined these passions with K-20 STEM Outreach while a National Science Foundation Fellow with the GK-12 Outreach Program at NCSU where she began Energy Clubs, an out-of-school-time program for third, fourth and fifth graders to introduce them to renewable energy.

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Margaret Hunter, Ph.D., is an Associate Professor and Associate Chair of Engineering at Hofstra University in the Fred DeMattei School of Engineering and Applied Science. She has been teaching in the Civil Engineering program for 25 years. Her educational research focuses on broadening the participation in engineering. This has included both formal and informal learning activities in pre-college, developing a course framework to aid faculty at 2 year institutions to encourage participation by women in STEM and currently involved in methods to improve retention in engineering.

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NSF S-STEM: A Nassau Community College and Hofstra University Partnership to Support STEM Student Success: Achievements and Challenges in the First Year of Implementation

The Nassau Community College and Hofstra University Integrated Achievement and Mentoring (iAM) Program is an NSF Scholarships in STEM (S-STEM) Track 3 (multi-institution) funded program built on the theoretical framework of legitimate peripheral participation [1] with an emphasis on inclusivity, community, and belonging [2]. The iAM Program has increased Scholar retention, academic performance, and engagement with student support services relative to peers. The program received NSF funding in 2022 to include a collaboration between Nassau Community College (NCC), a local two-year community college, and Hofstra University (HU) to create a seamless pathway for students from local high schools, through five NCC STEM majors (Biology, Computer Science, Engineering Science, Liberal Arts and Sciences, Math) to HU, culminating in a STEM BA/BS degree and entry into a STEM profession. It will accomplish these goals by augmenting the original program [3] with components to address challenges specific to NCC: a summer research experience, ALEKS for math placement support [4], joint NCC/HU advising, and an annual NCC/HU STEM faculty conference to strengthen curricular ties across institutions. The original iAM Program developed and utilized five components at the four-year institution: integrated support services, a STEM writing and metacognition seminar, dynamic hierarchical mentoring, financial support for Pell-eligible students, and a responsive program structure (Figure 1).

Both NCC and HU are located in a community in which more than 93% of high school students are minoritized in the sciences and more than 65% are low income. Our objectives are to: (1) shorten the length of time to earn STEM AS and BA/BS degrees, (2) increase feelings of belonging and identity with NCC and HU, (3) increase identity and confidence as STEM students and professionals, (4) ensure consistent engagement with student support services (e.g., academic success, career counseling and placement), (5) catalyze interdisciplinary and inter-institutional pedagogical collaborations, (6) identify curricular and co-curricular factors contributing to student success and career entry, (7) institutionalize sustainable, high impact practices, and (8) adapt and develop

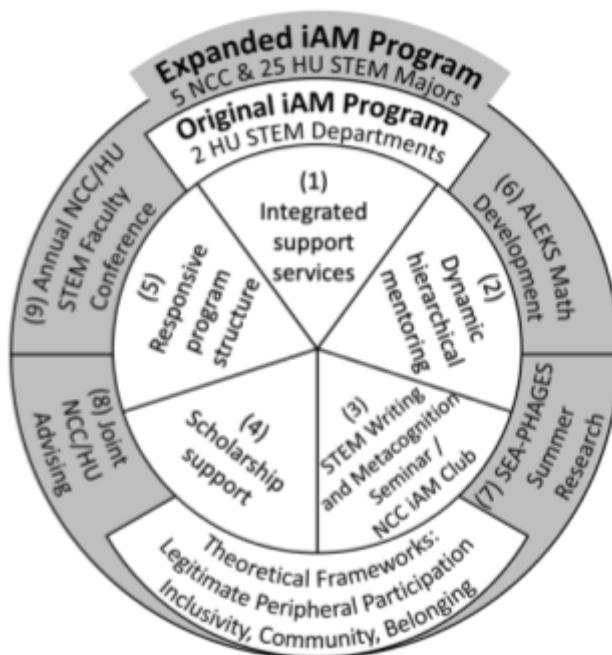


Figure 1. Elements of the original (white) and expanded (white and gray) iAM Program.

processes for other institutions to follow. The expanded program will support 90 unique Scholars. The HU entryway recruits STEM majors who were academically strong in high school and who initially underperform at HU. The NCC/HU entryway recruits local, academically successful high school students. Our goal is to increase HU and NCC/HU Scholar retention, transfer, and graduation rates by 25% relative to peers.

This work-in-progress paper focuses on NCC and the importance of recruitment, perseverance, and retention/transfer rate to HU. It details the iAM Program model and discusses the challenges and achievements of the first year of implementation of the community college cohort, summer research program, and the faculty collaborations between the institutions including the jointly hosted day-long faculty workshop.

Introduction

NCC and HU are natural partners poised to develop students for a globally competitive STEM workforce. NCC, part of the State University of New York, is the largest single-campus community college (CC) in New York, offering more than 75 degrees and certificate programs. HU is located one mile from NCC. HU is an important source of STEM professionals working across the New York City metropolitan area. While many STEM-interested low income students enroll directly in NCC from high school each year, only 1-2 enroll as freshmen at HU. Of the students enrolling in NCC, only 1-2 ultimately transfer to HU each year. While NCC and HU are geographically well-positioned to support diverse, local, STEM-interested students, barriers exist that prevent NCC and HU from successfully doing so. The iAM Program is intended to overcome those barriers.

The major goals of the project to be accomplished over six years are to:

1. Increase academic success, graduation, and career entry of STEM students broadly and local high school students in particular
2. Strengthen curricular pathways between CC and 4-year institutions
3. Evaluate adaptability, transferability, and institutionalization of the Program model

To achieve these goals, we created a pathway for students from four local high schools, through NCC and HU, culminating in a STEM BA/BS degree. Expanding to include NCC students is critical to support low income students as earning a college degree is a mechanism for social mobility [5], a tool for economic self-sufficiency [6], a predictor of socioeconomic status [7], and provides long-term benefits for the degree earner and their descendants [6]. The expanded program addresses NCC students' delayed degree completion due to math placement, lack of access to research experiences, the multi-step transfer process, and inadequate curricular integration between NCC and HU (Figure 1). We engage NCC-HU Scholars starting the summer before the first semester at NCC, as early support with math placement and advising is critical to NCC student success, facilitating timely completion of an AS and graduation with a BA/BS degree (Figure 1) [8], [9].

Cohort Recruitment

Principal investigators (PIs) at NCC worked jointly with NCC Admissions and the HU team to develop a program website with an application portal. The team developed an application, interview questions, and selection criteria. Five students were selected for the first cohort of NCC Scholars. These Scholars completed a four-week Summer Research Program. Additionally, as part of the recruitment process, NCC PIs presented a Metacognitive Learning Strategies workshop as part of a college recruitment and information event in October 2022 and at a STEM College and Career Day in April 2023.

Summer Research Experience

Scholars participated in a Summer Research Experience at NCC July 5 through August 3, 2023. The experience was four days each week with Scholars paid a \$2,000 stipend over the course of the summer. The Summer Research Experience involved hands-on experiences using SEA-PHAGES [10] that included a variety of scientific skills such as aseptic techniques, DNA extraction, thin layer chromatography, and protein quantification, to name a few. Scholars also had lessons on the scientific method, macromolecules, mtDNA, and cardiac anatomy and physiology. In addition, demonstrations and lessons on nuclear magnetic resonance, gas chromatography, scanning and transmission electron microscopy were conducted.

We used the research experience both to provide Scholars with hands-on experience and to expose them to the wide variety of student support services available on campus. During the research experience, Scholars visited several locations on NCC's campus including the Student Services Center, academic learning centers, and the College Library. All students spent 3 to 4 hours per week for 5 weeks using ALEKS [4], an online platform to support math development. At the conclusion of the experience, three students had improved their math placement scores on the NCC math placement exam. Scholars also received mentoring and academic advising in their specific disciplines.

Collaboration between HU and NCC

Project leadership for both institutions worked together to host a Kick-Off Meeting for the two PI teams to build and sustain collaboration between the S-STEM projects at HU and NCC. The meeting focused on team-building, coordination across institutions, and knowledge generation. Additionally, the two institutions jointly hosted a Knowledge Generation Day, focused on team building, increasing understanding of institutional context for both HU and NCC, and coordinating knowledge generation efforts across institutions.

Along with collaboration between the two PI teams, the project seeks to catalyze collaborations between HU and NCC faculty. The PI teams hosted a day-long workshop for NCC and HU faculty, focused on creating connections among faculty across institutions, curricular collaboration, and visioning for the future. We used the Stanford School's Design Thinking

process [11] to engage faculty participants in rich conversations about the interdisciplinary teaching experience at each institution.

Surveys were administered to the NCC Scholars before and after the Summer Research Experience. One set of survey questions asked Scholars to think about starting college in the fall semester and report how well-supported they felt with respect to engaging in activities important for success in STEM in college (Figure 2). While the first cohort at NCC was small (N=5), gains were seen in how well-supported Scholars felt in writing lab reports, raising their hand in class, using tutoring, using academic advising, working with peers to study, working on group assignments, talking with teachers and using college/career readiness opportunities (Figure 2).

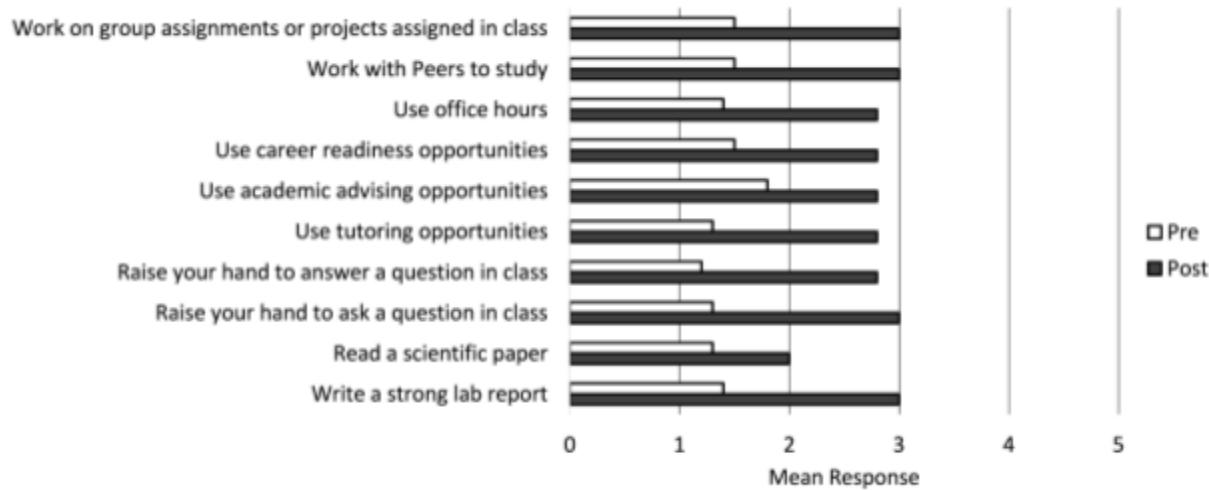


Figure 2. Mean Scholar responses to prompts asking how well-supported do they feel in terms of being able to engage in activities important for success in STEM in college. Scholars responded before (Pre) and after (Post) completing the Summer Research Experience. (0=Not at all; 1=To a very small extent; 2=To a small extent; 3=To a moderate extent; 4=To a large extent; 5=To a very large extent)

Scholars were also asked about a series of support services offered on campus (Figure 3; Figure 4). For several services, the number of Scholars reporting they knew what the support service did increased (Figure 3) and the number of Scholars who reported knowing how to access many services also increased (Figure 4).

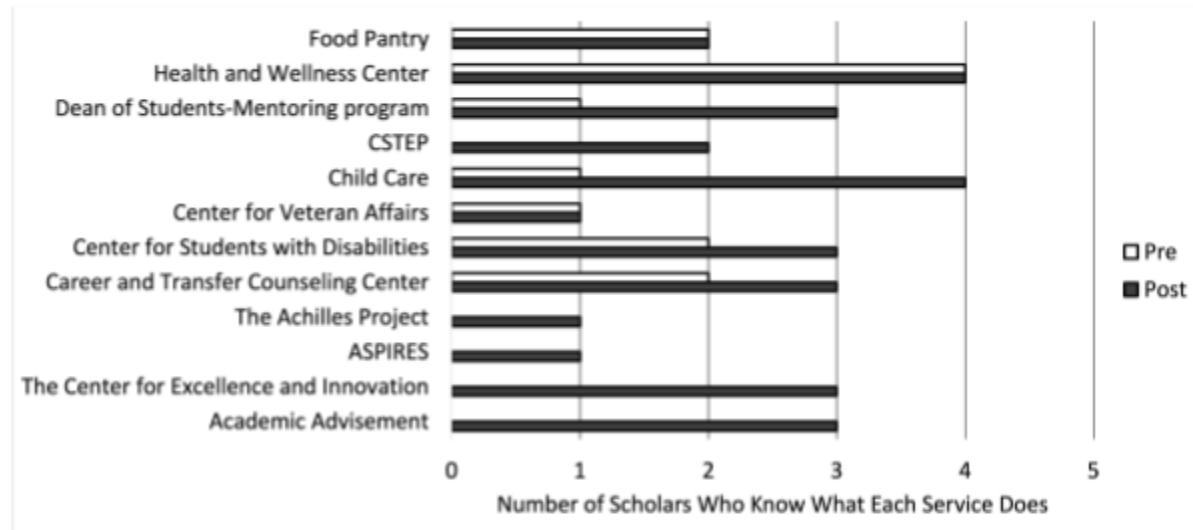


Figure 3. Number of Scholars reporting that they knew what each service does before (Pre) and after (Post) participating in the Summer Research Experience.

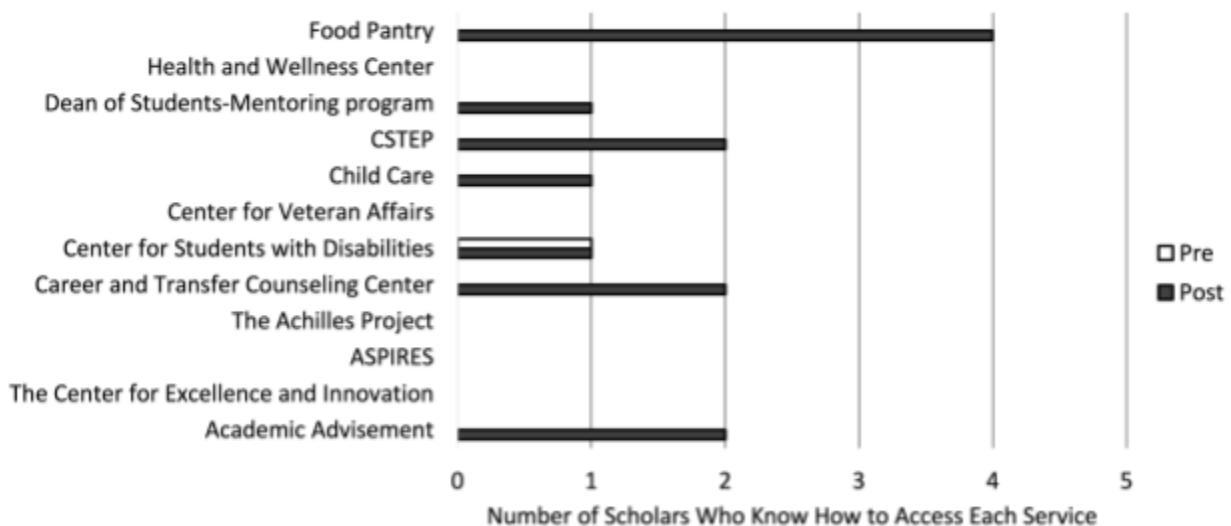


Figure 4. Number of Scholars reporting that they knew how to access each service before (Pre) and after (Post) participating in the Summer Research Experience.

Challenges and Future recommendations

The primary challenges faced relate to (1) recruitment from high schools to NCC and (2) access to institutional data. With respect to recruitment, NCC is often not students' first choice of college to attend. We had hoped to have our cohort populated with Scholars in April or May. However, many students did not apply to the iAM Program until May or June, having waited to hear from the other colleges to which they had applied. We also had fewer applicants than we expected. Thus, for the upcoming recruitment cycle we have extended the application deadline

and are working even more closely with local high schools to advertise the program and encourage students to apply. A final challenge was students not completing the Free Application for Federal Student Aid (FAFSA). Multiple barriers exist for some students with respect to the FAFSA (e.g., concern about completing it if parents are undocumented, discomfort with online forms). We are working closely with high school guidance counselors to help more students complete the FAFSA.

With respect to institutional data, HU has developed fairly strong workflows for data sharing as HU has been running the iAM Program since 2018. This was NCC's first year with the Program and we discovered that NCC did not have clear policies or workflows available for data sharing among relevant offices (e.g., Admissions, Institutional Research) and the program leadership team. A primary focus for the current year is to develop workflows that provide the program leadership team with the data required to successfully run the iAM Program without placing an outsized burden on NCC's administrative staff.

Both NCC and HU iAM Program leaders are collecting, collating, and analyzing data to understand the NCC/HU Scholar experience. These data include surveys and focus groups that are being explored to understand the extent to which the Program impacts Scholar STEM identity, access to and use of student support services, and Scholar metacognitive skills.

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