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Board 213: An Expanded Integrated Achievement and Mentoring (iAM) Program to Promote Access to STEM Professions

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An Expanded Integrated Achievement and Mentoring (iAM) Program to Promote Access to STEM Professions

Background

The Integrated Achievement and Mentoring (iAM) Program at Hofstra University (HU) responds to the challenge of retaining a diverse STEM student population [1]. This achievement-focused program provides students early access to the hidden curriculum and contextualizes support services in a model that is inclusive, promotes belonging, and develops student identity locally in the STEM community and globally as part of the University community. This is an NSF Scholarships in STEM (S-STEM) Track 3 (multi-institution)-funded Program built on the theoretical framework of legitimate peripheral participation with an emphasis on inclusivity, community, and belonging. Through an initial Track 2 (single-institution) award, the Program increased Scholar retention, academic performance, and engagement with student support services relative to peers.

The Program explores a transformative model that integrates existing institutional resources within an evidence-based framework. The model is intentionally adaptable to unique institutional or disciplinary contexts. The program seeks to advance knowledge in four broad areas: (1) scholar outcomes, (2) institutional impacts, (3) adaptability, transferability, and institutionalization, and (4) theory and practice. We are uniquely positioned to succeed, given resources and the collaborations built via the NSF-funded (STEM)^2 Network [2]. Here we describe the iAM Program, report quantitative outcomes related to Scholar retention and graduation, and discuss financial implications for the University.

Core Program Components

The iAM Program involves five (5) core components: 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). As the program expands to include a local community college, we include additional elements designed to address challenges faced by community college students: accelerated math placement using ALEKS, a summer research experience, joint advising across institutions, and an annual STEM faculty conference across the institutions (Figure 2).

The integrated support services are relative to the University. Rather than developing new student support services, the program engages Scholars with existing resources on campus, integrating those resources into the student experience within an achievement-based framework. This is as opposed to the current deficit-based framework that expects students to engage with resources when they need help. In this context, the program partners with a Center for Academic Excellence focused on academic skills such as study skills, time management, and goal setting. The Career Center offers career-oriented workshops such as developing LinkedIn profiles,

resume writing, and interview skills. Advisors from the Center for University Advising help scholars navigate the curriculum. The intent of integrating support services is to ensure students have access to the hidden curriculum [3], [4], that is, to the knowledge and skills required for success in college that faculty implicitly expect students to know but that are rarely explicitly taught.

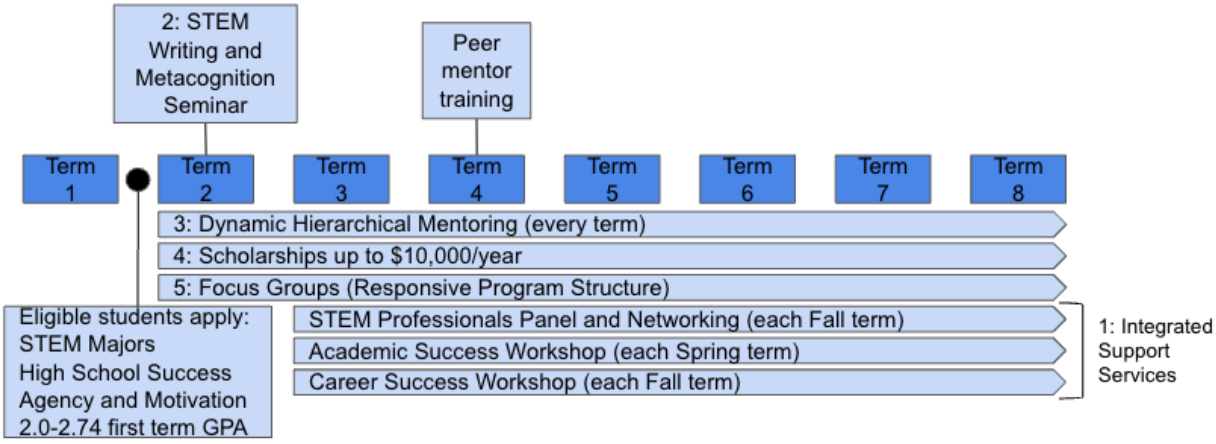

Figure 1. Program timeline and integration of five core program components.

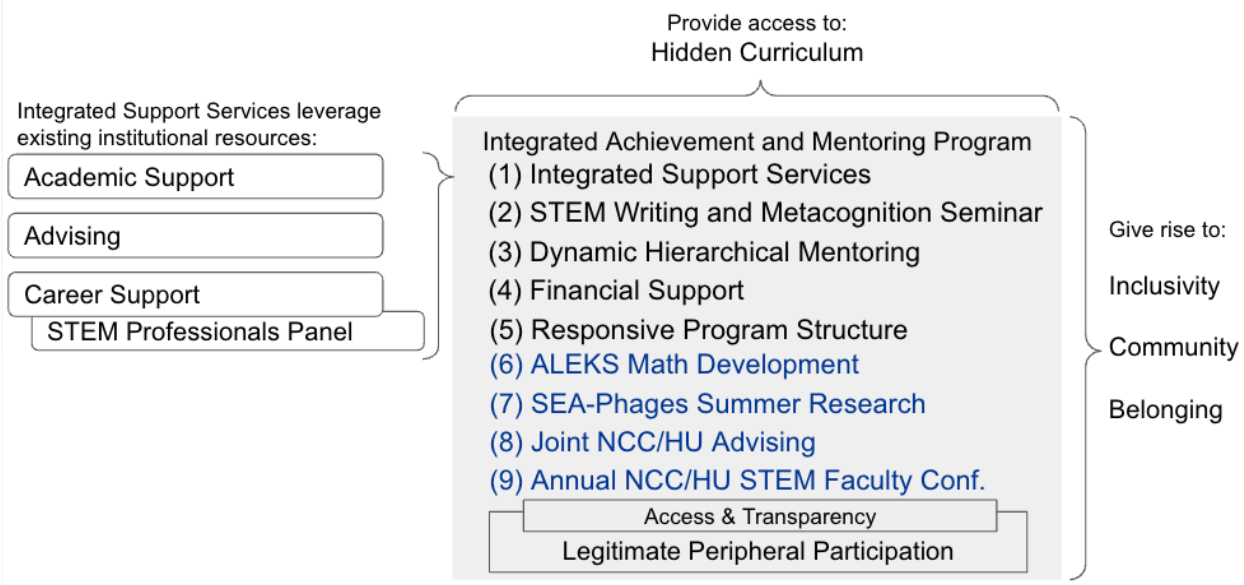

Figure 2. Relationship of iAM Program components and theoretical frameworks. Components 1-5 are original to the program [1]. Components 6-9 are being added with expansion to include Nassau Community College. The theoretical framework of Legitimate Peripheral Participation [5] underlies the selection and implementation of all program components. Integrated support services leverage existing institutional services while the iAM Program as a whole provides Scholars access to the hidden curriculum and gives rise to inclusivity, community, and belonging.

The STEM Writing and Metacognition Seminar is a zero-credit, pass-fail course held once per week during Scholars' first spring semester in the program. The seminar provides a foundation for Scholars' experience in the program. It is an opportunity for community building and engagement with existing support services as Scholars develop science writing and

metacognitive skills. It provides another opportunity to expose Scholars to the hidden curriculum [3], [4].

Dynamic hierarchical mentoring consists of faculty mentors and more senior Scholars who mentor more junior Scholars. As Scholars progress through the program, they are trained as mentors and subsequently mentor more junior Scholars. Scholars and mentors are organized into "squads" that meet twice each month, once with the faculty mentor present and once without. Scholars select their squad each semester based on their schedule and the associated faculty mentor. Squads form the basis of Scholars' continued interactions with the program.

Financial support for Pell-Eligible Scholars is $10,000 per year for up to four years, completely funded from the NSF S-STEM award. Providing scholarship support mitigates the disparity in unmet financial need between Pell- and non-Pell-eligible students.

The responsive program structure grew from the research component of the program. Focus groups were conducted each semester for each cohort (now conducted once per year). The focus groups provide rich information for qualitative analysis relative to the program's underlying theoretical framework. In addition, the focus groups allow the program leaders to make near-real-time adjustments in program structure to address the needs and concerns of Scholars.

Theoretical Framework

The theoretical framework guiding implementation of all program components is Legitimate Peripheral Participation (LPP; Figure 2) [5]. LPP focuses on identity construction through participation within the socio-cultural and historical contexts of a community of practice. It emphasizes the structure of resources, both human and material, to determine the extent participants have access and transparency [5]. Stemming from LPP are the concepts of inclusivity, community, and belonging. Given varied definitions of each concept in the literature, we operationally defined each term. We define inclusivity as the institutional structures, practices, processes, or mechanisms intentionally created to achieve equity for all students. Community is defined as a group of people who share or come to share characteristics that are definable, identifiable, and sufficiently distinct from other such groups. We adopted Strayhorn's definition of belonging: "Students' perceived social support on campus, a feeling or sensation of connectedness, and the experience of mattering or feeling cared about, accepted, respected, valued by, and important to, the campus community or others on campus such as faculty, staff, and peers." [6] In separate analyses of qualitative data from focus groups (not reported here) we use the operational definitions to look for evidence of each concept.

Methodology

Scholars were selected on the following criteria: Students in the Biology and Chemistry departments with a first term GPA of 2.0-2.74 with a high school GPA $\geq$ 3.3, $\geq$ 85th percentile on

a standardized college entrance exam, and/or received merit-based financial support from the University. Eligible students were sent an email invitation in the January between their first and second semesters to apply for the program (Figure 1). Responses to prompts on the application were used by the leadership team during online interviews.

Scholars entered the program at the beginning of their second term at HU. They enrolled in the STEM Writing and Metacognition Seminar course meeting weekly. Scholars were assigned to mentoring "squads" composed of peer mentors (successful STEM students) and a faculty mentor, meeting biweekly throughout each semester. They participated in All Program events three times each year (beginning of Fall semester, beginning and end of Spring semester), as well as academic and career-centered workshops hosted by the iAM Program in partnership with the relevant unit (e.g., Center for Academic Excellence, Center for Career Design and Development). Scholars networked with HU alumni working in STEM fields at an annual STEM Professionals Panel. Scholars provided feedback during focus group sessions (originally once per semester, now once per year). Results from analyses of focus groups are not reported here.

Outcomes

To date, five cohorts of students have participated in the Program (N = 49 Scholars) with the most recent cohort entering in January 2023. Based on data from the first four cohorts (N = 33 Scholars), mean Scholar retention across all terms was higher relative to peers who were eligible but did not join the program (by 14.6%) and peers who were not eligible to join (by 9.7%) (Figure 3). The four-year graduation rate of the first cohort of Scholars (N = 6) was 83%, much higher than the 33.3% 4-year graduation rate of peers who were eligible but did not join (N = 33) and 53.0% of peers who were not eligible to join (N = 202) (Figure 4).

The students and university benefit from higher retention and graduation rates. With respect to financial benefits, the primary cost of the program to the university is faculty time. The cost of faculty time to run the program, including course release time provided to the leadership team, is approximately $45,000/year. Using term-to-term retention rates of the first three cohorts of the program (N = 21) the projected net revenue benefit to the institution over seven years (until all three cohorts would graduate) is approximately $112,000. Less quantifiable benefits include increases in university rankings due to increased retention and graduation rates along with stronger ties to recent alumni which could translate to an increase in reputation and alumni giving.

Next Steps

The Program piloted the framework with small cohorts using funding from an initial Track 2 (single institution) NSF S-STEM award. During the Track 2 award, the program leadership team refined the program components and demonstrated a capacity to increase in scale and proven sustainability. With the recent receipt of an S-STEM Track 3 (multi-institution) award, the

Program is expanding to larger cohorts and a partnership with a local community college. The iAM Program now includes 25 majors across eight departments (Biology, Chemistry, Computer Science, Engineering, Math, Physics, Psychology, and Geology, Environment, and Sustainability Studies) at HU. We are also partnering with Nassau Community College (NCC) to provide an iAM Program Pathway through NCC and transferring to HU.

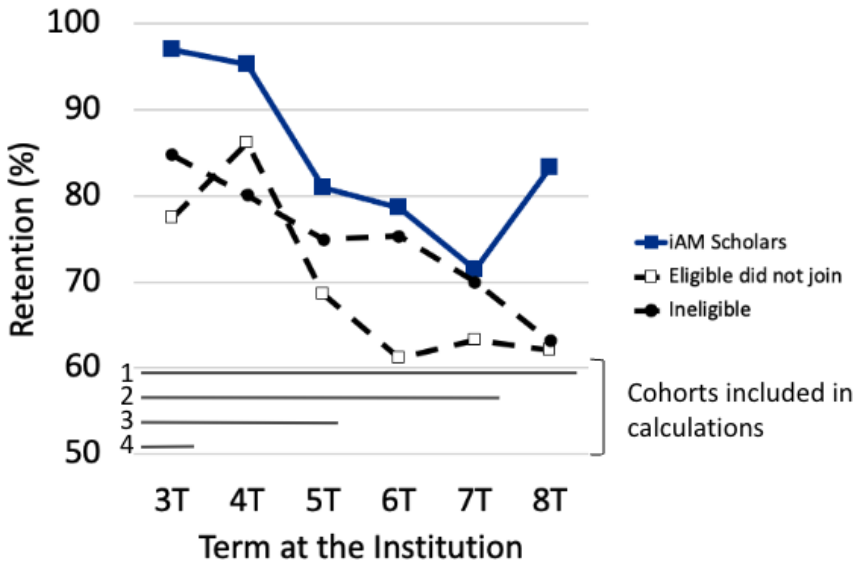

Figure 3. Student retention through time calculated as number of students retained at each time point relative to number of students in term 2. Horizontal lines indicate the iAM Scholar cohorts (and corresponding ineligible and eligible but did not join cohorts) included at each time point.

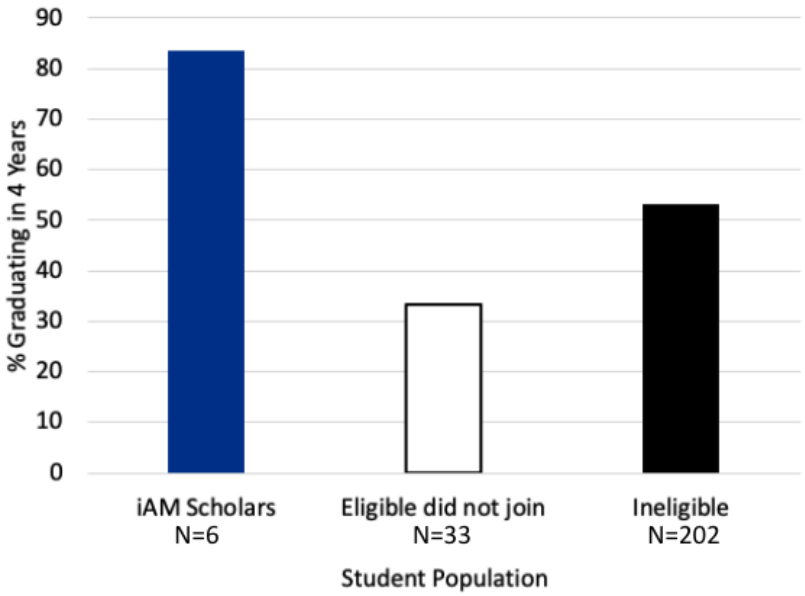

Figure 4. Percent of students graduating in four years. Data from the first cohort of iAM Scholars and relevant comparison populations.

NCC and HU are located in a community in which ≥ 93% of high school students are minoritized in the sciences and ≥ 65% are low income. The expanded iAM Program will 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) and HU, culminating in a STEM BA/BS degree and entry into a STEM profession. It will accomplish these goals by augmenting the original program with components to address challenges specific to NCC: a summer research experience, ALEKS for math placement support, joint NCC/HU advising, and an annual NCC/HU STEM faculty conference to strengthen curricular ties across our institutions (Figure 2).

The goals and objectives for the next phase of the Program include: (1) shorten 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) 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 processes for other institutions to follow. The expanded Program will ultimately support 90 unique Scholars. The HU Entryway will continue to recruit STEM majors who were academically strong in high school and who initially underperform at HU. The NCC-HU Entryway will recruit local, academically successful high school students. Our goal is to increase Scholar retention, transfer, and graduation rates by 25% relative to peers.

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