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# BOARD # 318: A Thrive Mosaic-based S-STEM Program to Enhance the Educational Success of Diverse Students in Mechanical, Electrical, and Computer Engineering

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# S-STEM - A Thrive Mosaic-based S-Stem Program to Enhance the Educational Success of Diverse Students in Mechanical, Electrical, and Computer Engineering.

## Introduction

The objective of the S-STEM Awards to Increase Mechanical (ME) and Electrical/Computer Engineering (ECE) Diversity (AIME) S-STEM program funded by the National Science Foundation (NSF Award # 2221587) is to increase sustainable gender and ethnic diversity by (a) financially supporting talented Underrepresented Minority (URM) students at Drexel University and (b) activating networks that will support the AIME scholar's intellectual growth, sense of belonging, socialization to their discipline, cultural capital, and (c) transforming the departmental culture that has structurally marginalized URM students in the past. (Figure 1.)

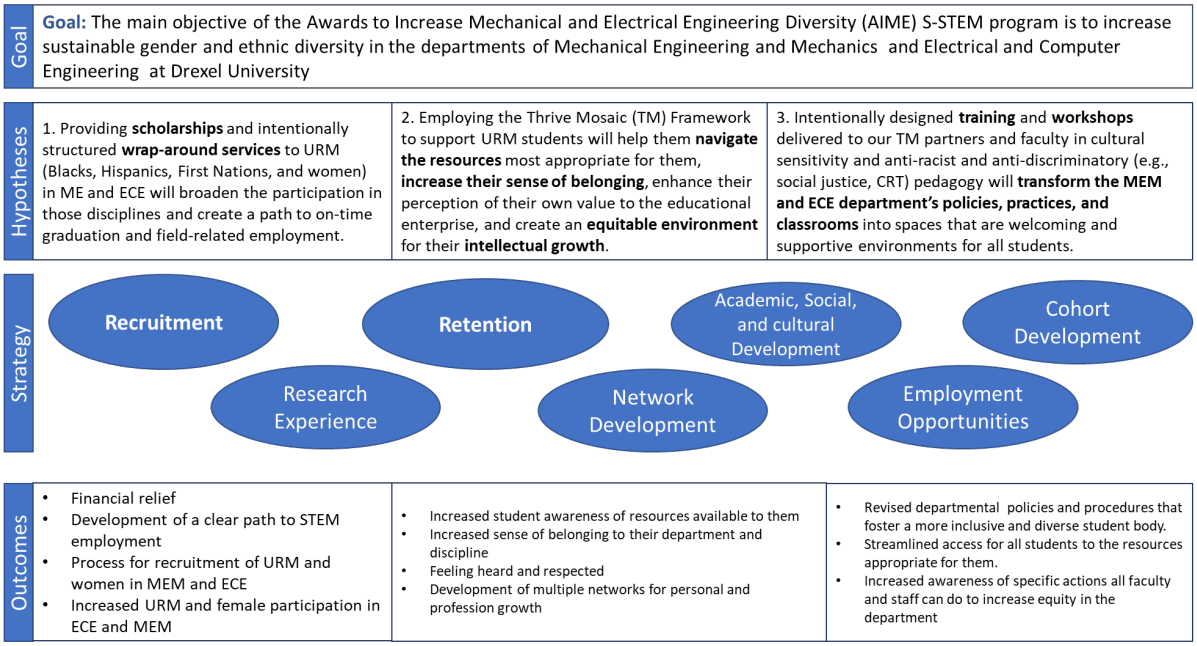


*Figure 1 Logic Model for the S-STEM A.I.M.E program.*

Although the primary purpose of the AIME Scholar program is to provide financial support to talented URM and women who have unmet financial needs in ME and ECE, we recognize that there are other obstacles low income student's face in an academic environment. To increase the likelihood of equitable educational experiences for our AIME Scholars and to interrupt the current policies, practices, and departmental culture that compromise learning opportunities, quality of mentorship, faculty advocacy, and participation in academic programs[1] we adapted the Thrive Mosaic (TM) Scholar Development Framework[2].

This framework is a conceptual toolkit for equitable STEM identity and leadership development that centers the student's development of social capital, community and cultural wealth, and academic capital within an ecosystem of partners (associates, advocates, mentors, coaches,

connectors, targeting trainers) who will provide specific support throughout the undergraduate experience[2]. (Figure 2.)

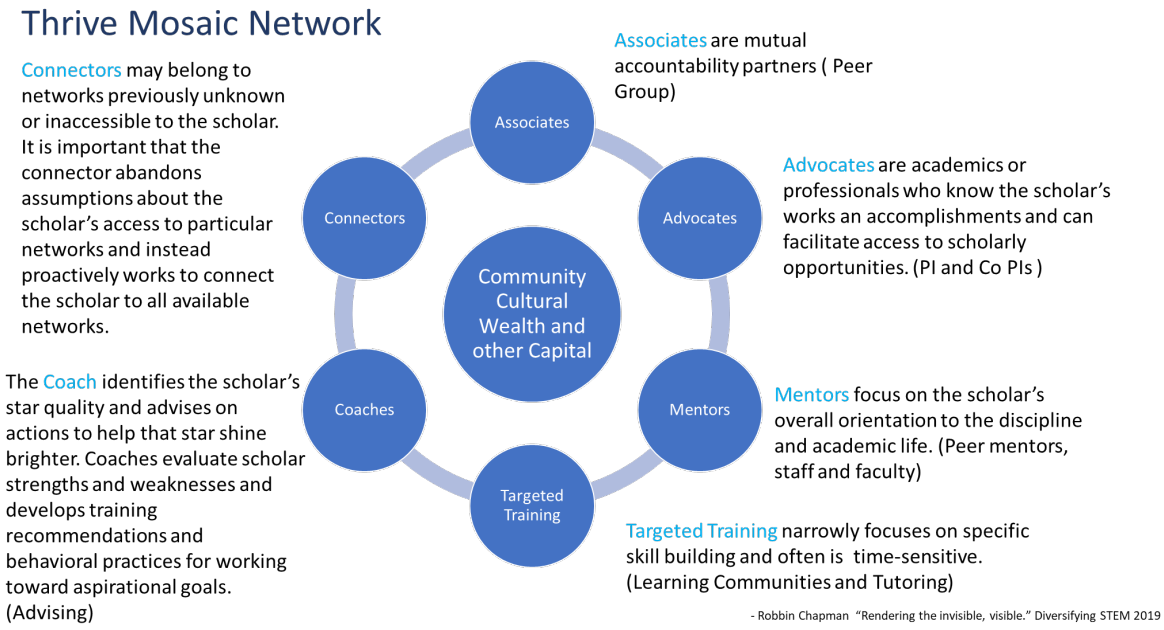


*Figure 2 Illustration of the Thrive Mosaic Network.*

The Thrive Mosaic Framework identifies key roles in a student's network that offer appropriate guidance or training throughout the student's academic life. In most cases these roles already exist at Drexel Univeristy, however, the framework applies structure and intentionality to how we present the network to the students. The PIs are TM Advocates, they know the AIME Scholars the best through bi-weekly meetings, seminars, and workshops. They and the Academic Advisors can nominate and write letters of recommendation for the AIME Scholars. We also have an undergraduate student who fulfills the role of Connector along with the Academic Advisors because the array of services and programs available to students can be overwhelming and a single person who can help a student navigate the network and make introductions helps to build trust and a sense of belonging.

The other important role in the framework is the TM Associate. This is the AIME scholars' network of peers who are committed to academic excellence, share common experiences, and can hold each other mutually accountable. Our AIME scholars have several opportunities to build a community of TM Associates starting with DELTA in the summer and then in the broader community of the Louis Stokes Alliance for Minority Participation (LSAMP). It is important to find a core group of students who can relate to each other's experiences in a STEM environment and build identities around success and resilience[3].

Beyond the TM Connector and TM Associates are roles that can be engaged as needed. Specifically, the LSAMP program offers mentoring (TM Mentor) opportunities as does the

Center for Black Culture and the Student Center for Diversity and Inclusion. Additionally, TM Coaching can be activated at the Center for Inclusive Education and Scholarship and Career Development Center. These workshops and seminars have built community wealth and academic wealth as our AIME scholars prepare for classes and Co-op.

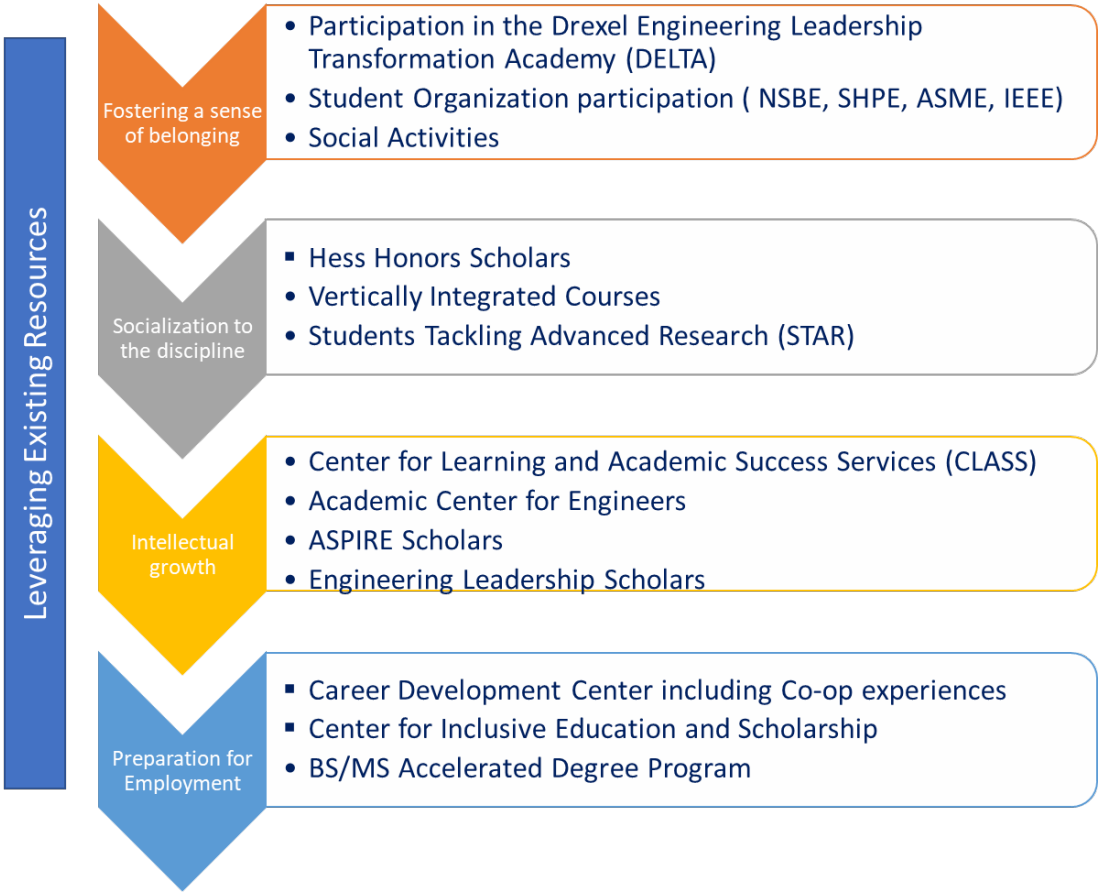


*Figure 3 Map of the A.I.M.E scholarship program.*

Figure 3 maps the program that our A.I.M.E scholarship program follows to ensure the scholars cultivate a sense of belonging, are socialized to their discipline, are prepared to grow intellectually, and are successful in finding employment.

### 1st Year Program Highlights

Our first-year A.I.M.E cohort includes 9 students: (a) 6 mechanical engineers, 2 Electrical and Computer Engineers (1 of each), and 1 Civil Engineer. (b) 6 males, 2 females, and 1 nonbinary (22.2% female), (c) 8 African Americans (1 of whom is also Hispanic), and 1 Asian American (89% African American). Fifty-six percent of our first cohort are first-generation students.

We wanted the A.I.M.E scholars to get to know each other and start building a sense of belonging and camaraderie. We designed a few events to bring the students together and introduce them to the PIs and each other. These events included a Kick-off BBQ, a Halloween Pumpkin Carving

Event, and an Introduction to the Thrive Mosaic Event. Three scholars attended the summer Drexel Engineering Leadership Transformation Academy (DELTA) program before the fall quarter started so they had an orientation to the campus, dorms, and participated in an engineering design activity. We assessed the sense of belonging at the end of the 2024-24 academic year and used a 10-question Belonging Scale. The students self-reported a moderately high to high sense of belonging to the AIME scholarship program.

**10-Question Belonging Scale**

**Note:** The higher the score (20-100) the stronger the sense of belonging in the program.

| | |
|---|---|
| Mean | 86.75 |
| Median | 85.00 |
| STDEV | 8.14 |
| Max | 100.00 |
| Min | 78.00 |

Students overall experienced a moderately high to high sense of belonging in their programs of study.

**The Academic Resilience Scale (ARS-30)**

**Note:** The higher the score (30-100), the higher the student's academic resilience.

| | |
|---|---|
| Mean | 80.09 |
| Median | 79.34 |
| STDEV | 9.63 |
| Max | 94.67 |
| Min | 68.67 |

Students indicated moderate to high levels of academic resilience.

*Figure 4 Results from the assessments.*

We hosted several seminars throughout the year to let the AIME Scholars know about the wrap-around services and opportunities for undergraduate research. For example, The *Louis Stokes Alliance for Minority Participation and You Seminar* was designed to introduce co-curricular and supportive resources. The guest speaker was the Director of STEM Support, LSAMP, Bridge to the Doctorate Graduate Fellowship, and Enrollment Management and Student Success. During the event, AIME Scholars learned about academic success challenges, strategies for success, time management, and effective study habits, tools, and methods. They were also introduced to various academic resource centers at Drexel University, including the Center for Learning and Academic Success Services, LSAMP, and the libraries. There are opportunities for freshmen to participate in undergraduate research and we held a seminar *Introduction to Undergraduate Research and Enrichment Programs*. For this event, the Principal Investigator (PI) invited Ms. Rachel James, Program Manager for Outreach, Undergraduate Research & Enrichment Programs from the Pennoni Honors College at the university. She presented the undergraduate research resources and enrichment programs available at the university. Ms. James discussed with scholars how her office assists students in the process of intellectual and self-discovery through research, fellowship advising, and enrichment programs. Her office helps students, including AIME scholars, to find, conduct, and share research. Scholars were also introduced to the STAR (Students Tackling Advanced Research) Scholars Program, which allows first-year students to engage in full-time, faculty-mentored research, scholarship, or creative work during the summer term after their first year at the university. Three of our AIME scholars applied for this opportunity, and two were awarded positions working with faculty in the Electrical and Mechanical Engineering Departments. We assessed the students' self-reported academic resilience at the end of the 2024-

24 academic year using The Academic Resilience Scale. Students indicated moderate to high levels of academic resilience. (Figure 4.)

**Future Work**

We introduced the idea of doing a podcast at the final seminar in the fall quarter and to help the students find time to work on the first episode we created a 1 credit-independent study course with a common meeting time. Co-PI Jennifer Atchison took a Podcasting in the Classroom workshop at the 2024 KEEN National Convention and implemented some of the techniques with the students. All the AIME scholars took "The Art of Telling Your Story" on-demand course from KEEN's Engineering Unleashed website. Using the course strategies, they wrote their own story about why they chose to study engineering. This helped them find their voice and learn how to write engagingly about their professional career. We also practiced writing interview questions and recorded mock interviews on their phones to get used to hearing their recorded voices. We ideated a name for the podcast and decided on "Dragoneer Diaries" and made a logo. In the Spring quarter, they recorded the interviews for the first episode. In the Fall 2024 we will edit the interview and post our first episode.

In the middle years, we plan to encourage our AIME scholars to apply to the Hess Honors Scholars program in MEM and other undergraduate research experiences in ECE labs. Research projects are available across almost all aspects of mechanical, electrical, and computer engineering. We will provide travel scholarships to students so they can present their results at technical and scientific conferences and meetings and/or publish in journals. Participating in undergraduate research is required to receive the incentive supplement of their scholarship for that year.

We will also have a seminar series, Engineers Create!, whose focus is to invite prominent researchers, who are also URM or women, to celebrate their research and contribution to their discipline and have lunch with the AIME scholars and their mentors so that the Scholars can learn about speaker's research and extend their academic and professional networks.

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