BOARD # 446: SCHOLARSHIPS TO ACCELERATE ENGINEERING LEADERSHIP AND IDENTITY IN GRADUATE STUDENTS (ACCEL)

Prof. Tracie Ferreira, University of Massachusetts Dartmouth

Tracie Earned her Ph.D. in microbiology from Georgetown University, and completed 2 post-doctoral fellowships, one in microbiology and the second in developmental Biology. She was awarded a K22 grant from the National Institutes of Health. The K22 allowed her to transition to a faculty position at The University of Massachusetts Dartmouth. She continued her studies in developmental biology, using the zebrafish model. The UMass Dartmouth Bioengineering program was created in 2010, and she joined the faculty in that department transitioning out of the Biology department. Tracie is committed to student success. She was the ABET coordinator for the initial accreditation visit in 2016, as well as the most recent re-accreditation visit in 2022. While in the Bioengineering department, her research has developed into using the zebrafish to test toxicity of biodegraded materials. She is also passionate about developing programs that position her students to enter the work force and become leaders. She enjoys the students at her institution as many of them are first generation college students. She feels that her program continuously improves to meet the current needs of her students and industry constituents.

Shakhnoza Kayumova, University of Massachusetts Dartmouth

Dr. Kayumova holds a PhD in Educational Theory and Practice from University of Georgia. She joined STEM Education and Teacher Development Department in Fall, 2014, and has taught a wide range of courses including Introduction to Qualitative Methods, Introduction to Quantitative Methods, Research Skills II, Emerging Theories and Methods in STEM Education. Dr. Kayumova is a four-lingual researcher, teacher educator, and learning scientist. Dr. Kayumova published and presented in more than 60 peer reviewed journals and conferences and has been awarded multiple research grants from National Science Foundation. Dr. Kayumova is a recent recipient of the National Science Foundation's Early Career award. Shakhnoza's work appears in journals such as Anthropology & Education Quarterly, Educational Philosophy and Theory, Democracy and Education, and Journal of Research in Science Teaching (JRST).

NSF S-STEM AccEL: SCHOLARSHIPS TO ACCELERATE ENGINEERING LEADERSHIP AND IDENTITY IN GRADUATE STUDENTS

Introduction

This paper presents the outcomes of the second year of the Accelerated Engineering Leadership (AccEL) program. The inception of the AccEL program responds to projections by the U.S. Bureau of Labor Statistics (BLS) indicating a nearly 17% growth in employment for master's- level occupations from 2016 to 2026, marking the highest growth rate across all education levels [1]. Among the disciplines experiencing the most significant growth in master's degree awards, engineering is ranked fourth [1]. Despite intentions to pursue further education, the realities of full-time employment and the extended duration required to complete a degree part-time often deter these students from achieving their educational aspirations. Literature indicates that students who continue in engineering careers typically demonstrate high levels of self-efficacy and identify strongly with the engineering community [1,2]. Although research on self-efficacy and engineering identity has expanded, it predominantly focuses on the initial college experience [3,4]. Limited research exists on self-efficacy and engineering identity among students persisting in engineering education and into their professional careers [4,5]. The AccEL seeks to address this gap by examining these factors among students who continue their engineering studies and enter the professional field. In this paper, we report on the initial programming and application and outcomes of AccEL programming.

This project will develop programs to encourage and recruit students to the accelerated BS/MS degree. The Accelerated Engineering Leadership (AccEL) program targets three essential objectives: (1) it seeks to enhance graduate degree completion among Low-Income Academically Talented (LIAT) students to meet the increasing demand for advanced engineering education in the workforce; (2) it implements evidence-based academic and student support initiatives aimed at bolstering non-cognitive skills, including self-efficacy and engineering identity, thereby facilitating the transition of LIAT undergraduates to graduate-level programs; and (3) it aspires to cultivate leaders proficient in technology, entrepreneurship, and innovation, who will contribute to and fortify the economy of the South Coast of New England—a region noted for its diversity and post-industrial economic challenges marked by significant poverty.

Results

In its inaugural year, the AccEL program generated a large applicant pool, with 46% of eligible students applying. The cohort reflected diversity in both gender and ethnicity, with 75% being women and/or from underrepresented groups in engineering (Hispanic/Latino or Black/African American). The second cohort of College of Engineering students in their +1 year of their 4+1 MS degree, included 13 students, 69% of students in the second cohort are either female or identify with a minoritized racial or ethnic group. Of the second cohort, 85% are employed in their field and 2 are finishing their MS degrees. The second cohort exit interviews and surveys reveal that the AccEL program helped cohort 2 students increase their sense of identity as a scientist/engineer by providing opportunities to engage in scientific research and developing research ideas and solutions. Students also reported that the program helped to build their skills in research, communication and time management, enhance their professional life and independence, and social connections and networks. The majority of cohort 2 students interviewed reported that they participated in STEM conferences where they gained experience in presenting their research and extended their professional network to include students and faculty from other universities.

This year we welcomed 11 students into the third cohort (5 women and 6 men) in Fall 2024. Four of the students in this third cohort were from underrepresented minority groups (2 Hispanic/Latino and 2 Black/African American).

We continued with the Introduction to the Research University (IRU) Seminar, equipping students with essential information to succeed in graduate studies or become employed in their field of study. The second cohort did not have any scholars interested in pursuing a PhD, and the third cohort has one student interested in attending Medical School. One of the major challenges with the IRU programming is having non-scholar participants for data gathering. This year we created a 0cr, pass/fail, Engineering Leadership and Career development seminar. Having a seminar reflected on their transcripts incentivized 3 non-scholars to participate which is encouraging.

In addition to the programming for current MS S-STEM scholars, we have a “Why Grad School” workshop series to encourage juniors to consider pursuing a Master’s degree. This includes career center activities, alumnae panels, personal statement preparation and time working with students to identify potential research advisors. The scholarship application for AY 24-25 was delayed by the FAFSA delay in spring 2024. We continue to struggle to get enough applicants to disperse all of the funds for each academic year. Lastly, we work closely with graduate program directors in each department to assist in recruiting S-STEM applicants and how to share the benefits of completing the +1 MS degree.

Future goals

Data from the scholars reveals their desire to have programming that is social in nature to strengthen the connections in the cohort. We also will be working to bring past AccEL scholars to participate in an alumnae panel. This will likely be a zoom since ¾ students from Cohort 1 that are in PhD programs are no longer in Massachusetts.

In the forthcoming phases of our research, we are poised to conduct analyses on survey results pertaining to self-efficacy as well as evaluate interviews to discern the long-term impact of the program on student self-efficacy. Responding to the feedback received, we are preparing to implement a more structured approach to ensure the Scholars' completion of an "Independent Development Plan." This plan is a strategic initiative designed to aid students in evaluating their strengths and interests, thereby facilitating informed decisions regarding their professional trajectories post-MS degree. Additionally, we are intensifying our efforts to attract S-STEM scholarship candidates from every department within the College of Engineering, with the objective of enriching the diversity within our cohorts.

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References

[1]. Bureau of Labor Statistics (https://www.bls.gov/careeroutlook/2018/article/graduate-degree-outlook.htm).

[2]. Cribbs, J.D., Cass, C., Hazari, Z., Sadler, P.M., & Sonnert, G. (2016). Mathematics identity and student persistence in engineering. *International Journal of Engineering Education*, *32*(1A), 163-171

[3]. Godwin, A., Cribbs, J., & Kayumova, S. (2020). Perspectives of identity as an analytic framework in STEM education. In *Handbook of research on STEM education* (pp. 267-277). Routledge.

[4]. Godwin, A., & Potvin, G. (2017). Pushing and pulling Sara: A case study of the contrasting influences of high school and university experiences on engineering agency, identity, and participation. *Journal of Research in Science Teaching*, *54*(4), 439-462. doi: 10.1002/tea.21372

[5]. Patrick, A. D., & Prybutok, A. N. (2018). Predicting persistence in engineering through an engineering identity scale. *International journal of engineering education*, *34*(2a).