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Board 203: Assuring Student Success in Engineering-Technology Programs

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Dr. Ece Yaprak is a Professor and Chair of the Engineering Technology Division in the College of Engineering at Wayne State University. She received her BS degree in electrical engineering from the University of Michigan (Dearborn) in 1980 and MS and PhD degrees in computer engineering from Wayne State University in 1984 and 1989, respectively. Dr. Yaprak's research interests are in computer networks and communications, especially in wireless communications and wireless sensor networks. Her research has been published in leading scholarly journals in engineering, including the IEEE Transactions on Communications, the IEEE/ACM Transactions on Networking, IEEE Transactions on Education and the International Journal of Modeling and Simulation. Dr. Yaprak's research has been funded by grants awarded her from the National Science Foundation, the US Department of Energy, NASA, the US Navy, and the business community. She has held 8 research fellowships at NASA research centers (John Glenn Laboratory at Case Western, Jet Propulsion Laboratory at Cal Tech, Ames Research Center at Stanford, and the Johnson Space Center at Texas A&M Universities) and the U.S. Navy (at its SPAWAR Research Center in San Diego). She has also served as a Fulbright scholar at the Nokia Wireless Communications Research Center at the University of Oulu in Finland. Dr. Yaprak has been involved with ABET Accreditation in various capacities since 2002: From 2002 to 2012 she served as Program Evaluator, evaluating Electrical Engineering Technology and Computer Engineering Technology programs, both in the US and internationally. From 2006 to 2012 she served on the IEEE Committee on Engineering Technology Accreditation Activities (CETAA) as Chair (April 2010 – April 2012), Vice-Chair (April 2008-April 2010) and Committee member (April 2006-April 2008 and April 2017 - present). Dr. Yaprak also served as an ABET IEEE/ETAC Commissioner (July 2012-July 2017). Dr. Yaprak also serves on the ABET Board of Delegates (November 2019-November 2025). Dr. Yaprak served as a Program Director at the National Science Foundation's (NSF) Division of Undergraduate Education, Feb 2015 to Feb 2017. In that role, she was responsible for planning and budgeting for science in engineering education; managing the awards process; marketing the program; working with other NSF programs, federal agencies and organizations; advising and assisting the division's director in long-range planning; and reviewing research, education and infrastructure proposals.

Mr. Mark A Jager, Wayne State University

Mark Jager has over 40 years of teaching and engineering experience in the automotive and defense industries focused on welding and metallurgical engineering.

Since 2023 Mark has held the position of Assistant Professor (Teaching) and Program Director in the Welding and Metallurgical Engineering program in the Engineering Technology Department at Wayne State University (WSU) in Detroit, MI. Prior to joining Wayne State, he was full-time faculty at the Monroe County Community College (MCCC) in the Welding Technology program. Before beginning

his teaching career, Mark spent 35 years at Tenneco in Monroe, MI as an Engineer, Lab Supervisor, Engineering Manager and Global Materials Engineering Manager. At Tenneco, Mark also served as the corporate Welding Metallurgist and Chief Metallurgist. Prior to Tenneco, Mark held the position as a Welding and Metallurgical Engineer at the General Dynamics Electric Boat Division in Groton, CT for 4 years. Mark has an Associate of Applied Science Degree in Metallurgical Technology from Macomb Community College in Warren, MI, a Bachelor of Science Degree in Metallurgical Engineering, and a Master of Science Degree in Engineering Technology, both from Wayne State University.

Mark is a member of the American Society for Engineering Education (ASEE), American Welding Society (AWS) and American Materials Society (ASM) International.

Assuring Student Success in Engineering Technology Programs

Abstract. Being more diverse than traditional engineering programs, Engineering Technology (ET) programs offer a significant vehicle for advancing equity and inclusion in STEM education and workforce. For example, the share of black students in 4-year ET programs is almost three times that of black students earning 4-year degrees in engineering (10.7 percent versus 3.8 percent) [1]. Also, based on 2020-30 employment projections by US Bureau of Labor Statistics [2], there is a great demand for ET graduates (e.g. mechanical engineering technologists, construction managers, electrical engineering technologists, welding technologists, and computer support specialists). This demand will increase even higher in the near term as the 2021 Infrastructure Investment and Jobs Act (IIJA) is being implemented. Wayne State University's (WSU) Division of Engineering Technology offers upper division only programs (2+2) leading to 4-year degrees. The typical challenges facing transfer students are in this case compressed into 2-year upper-division-only program offerings, which provides manifold opportunities to acquire new insights into how to help this sub-group of students, especially those with low social-economic status. In this project that is in its early stages, the PIs plan to (a) provide financial support to 4 cohorts of 12 high-achieving, low-income ET transfer students with unmet financial need (48 total unique students with each cohort running for two years); (b) implement evidence-based techniques to improve overall student retention rates, graduation rates, and average time-to-degree; and (c) foster professional identity and prepare students to enter the STEM workforce or graduate school. Authors hypothesize that (i) early engagement, and (ii) continuous support play a key role in fostering identification with the engineering profession, retention, and persistence of ET transfer students, thus improving their academic and professional outcomes. Accordingly, multiple evidence-based social, academic, and professional activities have been designed to engage and continuously support the scholars through their degree completion.

Keywords. Transfer Students; Engineering Technology; Recruitment; Early Engagement

Project Implementation and Lessons Learned

The first cohort of students (10 students) were recruited and enrolled in Fall 2023. So far, PIs have a) organized an orientation meeting for the scholars, b) created a Canvas group for the scholars for effective communications, c) introduced the scholars to their faculty mentors, d) organized an active learning workshop for all faculty at the Division of Engineering Technology in collaboration with Office for Teaching and Learning (OTL) at WSU. They have also distributed the first survey to both scholarship recipients and non-recipients and are eager to analyze the preliminary results for the continuous improvement of the project. It is noted that PIs were able to have three scholars accepted for participating in the AAAS S-STEM Scholars Meeting that was held on September 14-16, 2023, in Washington, DC. In the following, some of the activities implemented in this project along with the lessons learned are described:

Recruitment. PIs examined different recruitment strategies and learned important lessons:

- The full-time enrollment requirement was changed to a minimum of 8 credit hours per semester to allow students more flexibility as most of them already have other work and familial responsivities.
- The minimum number of credit hours to transfer at the time of application was lowered to a) be able to attract a larger pool of applicants, and b) address the inconsistency in how the

applicants' transfer credit hours were calculated. Most of students were coming with more transferrable credit hours than the number of credit hours that could actually be counted toward their degree. There were also some applicants who were enrolled for a number of transferrable credit hours at the time of application that could count toward their degree when admitted; but those credit hours were not visible in their official transcript when they applied for the scholarship. In the next round of application, PIs will request for unofficial transcripts as well to get a more accurate idea of the number of credit hours applicants could use toward their ET degree.

- Among the accepted scholars, PIs found a student taking lower division courses that should have been fulfilled in high school or community college levels and would not count toward their degree program. To prevent this in future cohorts, PIs added an additional requirement to make sure all accepted applicants can start with the upper division courses applicable to their ET program. The new requirement is to place into MAT 1800 (Elementary Functions) course or higher at the time of admission. MAT 1800 is a prerequisite course for almost all upper division courses in WSU's ET programs.

Faculty Mentoring. Each scholar in the cohort was assigned an ET faculty member in the scholar's degree program as a mentor. Through the first semester, the scholars were encouraged to have informal meetings with their mentor to discuss their plan of work, their progress, and their concerns if any. Scholars were found to be very appreciative of this mentoring opportunity. PIs use this mentoring as an opportunity to foster engagement from the beginning of scholars' degree program and promote sense of belonging and persistence. In the following semesters, mentors and mentees will be provided with specific talking points to help initiate discussions.

Active Learning Workshop. Inspired by a prior project and findings in the literature, this project hypothesizes that early engagement through the use of active learning techniques can enhance student performance in ET [3]. Therefore, PIs in collaboration with the Office for Teaching and Learning organized an Active Learning workshop for all ET faculty. This workshop was very well received by attendees, as they showed great interest to work with this office and take advantage of their resources to implement active learning techniques in their classrooms.

It is noted that this is a work-in-progress project in its early stages and specific results and analyses of the project activities and their implications are expected to be produced in the following years after completing the first rounds of surveys and interviews.

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