Board 3: Engineering Technology Scholars-IMProving Retention and Student Success (ETS-IMPRESS): First Year Progress Report

Dr. Nasser Alaraje, Michigan Technological University

Dr. Alaraje is a Professor and Program Chair of Electrical Engineering Technology in the School of Technology at Michigan Tech. Prior to his faculty appointment, he was employed by Lucent Technologies as a hardware design engineer, from 1997- 2002, and by vLogix as chief hardware design engineer, from 2002-2004. Dr. Alaraje's research interests focus on processor architecture, System-on-Chip design methodology, Field-Programmable Logic Array (FPGA) architecture and design methodology, Engineering Technology Education, and hardware description language modeling. Dr. Alaraje is a 2013-2014 Fulbright scholarship recipient at Qatar University, where he taught courses on Embedded Systems. Additionally, Dr. Alaraje is a recipient of an NSF award for a digital logic design curriculum revision in collaboration with the College of Lake County in Illinois, and a NSF award in collaboration with the University of New Mexico, Drake State Technical College, and Chandler-Gilbert Community College. The award focused on expanding outreach activities to increase the awareness of potential college students about career opportunities in electronics technologies. Dr. Alaraje is a member of the American Society for Engineering Education (ASEE), a member of the ASEE Electrical and Computer Engineering Division, a member of the ASEE Engineering Technology Division, a senior member of the Institute of Electrical & Electronic Engineers (IEEE), and a member of the Electrical and Computer Engineering Technology Department Heads Association (ECETDHA).

Dr. Lorelle A Meadows, Michigan Technological University

Dr. Lorelle A. Meadows is the Dean of the Pavlis Honors College at Michigan Technological University. Dr. Meadowsreceived her B.S., M.S. and Ph.D. in Oceanic Science from the University of Michigan, College of Engineering. Dr. Meadows was previously Assistant Dean of Academic Programs in the College of Engineering at the University of Michigan.Her primary responsibility in that role was to assure the delivery of a curriculum that addressed college-wide educational objectives to prepare students for 21st century careers. In this role Dr. Meadows led the planning, implementation and assessment of the College of Engineering first year program and targeted curriculum development projects. This led to her development as an educational researcher and she now conducts interdisciplinary research at the intersection of social psychology and engineering education, with specific emphasis on the influence of gender stereotypes in student teams.

Dr. Laura Kasson Fiss, Michigan Technological University

Laura Kasson Fiss, Research Assistant Professor in the Pavlis Honors College at Michigan Technological University, has received funding from NEH and NSF for projects in innovative curricula. Her work on nineteenth-century humor has appeared in Victorian Periodicals Review, The Lion and the Unicorn, The Cambridge Companion to Gilbert and Sullivan and Configurations (co-authored, in press). Co-authored pieces on higher education appear in the proceedings of First Year Engineering Experience, American Society for Engineering Education (forthcoming), and two forthcoming books on honors education.

Dr. Susan L. Amato-Henderson, Michigan Technological University

Susan Amato-Henderson is an Associate Professor of Psychology and Chair in the Department of Cognitive and Learning Sciences at Michigan Technological University. She received her Ph.D. in Experimental Psychology from the University of North Dakota. Her research interests globally fall within motivation science areas, including self-efficacy, sense of belonging, and other personal factors influencing the success of students. Additional research areas include: responsible conduct of research, human values, and detection of deception.

Guy C Hembroff, Michigan Technological University
Prof. Aleksandr Sergeyev, Michigan Technological University

Aleksandr Sergeyev is currently a Professor in the Electrical Engineering Technology program in the School of Technology at Michigan Technological University. Dr. Aleksandr Sergeyev earned his bachelor degree in Electrical Engineering at Moscow University of Electronics and Automation in 1995. He obtained the Master degree in Physics from Michigan Technological University in 2004 and the PhD degree in Electrical Engineering from Michigan Technological University in 2007. Dr. Aleksandr Sergeyev's research interests include high energy laser propagation through the turbulent atmosphere, developing advanced control algorithms for wavefront sensing and mitigating effects of the turbulent atmosphere, digital inline holography, digital signal processing, and laser spectroscopy. Dr. Sergeyev is a member of ASEE, IEEE, SPIE and is actively involved in promoting engineering education.

Kellie H Raffaelli
Dr. John L. Irwin, Michigan Technological University

As Professor for Mechanical Engineering Technology at Michigan Technological University, Dr. Irwin teaches courses in Product Design & Development, Statics and Strength of Materials, Parametric Modeling, and Senior Design. Research interests include STEM education, where as PI for Improving Teacher Quality grants (2010 & 2013) he has developed and implemented professional development courses for K-12 science teachers to implement inquiry-based learning while utilizing computer simulations and 3D printing in their classrooms to help solve engineering problems.

Engineering Technology Scholars – IMProving Retention and Student Success (ETS-IMPRESS) - First Year Progress Report

Abstract

Recognizing a national and regional need for a highly trained engineering technology STEM workforce with baccalaureate degrees, the Engineering Technology Scholars – IMProving Retention and Student Success (ETS-IMPRESS) project provides financial support and an ecosystem of high-impact curricular and co-curricular activities to increase the success of academically talented students. A total of 12 first-time students are supported for four years and 36 students transferring from community colleges are supported for two years. The goals of the project are to (1) increase the number and diversity of students pursuing degrees in engineering technology (first-generation, underrepresented students, women, and veterans); (2) add to the body of knowledge regarding best practices in Engineering Technology and promote employment; and (3) contribute to the literature on self-efficacy. The project brings together engineering technology academic programs that are offered through the School of Technology and programs in the Honors College, an inclusive and unique college designed around high-impact educational practices.

The project provides a unique opportunity to engage academically talented engineering technology students in activities designed to foster leadership, technical know-how, and employability skills for technology fields that actively recruit and employ graduates from diverse backgrounds and communities. By focusing on a broad range of students, the project investigates the relationship between student characteristics and student success through (1) a mixed methods pre/post research design that examines differences in motivation, self-efficacy and professional skills and (2) a matched cohort comparison study of transfer students that examines participation/non-participation in engineering technology programs of study with honors' college elective programming.

The paper will address first year project activities including the ETS-IMPRESS recruitment, and advertisement plan to first-year and community college transfer students. The paper will also address the student eligibility and selection process, the recruitment of the first cohort scholars, and finally the orientation program including the summer bridge undergraduate research experience.

I. Research Background

Research shows that the impact of financial aid on retention is more significant in STEM programs than in other degrees because STEM degrees often take longer to complete [1]. Financial concerns and issues can erode the self-confidence of students and their willingness to remain in STEM [2]. To reform STEM education, financial support is provided by a variety of external organizations, including disciplinary societies, education associations, resource networks, foundations, and governmental agencies [3]. For underrepresented minorities in STEM programs, financial support comes from a range of programs, including general programs supporting underrepresented minorities, financial aid that targets students in STEM, and need-based aid programs. Research has shown that financial incentives are correlated with reduced attrition among low-income and minority students when provided in conjunction with academic support and campus integration programs. Colleges can also achieve better outcomes by simplifying bureaucratic procedures for

applying for financial aid [4]. For example, short reminders to first-year college students to fill out financial aid forms have been shown to improve persistence [5]. According the President's Council of Advisors on Science and Technology (PCAST) report [2], retention of students in STEM majors is the most effective way to expand the STEM pipeline.

Financial support that meets student need is strongly correlated with student attendance, persistence, and graduation [6]. Bowen and colleagues studied a possible relationship between college financing and baccalaureate completion. They defined the "net price" of tuition as tuition minus grant aid, and found a positive relationship between lower net prices and higher graduation rates [7]. Others have suggested that financial incentives could be significant factors to improve student performance [8]. A third study suggested that the most beneficial effect of financial aid was to increase students' freedom to become more engaged in the academic and social environments, which led to increased student persistence [9]. In the past decade, Florida and Pennsylvania policymakers provided financial incentives to schools that helped students clear milestones on their academic journeys or finish work toward degrees or credentials, which led to increasing rates of degree completion [10]. The existing student aid system was designed for college students who were financially dependent on their parents. However, students' financial needs have changed. A significant number of today's students (especially community college students) are older; many attend part-time due to family and work responsibilities. Additionally, financial aid combined with enhanced student support has been shown to be more effective in promoting persistence and completion than financial aid alone [11]. This project combines both financial aid and student support.

In addition to financial need, student retention can be negatively affected by a lack of belonging or social integration in the academic environment. Students who are socially integrated are active, participating and engaged members of an educational environment [12-17]. To engage students in their learning, The Association of American Colleges and Universities points to the value of participation in multiple high impact practices (e.g. learning communities, research experiences, internships, global learning) especially for increasing perceptions of learning among underserved groups [18]. Thus, providing support programs, including cohort/community building activities, summer bridge programs to enable college readiness, mentoring, advising, tutoring, and undergraduate research experiences are key factors in retaining students. All of these recommendations are directly addressed in our ETS-IMPRESS project. The ETS-IMPRESS project provides financial support and an ecosystem of high-impact curricular and co-curricular activities to increase the success of academically talented students. A total of 12 first-time students will be supported for four years of STEM study, and 36 students transferring from community colleges in state of Michigan and neighboring states will be supported for two years. The project will focus on expanding the number and diversity of academically talented and financially disadvantaged individuals entering and completing degrees in Engineering Technology at Michigan Tech. The project brings together Michigan Tech's programs in engineering technology that are offered through the School of Technology and programs in the Pavlis Honors College, an inclusive and unique college designed around high-impact educational practices. School of Technology targeted majors are: 1) Electrical Engineering Technology, 2) Computer Network and System Administration, and 3) Mechanical Engineering Technology.

II. Implementation Plan:

Figure 1 shows the project implementation plan.

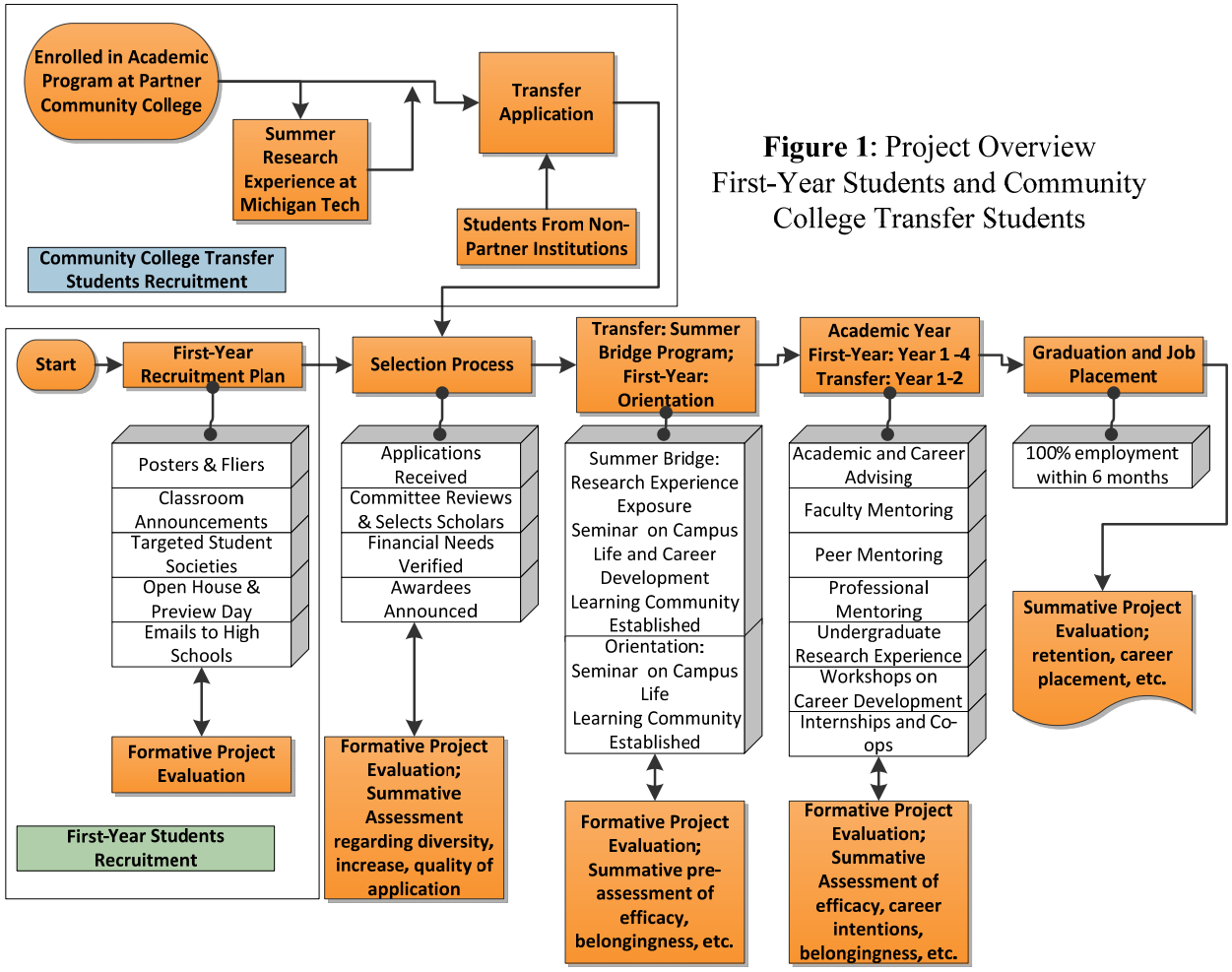

Figure 1: Project Overview First-Year Students and Community College Transfer Students

III. Student Selection, Orientation Program, Advertising and Recruitment Plan

A. Advertising and Recruitment Plan: An aggressive recruiting strategy were used to attract financially disadvantaged and academically talented underrepresented minority, returning veterans, and low-income students to School of Technology programs. Our recruitment strategy took advantage of existing Michigan Tech recruiting initiatives existing articulation agreements with key community college partners. ETS-IMPRESS scholarship program recruitment materials were developed and advertised to the Michigan Community college association, Michigan Tech's partner community colleges, and other community colleges in the state of Michigan through reaching out to individual who can help encourage transfer students to consider applying for the ETS-IMPRESS scholarship. The list includes: Macomb Community College, Alpena Community College, Bay College, Jackson College, Lansing Community College, Mid-Michigan College, Monroe County Community College, Mott Community College, Muskegon Community College, Southwestern Michigan College, and West Shore Community College.

ETS-IMPRESS recruitment material was shared also with state of Michigan science and math teachers, teachers within the Copper Country Intermediate School District (CCISD) and other

intermediate school districts in the region. ETS-IMPRESS scholarship information was posted on social media venues, including Facebook, LinkedIn, Twitter, and Instagram to advertise the program. The project also gained media coverage local to Michigan Tech and across the region.

B. Student Eligibility and Selection Process: Each applicant must be a US citizen, national, or permanent resident alien. First-year students applying for admission must have a high school GPA of 3.0 or higher, an ACT Composite score of 22, and for the new SAT they need a combined score of 1110. Community college transfer students must have a minimum GPA of 3.0. Students must have an Associate's degree in a relevant engineering technology program. Both first-year and transfer students will be required to submit an essay to describe their career goals and why they should be considered for the S STEM scholarship. Financial need of both eligible first-year students and transfer students will be verified using the US Department of Education's rules for need-based Federal financial aid. Michigan Tech's Financial Aid Office will utilize the student information data warehouse to verify student eligibility during this phase.

A total of 41 students applied for acceptance into the ETS IMPRESS program. There were 17 students deemed eligible (financial need of at least $4500), with 9 (5 freshmen and 4 transfer students) students awarded program entrance based upon average ratings of multiple application reviewers using an evaluation rubric. An additional 24 applicants were not eligible for participation for the following reasons: incomplete application (n=3); international student (n=2); unmet need less than $4500 or undetermined due to no FASFA (n=6); and non-SOT majors/not interested in changing to SOT major (n=14). Applications were received from six states, including Michigan, Wisconsin, California, Florida, and Hawaii. The ETS-IMPRESS management team reviewed the applicants' materials and ranked them using a selection rubric. The average GPA for all applicants was 3.61, while the average GPA for first-year awardees was 3.65 and average GPA for transfer awardees was 3.6. The 60-point selection criteria rubric used by the committee also ranked high school ACT scores for the first-year applicants or a relevant associate's degree for transfer students; honors and awards; a personal statement; letters of recommendation; and level of unmet financial need. Nine were selected for the scholarship, five as first-year students and four as transfer students. Selected applicants include one African American, one multiracial, and two female scholars. A small collection of ETS-IMPRESS awardees' quotes are shown below:

"I believe the ETS-IMPRESS scholarship will open doors to various opportunities for me. This program will make me more engaged around campus and within my major as well as cultivate new skills in myself that will prove beneficial to me as I enter the workforce in the future." Tierra Kelley – Electrical Engineering Technology.

"The ETS-IMPRESS will help me to mold my future with my own hands. The opportunity is truly once in a lifetime." Akil McDaniel – Computer Network and System Administration.

"This opportunity that I have with ETS-IMPRESS, is truly unique. I have had the chance to do research, and be a part of the Pavlis Honors College. I believe that as time passes, more opportunities will present themselves though this scholarship and I am excited to see what the future holds." Karen Helppi – Mechanical Engineering Technology

C. Orientation Program:

During first-year orientation, the Pavlis Honors College (PHC) served as a stop on the campus tour, helping familiarize students with our space and programs. Interested students could return for open advising time, when our staff offered a personalized guide to engagement not only with the Honors Pathway Program but also with our other interdisciplinary experiential programs. An interactive pre-class session provided a taste of our curriculum. While open to all students, ETS-IMPRESS students were highly encouraged to take advantage of these opportunities. In addition, a networking event for all PHC Pre-Admitted students allowed ETS-IMPRESS students an opportunity to meet each other and fellow highly motivated first-year students. As the semester progressed, several other social events for Honors Pathway students were held. In addition to weekly open office hours, a networking event with career fair recruiters during Week 5 provided students an opportunity to engage informally with future employers. During week 6, we held a kick-off event for ETS-IMPRESS scholars at which all the students introduced to a variety of representatives from campus resources, including Career Services, the Waino Wahtera Center for Student Success, Financial Aid, Diversity and Inclusions, and Counseling Services. Each office representative introduced themselves and described the services they offer. Students thus had the opportunity to establish relationships with administrators, faculty and staff from the Pavlis Honors College as well as the School of Technology, and upper-class students from their programs.

D. Summer Bridge Program:

ETS-IMPRESS transfer students were provided with a residential five-week summer research experience integrated with our long-standing and highly successful MiCUP Summer Internship Program for prospective community college transfer students. During this program, each ETS-IMPRESS scholar was placed with a faculty member in the School of Technology to complete an immersive summer research experience, which culminated in a public presentation of the research findings. As part of this program, the scholars enrolled in a 1-credit honors summer research seminar and gained key insights into campus resources as well as building relationships with other transfer students, faculty and staff at the university.

IV. Conclusion

New and more diverse STEM graduates are needed to meet workforce needs. Research shows that financial support is key for student success, especially for academically talented but financially disadvantaged students. ETS-IMPRESS will enable new Engineering Technology graduates, drawing upon academically talented but financially needy students that will be in high demand and able to quickly integrate into a wide spectrum of STEM careers. This project focuses on Engineering Technology education, the “T” in STEM workforce development. A total of nine

students (five freshmen and four transfer students) were awarded the STS-IMPRESS scholarship in year one of the program. The ETS-IMPRESS is the first S-STEM project in Michigan Tech's School of Technology and is proposed in partnership with the new Pavlis Honors College, an inclusive and unique college designed around high-impact educational practices.

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