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CLEAR Scholars in Engineering: Academic, Career, and Leadership Development to Help Students with Financial Challenges Achieve their Full Academic Potential

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CLEAR Scholars in Engineering: Academic, Career, and Leadership Development to Help Students with Financial Challenges Achieve their Full Academic Potential

Funded by a National Science Foundation S-STEM grant, the CLEAR Scholars in Engineering program at Indiana University-Purdue University Indianapolis (IUPUI) provides financial support, mentoring, and leadership and career development to undergraduate students with demonstrated potential to succeed in engineering, but who face significant financial challenges, possibly in combination with other barriers to meeting their full potential, such as being a first-generation college student or a member of an underrepresented group. In addition to scholarship support, CLEAR Scholars are provided with an intentional set of activities that promotes student retention, achievement, and persistence to graduation through: (a) Community-building through a cohort model; (b) Leadership and career development; (c) Engagement with industry; (d) Advising through mentoring; and (e) Resources for academic success (hence the acronym CLEAR). The ultimate goal of this project is to produce engineering graduates with lower student loan indebtedness and greater preparation for post-degree roles.

Entering the Program

Students apply for the CLEAR Scholars program as rising sophomores. To qualify, they must be engineering majors with a GPA of at least 2.7 earned in freshman math, science, and engineering classes in order to demonstrate their potential to succeed in engineering. Applicants submit a brief essay describing their interest in the program and why they think they are a good candidate, along with a recommendation letter from a faculty member. CLEAR Scholars remain in the program through their sophomore, junior, and senior years, provided they remain in engineering and maintain a GPA of at least 2.5. The sophomore year was chosen as the starting year of intervention because many existing campus efforts promoting student success and retention focus only on the first year, and resources for career planning are targeted primarily at juniors and seniors, leaving second-year students an invisible population receiving the least attention of any class [1]. Fourteen students have successfully graduated from the program since its inception in 2012.

Program Activities

CLEAR Scholars meet monthly during the fall and spring semesters for activities that connect them to academic and career development resources, as well as helping them develop relationships with one another and with the CLEAR Scholars coordinator. A typical schedule of activities for the year is shown in Table 1. *Resources for Success Workshops* include presentations from on-campus programs that support academic success, particularly those that are especially relevant to success in engineering, such as the Math Assistance Center; as well as activities that reinforce student self-efficacy, such as developing time management skills by comparing planned weekly schedules to actual time spent on those activities and reflecting on how to plan accordingly. *Academic Reflections* give Scholars an opportunity to reflect on their

most recent semester as they are about to enter a new semester and to analyze what went well, what went less well, and what they might do differently going forward. It also gives more advanced students in the cohort a chance to mentor younger students in the same degree program, which both helps younger Scholars succeed academically and strengthens the social bonds of the cohort. Scholars consistently rate these opportunities to get to know and learn from one another as among their favorite aspects of CLEAR Scholars.

Month	Focus of Cohort Meetings
September	Kickoff/icebreaker activity to build community among cohort participants; needs assessment for CLEAR Scholars; and a Resources for Success Workshop facilitated by school-/campus-level office (e.g., Learning Assistance Center; Writing Center; Math Assistance Center) to promote Scholar achievement as the academic year starts.
October	Career Development Workshop, based on needs assessment, to help students prepare for Career Fairs and plan ahead for internship opportunities
November	Leadership Development Workshop, facilitated by an industrial representative from the Dean's Industrial Advisory Council (DIAC) on an emerging leadership-oriented topic of interest to engineering students (based on needs assessment).
January	Academic Reflections and Resources for Success Workshop to promote Scholar achievement at the start of the spring semester.
February	Career Development Workshop to help students prepare for summer internship, cooperative education, study abroad, or undergraduate research opportunities.
March	Leadership Development Workshop, facilitated by an industrial representative from the DIAC on an emerging leadership-oriented topic of interest to engineering students.
April	Industry Engagement Field Trip, a 2-3 hour site visit with a local organization representing one of the 6 engineering disciplines in the school; this event will be held with the support of DIAC member organizations.
May	End of year wrap-up, reflection, and celebration meeting, and a preview of summer electronic mentoring and cohort assignments and facilitation activities.

Table 1: Example schedule of annual CLEAR Scholars activities

As previously reported [2], a key feature of CLEAR Scholars has been engagement with both campus and industry partners to provide programming and opportunities to our Scholars. Through *Career Development Workshops*, the Engineering and Technology Career Services Office provides both regular presentations about their services and one-on-one professional development including résumé review and mock interviews. Scholars are connected with Career Services upon entering the program as sophomores and are encouraged to take advantage of their services throughout their time in the program. In addition, industrial partners – including members of the Dean's Industrial Advisory Council (DIAC) for the School of Engineering and Technology – provide *Leadership Development Workshops* to Scholars on effective leadership techniques, workplace expectations, and other topics of interest, as well as opportunities for job shadowing and site visits to local industries that hire engineers.

Perhaps as a result of this focus on preparing students for success in the workplace, one of our most significant results so far is that CLEAR Scholars have been significantly more likely to pursue credit-bearing industrial internship and co-op experiences compared to the average IUPUI student. So far, 50% of students participating in CLEAR scholars have completed at least one semester of industrial internship or co-op in an engineering-related role for credit, compared to only about 5% of all engineering majors at IUPUI who complete such an experience. Based on our conversations with them, we hypothesize that the CLEAR Scholars enter the program already possessing a higher than average interest in pursuing career development opportunities – thus attracting them to the CLEAR Scholars program in the first place. Subsequently, the program's emphasis on connecting these students to career-related resources both reinforces the importance of these experiences and provides the tools to help Scholars secure industry positions. Feedback and advice from upperclassmen to younger students in the cohort further reinforces the value of those experiences for the students who have pursued them. Expanding our count to include not only credit-bearing industrial internships, but also industrial internships that did not result in college credit and both for-credit and not-for-credit undergraduate research opportunities, 12 out of 14 CLEAR Scholars (86%) spent at least one semester or summer engaged in experiential learning directly related to their major prior to graduation. Based on these results, the CLEAR Scholars program is doing a good job of connecting students to the resources they need to prepare for their post-graduate career-related goals.

Results

After five years, 13 out of 14 students who participated in the program so far successfully completed an engineering degree; and all remain in a STEM field. Two of these Scholars went straight into a post-baccalaureate graduate program, one in engineering entrepreneurship and the other in a pre-doctoral research training program. One Scholar took a job in an academic environment working as an Energy Engineer in the campus environmental assessment center. The rest work as development engineers, quality engineers, software engineers, and in other engineering roles in industry. Two Scholars were able to use the financial support from CLEAR Scholars to budget for summer classes and graduate earlier than initially anticipated, thus reducing their overall financial burden. Thus, the CLEAR Scholars program has shown success in retaining and graduating engineering students, preparing them for post-graduation roles in STEM fields, and helping them reduce their financial burdens.

Future Directions

As this S-STEM grant reaches its end, the School of Engineering and Technology plans to combine key features of the CLEAR Scholars project and other recent success initiatives at IUPUI [3],[4] in a new program. These projects revealed several strategies that lead to increased academic success, retention in, and engagement with STEM fields, including building connections through a cohort model and early engagement with career development resources (CLEAR Scholars); and active learning strategies employed in gateway STEM courses [3,4]. In

Fall 2018, the School of Engineering will pilot two initiatives that draw on these results: Peer-Led Team Learning (PLTL) activities will be introduced to a couple of math recitation sections specifically reserved for Engineering students who place into pre-calculus. These students, who start their college careers already behind in math, are at a high risk of leaving engineering, particularly if they perform poorly in pre-calculus, which typically has a high DFW rate. The goal of the PLTL activities is to provide both peer support and active learning opportunities to help these students succeed academically and ideally remain committed to their engineering major. In addition, the use of the CourseNetworking (https://www.thecn.com/) online learning collaborations and ePortfolio tool will be piloted in several freshman First Year Seminar courses. The system provides another mechanism for student networking and connection; in addition, it offers a badge system that can be used to encourage and reward student engagement with campus resources (such as the Career Services Center or the Math Assistance Center) and provides a record of student participation in activities that may be of interest to future employers, such as leadership and service opportunities. These pilot projects will pave the way for another cohort-based program slated to start in 2019 combining PLTL for introductory mathematics, CourseNetworking, and the career and leadership development activities of CLEAR Scholars. The goal of these interventions is to improve student success and retention in engineering by helping students develop a stronger STEM identity through deeper connection with their peers, their coursework, and campus resources.

References

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