Sustaining Undergraduate Classroom and Career Excellence for STEM Students

Blake C. Colclasure
Assistant Professor of Environmental Science
Doane University
1014 Boswell Ave.
Crete, NE 68333
(402) 826-6728
blake.colclasure@doane.edu

Kristopher Williams
Director of Institutional Effectiveness
Doane University

Dane Bowder
Assistant Professor of Biology
Doane University

Cale Stolle
Assistant Professor of Engineering
Doane University

Christopher Huber
Associate Professor of Chemistry
Doane University

Tessa Durham Brooks
Associate Professor of Biology
Doane University

Introduction

Improving diversity, equity, and inclusion in postsecondary STEM education is of paramount significance. Programs that are intentionally designed to provide underrepresented students access to relevant, equitable, and valuable STEM-based learning opportunities are critical to support the calling for a more diverse workforce in STEM careers and post-baccalaureate education (Daily & Eugene, 2013). Prior research has indicated that the formation of students' STEM-identity improves the retention of students pursuing STEM majors. Increasing STEM-identity requires purposefully designed approaches aligned to student characteristics. The intersection of gender, race/ethnicity, socioeconomic background, and academic preparation all affect STEM-identity to varying degrees (Collins, 2018; Martin-Hansen, 2018; Rosa, 2018). In addition to improving students' STEM-identity, improving career knowledge and preparation is another clear area of need for underserved students (Chemers et al., 2013; Gibbons & Borders, 2010). This poster describes the Sustaining Undergraduate Classroom and Career Excellence for STEM Students (SUCCESS) Project and its outcomes. The project was established at Doane University, a rural, residential, primarily undergraduate institution in Nebraska. The project was funded through the National Science Foundation (NSF) with a goal to increase the number of students, particularly low-income and underserved students, prepared to pursue graduate degrees in non-biomedical STEM programs, while also diversifying the pipeline of STEM majors in undergraduate degrees. The project utilized a multi-method approach in achieving this goal, including the formation of three student cohorts that were provided tailored support and learning.

How it Worked

The SUCCESS Program ran from 2015 to 2020 and established three cohorts of S-STEM scholars (scholars). Criteria to become a scholar were: a) apply and be admitted to the university; b) have a minimum high school GPA of 3.0; c) pursue a STEM major (with a STEM, non-biomedical, career intent); d) be Pell-Grant eligible (indication of low income/financial need); and, e) apply for the SUCCESS Program. The application included a short essay, recommendation letter from a high school teacher in STEM, the creation of an introduction video, and a face-to-face interview. The SUCCESS Program provided each chosen scholar 4 years of financial support through a scholarship (up to $10,000 per year, averaging $5,000 per year, minimum of $2,000 per year, as determined by each scholar's financial need). To maintain the yearly financial support, scholars were required to continue in the SUCCESS Program. The SUCCESS Program included components aimed to improve students' STEM-identify, support, and academic success. In the first year of the program scholars were required to live on-campus in a living-learning community – a specific residence hall designed for scholars. The intent of the living-learning community was to strengthen the cohort through shared experiences and interests. An upperclassman majoring in a STEM discipline was assigned to live in the same living-learning community and served as a SUCCESS Program liaison. First-year scholars completed the 3-credit course, *LAR 101: Science and Society*, designed specifically for each cohort. Additionally, throughout years one and two, scholars completed STEMinars – weekly workshops, discussions, and luncheons that explored cutting edge research on STEM topics. In years three and four, students were required to participate in SUCCESS program workshops that were tailored for career exploration in STEM and connected scholars with local and regional STEM employers. Furthermore, faculty from each targeted STEM major and key student support services administrators served on a management team and collaboratively implemented, monitored, and evaluated scholar support services designed to increase graduate rates and prepared scholars for STEM jobs and graduate programs. Support services included peer

tutoring, supplemental STEM instruction, academic counseling, writing center support, and retention support. Throughout the four years, scholars were required to maintain a minimum cumulative GPA of 3.0.

Results & Implications

The SUCCESS Project provided scholarships, educational programming, and support for 28 scholars (10 Cohort I scholars, 11 Cohort II scholars, and seven Cohort III scholars). The average scholarship awards per year were $4,650 (Cohort I), $5,410 (Cohort II), and $4,714 (Cohort III). Over the grant period, the number of majors in targeted STEM programs increased by 12.9%, while enrollment on the residential campus decreased by 5%. While the goal of the program was to increase enrollment in STEM programs by 17%, the increase of 12.9% in STEM enrollment was substantial for this small university. All scholars (10) in Cohort I graduated with a STEM degree in May 2019, 10 of 11 Cohort II scholars graduated with a STEM degree in May 2020, and 7 of 7 Cohort III scholars graduated with a STEM degree in May 2021. Evaluation surveys were used to provide data on scholars' experiences with SUCCESS Project initiatives. Scholars reported an increased interest in science and STEM careers. STEM employer visits were ranked highly among scholars as having an impact on their interest in STEM careers. Company visits included, but were not limited to, Celerion, Li-CoR, Cargill, and a local water treatment plant. Scholars also reported feeling well-prepared for careers and noted particular appreciated for the mock interviews and resume preparation as part of the program. Scholars had positive perceptions toward the *LAR 101: Science and Society* course and STEMinars. Of the 10 students who graduated from Cohort I, five are in STEM jobs and four are in STEM graduate school. Of the 11 students who graduated from Cohort II, four are in STEM jobs and four are in STEM graduate school, and of the seven students from Cohort III, two are in STEM careers and five are enrolled in graduate school.

Future Plans

Track I of the SUCCESS project ended and the authors have submitted and received a NSF S-STEM Track II grant. The grant will provide 120 unduplicated, annual scholarships to 30 low income students with academic ability, talent, or potential and demonstrated financial need who are pursuing STEM degrees. Although most features of the Track I SUCCESS program will continue (first-year living learning community, STEMinars, employer visits, etc.), Track II will include more robust recruiting initiatives. Strategic recruitment from five high schools that serve high numbers of underrepresentative groups is planned. Track II aims to increase retention rates of scholars by 13 points to 90% (baseline is 77%) and to increase the four-year STEM major graduation rate by 39 points to 80% (baseline is 41%). Track II will also improve evaluation measures of the program. One-on-one interviews/focus groups will be conducted with scholars before, during, and after completion of the program. Improved quantitative measures will be used to measure students' STEM-identify and career motivation.

Costs & Resources

Track I of the SUCCESS Project (completed) was supported by a $607,539.00 grant. Although many of the programs in the SUCCESS Project could be completed without grant assistance, we have identified the scholarship contribution ($521,664.00) as a foundational component to attract and retain scholars. The project was made possible by a collaborative effort between STEM faculty, university administration, student support services, and industry. The Track II award includes additional scholarships to support students and is a more robust program, funded by 1.5 million dollars from the NSF for program implementation.

References

Chemers, M. M., Zurbriggen, E. L., Syed, M., & Goza, B. K. (2011). The role of efficacy and identity in science career commitment among underrepresented minority students. *Journal of Social Issues, 67*(3), 469-491. https://doi.org/10.1111/j.1540-4560.2011.01710.x

Collins, K. H. (2018). Confronting color-blind STEM talent development: Toward a contextual model for Black students' STEM identity. *Journal of Advanced Academics, 29*(2), 143-168. https://doi.org/10.1177/1932202X18757958

Daily, S. B., & Eugene, W. (2013). Preparing the future STEM workforce for diverse environments. *Urban Education, 48*(5), 682-704. https://doi.org/10.1177/0042085913490554

Gibbons, M. M., & Borders, L. D. (2010). Prospective first-generation college students: a social-cognitive perspective. *The Career Development Quarterly, 58*(3), 194-208. https://doi.org/10.1002/j.2161-0045.2010.tb00186.x

Martin-Hansen, L. (2018). Examining ways to meaningfully support students in STEM. *International Journal of STEM Education, 5*(1), 1-6. https://doi.org/10.1186/s40594-018-0150-3

Rosa, K. (2018). Science identify possibilities: a look into Blackness, masculinities, and economic power relations. *Cultural Studies of Science Education, 102*(6), 1363-1393. https://doi.org/10.1007/s11422-018-9859-z