2021 ASEE ANNUAL CONFERENCE
Virtual Meeting | July 26–29, 2021 | Pacific Daylight Time
Paper ID #33017

Successes and Lessons in Year 4 of an S-STEM Summer Sophomore Bridge during the COVID-19 Pandemic

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Successes and Lessons in Year 4 of an S-STEM Summer Sophomore Bridge during the COVID-19 Pandemic

This grantees poster paper documents activities and outcomes of the fourth year of the Engineering Fast-Forward program, an S-STEM summer sophomore bridge and scholarship program at Louisiana Tech University. The Engineering Fast-Forward Scholarship program supports engineering majors in the summer between their first and second years to take one engineering and one mathematics course, along with a professional development (PD) course that usually includes opportunities to visit regional companies employing engineers. The purpose of the program is to provide students with scholarships and support while they have a gentler transition into more challenging sophomore engineering and mathematics coursework. Additionally, completing this coursework early allows for more enriching experiences later in the curriculum, such as minors, internships, and undergraduate research.

The first cohort of Fast-Forward students from Summer 2017 have now had sufficient time to achieve a four-year graduation, while the second cohort from Summer 2018 would now be enrolled in senior design coursework if they remained in engineering and on-track in their degree plans. This poster will examine the on-track success for both of these cohorts and the four-year graduation rates of the first cohort.

Additionally, the fourth year of the program in Summer 2020 saw significant changes due to COVID-19. This poster will describe the challenges of offering the program entirely online, changes to overcome those challenges, and unexpected opportunities that arose. Recognizing the potential for a Summer 2021 program in an online or hybrid environment, we will summarize lessons learned from the 2020 experience.

Cohort 1 Student Outcomes

Eighteen rising sophomores participated in the first cohort of the Engineering Fast-Forward Program in 2017. All eighteen students have been retained in a STEM degree program (100% STEM retention). Fifteen of the eighteen graduated in Spring 2017, fourteen with undergraduate engineering degrees and one with a mathematics degree (83% 4-yr graduation). The three remaining Cohort 1 students are on-track to complete their degrees during the next year, two in engineering and one in biology. Both engineering majors have intentionally chosen a five-year degree plan to enrich their education: one is in the process of completing two minors, while the other took off two quarters her sophomore year to complete a co-op experience.

Cohort 2 Student Outcomes

Seventeen students participated in the second cohort of the Engineering Fast-Forward Program in 2018. Two students left the institution, while the other fifteen students have been retained in a STEM degree program (88% STEM retention after three years). Specifically, of the fifteen STEM majors, thirteen have been retained in engineering, one changed to chemistry, and one changed to computer science. Eleven of the fifteen are on track to complete their degrees this academic year, which will yield a four-year graduation for these students (65% on-track for 4-yr graduation). Six of these eleven are completing one to two minors (mathematics, computer science, business leadership, and/or electrical engineering), and one of the six is actually

completing a minor while concurrently enrolled in the Computer Science Master's degree program.

Additional Training Provided by the Project

The Fast-Forward project is continuing to support the training of other students, beyond those directly participating as scholars in each cohort. Doctoral students from Industrial/Organizational Psychology continue to be involved in the design and delivery of the PD course, and an undergraduate mathematics major has joined the data analysis team for her senior research capstone project. In addition, a team of graduate students is presently looking at the student outcomes and financial aspects of the Fast-Forward program, as part of their Six Sigma Black Belt certification from Louisiana Tech University. Their objective is to investigate the institutional sustainability of the project post-funding.

COVID-19 Response

The Year 4 program in Summer 2020 yielded a smaller cohort than the previous three years. Only eleven students enrolled in the program, despite efforts from the project team to increase participation through multiple recruiting initiatives beyond the normal recruiting efforts. It is the hypothesis of the project team that students electing to not participate in the summer program was COVID-19-related as well. The spring quarter had been stressful to students and faculty alike, with an abrupt shift to online courses over a weekend, after only the first two days of the spring quarter.

Significant program changes were implemented due to the impact of COVID-19 on the Summer 2020 program, which University regulations required to be conducted completely online. Distribution of course materials, facilitation of social interactions, spatial visualization instruction, and industry visits all required adaptation.

Course Materials

Course materials that are normally given to the student just-in-time during the summer program were mailed to students at their home addresses at the beginning of the summer. Similar to previous years, this included: snap cubes (spatial visualization), white handkerchiefs (professional development - handshakes), thank you notes with stamped envelopes (professional development - industry speaker follow-up), and tomato timers (professional development - time management). We also included handkerchiefs in school colors and hair ties so students could make their own face covering (pre-made masks were not readily available at that time).

Social Interaction

Students were not able to meet each other face-to-face in the spring quarter for a kick-off meeting with the project staff. Therefore, the first class day in the summer included the students and project team preparing an "About Me" slide each to help everyone get to know each other. Zoom breakout rooms were used to facilitate small group discussion, in-class work, and two rounds of mock interviews. We adapted our team-building exercise, replacing an in-person model-building exercise with an online scavenger hunt which helped foster communication and relationship-building within the cohort.

The biggest challenge was promoting trust and relationships in a virtual environment. Students yearned for a face-to-face interaction, even after the summer program ended. Once restrictions were eased in the fall, we hosted an in-person but socially distant version of a team-building activity that was popular among previous cohorts. This activity highlighted the challenges of communication in team settings and encouraged students to evolve strategies for dealing with communication blocks. Many of the students who participated had never met face-to-face and welcomed the opportunity to interact in person.

Spatial Visualization Curriculum

The spatial visualization curriculum was taught in a flipped format. Students were provided access to videos of the lessons, and class time was used to work examples and for students to ask questions about the content.

Industry Visits

Area companies were not able to host our group for face-to-face visits each week. Therefore, we invited engineering industry speakers to interact virtually each week. As a consequence of having virtual speakers, we were able to hear from speakers based outside our region, e.g. South Louisiana, Houston, Kansas, and Colorado.

Lessons Learned

Summer 2020 was challenging, but did reveal some hidden gems that we intend to keep in place for the next cohort, even though many restrictions have been lifted and we are planning on an in-person experience for 2021.

The "About me" slide presentations went over well in the online environment, so we decided to keep the activity for 2021 and develop "Bingo" cards for students to complete as they learn about their classmates.

"Flipping" the spatial visualization content allowed more flexibility for students to control their own pace. Additionally, students seemed more satisfied with the spatial visualization curricular component of the PD course compared to previous years. We will continue this flipped format, where the students review the videos at their own pace outside of class and class time is used for answering questions and working examples.

The suspension of plant tours yielded some unexpected insights regarding benefits of both in-person and remote modalities. While it was expected that students would miss out on the plant tour aspect of industry visits, a surprising observation was that the PI noticed the drive to and from each site had been an opportunity to get to know the students and discuss what they had learned. This organic conversation was hard to replicate in an online environment. On the positive side, geography no longer limited which sites and companies participated in industry visits. Further, the virtual format pushed the focus of the "visit" from specifics of production processes towards more personal reflections of the speaker's career trajectory in engineering. This was especially relevant as many of the speakers were Louisiana Tech alumni. We expect that in 2021 the speakers will continue to participate remotely, however, the scholars will be co-located, which we hope will facilitate follow-up conversations.

There is still some uncertainty about Summer 2021, but these lessons will help us navigate a path to providing the most enriching experience for our scholars.

Acknowledgements

This material is supported by NSF DUE #1564768. Any opinions, findings, conclusions, and recommendations expressed are those of the authors and do not necessarily reflect the views of the National Science Foundation.