

Board 250: Developing and Implementing Innovation-based Academic Content and Experiences for First-Year Low-Income Students

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Innovation is critical to the health of our nation and economy, yet too few sciences, technology, engineering, and math (STEM) students are provided the academic opportunity to develop an innovation skillset while in their undergraduate degree program. With S-STEM grant funding from the NSF Division of Undergraduate Education (EHR/DUE), researchers at the University of Arkansas are creating academic content and extracurricular activities to help STEM students understand innovation and develop an innovation skillset and mindset. In the completed first year of the grant, the team has developed a 2-week intersession innovation bridge program for incoming first-year students as well as a two-semester first-year innovation course sequence.

Students were selected using a written application consisting of their university scholarship application with the addition of two essay questions: 1) Describe an experience you have had with innovation? and 2) Why are you interested in innovation? Finalists were then selected for Zoom interviews with committees consisting of a PI/co-PI, a student and an industry member.

Innovation Bridge Program Course

A two-week innovation bridge program held in the intersession immediately preceding the students' fall semester was developed for the incoming first-year students. This 3-credit hour course [1] dedicated two credit hours to teaching students about the innovation process - the steps required to take a new idea from inception to a newly implemented product or service. It was also designed to develop the students' innovative thinking and behaviors. The remaining 1-credit hour was devoted to student success strategies and developing feelings of inclusion.

The first class included 12 NSF S-STEM students as well as 12 non-STEM students, all of which were participating in the Path Program. The Path program is designed to increase retention of underrepresented students [2]. The second cohort included **16** S-STEM students and **15** non-STEM students. Including both STEM and non-STEM students allowed multidisciplinary collaboration for diversity of thought.

An anonymous exit survey was deployed to provide insights on the bridge program course. It was found that:

- 100% felt that the course provided information that will help them be more successful at the university.
- 96% of participants felt that the class was valuable in developing their understanding of innovation and appreciating the importance of innovation.
- 92% felt more comfortable with taking risks and expressing their ideas after the class.
- 88% felt it helped them develop their thinking to be more creative and innovative in the future.

Improvements were made for the second year of the bridge program based on experience and student feedback. Student teams were able to innovate a product based on their interests rather than having all teams innovate the redesign of the same product. This required more guidance but was worth the effort. Speakers were asked to be more interactive than the first year.

First-Year Innovation Courses

Two first-year innovation courses, one in fall and one in spring, each 1-credit hour, provided an expanded innovation academic experience. This two-semester sequence teamed STEM students with business students and involved innovation-related, industry-collaborative projects. In the fall, students were guided in-depth through the innovation process with interactive lectures from experts in their fields, assigned readings, online expert videos and case studies. Students applied what they learned as the semester progressed to assignments and in-class active learning experiences. In the last 4 weeks of the semester, students formed new teams and identified an innovative service or product that they proposed to develop in the following spring semester course. The students presented their proposal verbally and in writing and were provided feedback. In the second semester, the teams followed the innovation process learned in the first semester to develop their proposal. At the end of the spring semester, students presented their proof-of-concept or prototype with a poster presentation and oral presentation at the year-end symposium.

At the end of the first-year innovation course sequence, an anonymous student survey provided the following insights:

- 100% of students agreed that the courses were valuable in developing their understanding of innovation and appreciating the importance of innovation.
- 100% agreed that the courses helped them develop their thinking to be more creative and innovative in the future.
- 87% agreed that hearing from experts in industry during the courses was valuable to them.
- 87% agreed that the courses helped them feel more comfortable with taking risks and expressing their ideas.
- 67% agreed that working with their industry mentor on their project was valuable to them.

In the second iteration, improvements were made. Expectations of being a faculty mentor were better explained to help make the experience better for students. Students were also guided in the expectations and responsibilities of mentees in the mentor-mentee relationship. Synthesis days were built into the schedule to better connect the topics together. Speakers were asked to be more interactive, and students were provided with speaker information ahead of time so they could formulate questions in advance. As the spring course is now in session as of this writing, feedback on the impact of the improvements will be shared at the conference. These first-year innovation courses will continue to be taught with university funding even after the grant period ends.

A set of measures was developed to quantify students' innovative capacity and behavior [3]. This survey will be deployed to STEM sophomores in April 2023, and a matched comparison will be used to identify whether any difference can be detected between the S-STEM sophomores and the matched set of non-participants.

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References

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