

Gateway into first-year STEM curricula: a community college/university collaboration promoting retention and articulation

This proposal is a collaboration between Wright State University (WSU) and Sinclair Community College (SCC) to develop a common first-year STEM experience with the following intended outcomes: 1) A 10% increase in first-to-second year *retention* of STEM majors at both institutions; 2) A 10% increase in *articulation* of STEM majors from SCC to WSU. The result is expected to increase the number of WSU STEM graduates by at least 50 students per year by the close of the project. This model is readily transferable to other community college/university dyads in urban settings with comparable open admission policies.

STEM attrition is a problem throughout the 4-6 years of college study; however the first-year experience (FYE) is most critical to retention of students in STEM disciplines. Thus, a focus on promoting success in the first year will help to ensure that students remain in STEM disciplines, as opposed to switching majors or dropping out.

WSU and SCC are located in Dayton, Ohio, a metropolitan region of about 1 million people. The institutions share a student body drawn largely from the 5 adjacent counties. Many of these students are first-generation college students, and many are underprepared for the rigors of college in general and STEM programs in particular. The primary barrier to success in Engineering/Technology is the mathematics “gateway” calculus sequence; the barrier to success in Science/Mathematics is general innumeracy and scientific illiteracy.

Prior NSF support of WSU’s National Model for Engineering Mathematics Education has shown that the introduction of EGR 101 “Introductory Mathematics for Engineering Applications,” coupled with a significant restructuring of the early engineering curriculum, has resulted in a 10% increase in first-to-second year retention as well as increased student motivation and confidence in math and engineering.

Based on this early success, the proposed research will:

1. Implement EGR 101 and the associated engineering curriculum reforms at SCC.
2. Develop a companion lab-based class for science majors (Scientific Thought and Method), SM 101/ASE 101, for instruction at both WSU and SCC.
3. Provide professional development opportunities for faculty at both institutions.
4. Train STEM seniors/graduate students to serve as lab/recitation assistants, and peer tutors for any introductory STEM classes.
5. Disseminate the curriculum and associated first-year experience through production of a textbook and through presentations at professional meetings.

Intellectual Merit: Curricular innovations will be employed to increase first-to-second year retention by 10% across the STEM disciplines. Developing a common curriculum will enhance articulation of students from the community college to the university. These educational treatments will increase undergraduate STEM graduation rates from 4-6 years onward and in proportion to ambitious recruitment goals separately established (and funded) by the institutions. Adoption on a national basis would present opportunities for a significant scale-up effect.

Broader Impacts and Integration of Diversity: Both institutions have high percentages of women and also of minority students. Additionally, WSU has a long tradition of accessibility (particularly within the STEM disciplines); as such, this project will further enhance graduation rates among students with disabilities. Further, the proposed hands-on, problem-based classes will be more accessible to those who have been historically underrepresented in STEM disciplines. This model is therefore highly appropriate for other metropolitan university/community college dyads with similarly diverse enrollments.