

Transforming STEM Education in a Large Urban University (TSE@USF)

The TSE@USF project was funded by the National Science Foundation (NSF) WIDER program for 2013-2015. The two-year planning process was designed to develop a plan to transform STEM education in a large, urban-serving university. The plan focused on developing interventions to increase student persistence and success in STEM courses and degree programs at USF, particularly among groups underrepresented in STEM fields. The interventions entail changes in course design, use of evidence-based instructional strategies, and systems of institutional support for both faculty and students in STEM “gateway” courses.

With Dr. Gerry Meisels as PI, the TSE@USF Planning Team (PT) developed the implementation plan and ultimately a proposal for funding the institutional reform program that was designed. The proposal was submitted to the NSF IUSE program, accepted, and the Systemic Transformation of Education Through Evidence-Based Reform (STEER) project resulted. Benefit from the WIDER funds further assisted in the transition to the STEER project.

The PT was a diverse group, with representation from faculty members, department chairs, and administrators to provide important experience and perspectives from their respective role groups. Each brought connections to internal and external resources that were needed at points in the planning, whether connections to high-caliber seminar speakers or opening doors to key offices at the university. The PT produced an extensive list of university policies and support structures that could facilitate or impede the change effort. The list includes items impacting faculty, graduate assistants, and undergraduate students. They then identified key policies on which to focus as leverage points for change – involving tenure/promotion, evaluation of teaching, faculty assignments, faculty development, and facilities.

The PT took a strategic approach to its work, recognizing the importance of being systematic in articulating a vision, building support, and ensuring alignment of the various elements of the implementation plan. The PT conducted an in-depth analysis of the current picture of the university STEM programs, including trajectories of students entering, leaving, and completing degrees in STEM fields and data regarding the reasons students change their major. This analysis formed the basis for conceptualizing and planning the needed interventions.

The project focused on a set of priority interventions – four pedagogical strategies, four curricular innovations – to offer as the subject of its course transformation efforts. This smaller, more focused set of interventions more readily enables groups of faculty within and across disciplines to be formed and supported to explore implementation. Concentrating changes primarily on “gateway” courses also has the greatest potential impact on STEM major recruitment and retention.

A seminar series and faculty learning community continually exposed interested faculty to a range of ideas, from broad principles to particular instructional practices. The seminars, which included leaders from several universities and STEM organizations, were widely attended. They included:

Prof. Adrianna Kezar, University of Southern California: STEM Education, Shared Leadership, and You

Dean Vasti Torres, University of South Florida: Do Students Under-represented in STEM Experience the Learning Environment Differently

Prof. Richard Pollenz, University of South Florida: Understanding Institutional Data Can Inspire University-Wide Adoption of Evidence-Based Practices in STEM Education

Prof. George Kuh, Indiana University: Fostering STEM Student Engagement: What Matters

Prof. Melanie Cooper, Michigan State University: Evidence-Based Approaches to STEM Education

Prof. E. William Wischusen, Louisiana State University: Impact of a Pre-Freshman Boot Camp on Student Performance

Dr. Jay Labov, National Research Council & National Academy of Sciences (NAS): The Changing National Landscape of Undergraduate STEM Education

Prof. Linda Slakey, University of Massachusetts: Making Student-Centered Teaching the New Normal: Are We at a Tipping Point?

Dr. Shirley Malcom, American Association for the Advancement of Science (AAAS), Undergraduate STEM Education: Moving Diverse Populations from the Margins to the Center

Prof. Gabriela Weaver, Purdue University: Shifting the Teaching Culture in a Research University to Student-Centered Approaches

Prof. Michael Klymkowsky, University of Colorado: The Challenges in Implementing, Designing, and Delivering Coherent Curricula in STEM Disciplines

The importance of close coordination with the entities that produce the students who come to the university – local school districts and community colleges was acknowledged by engaging these institutions as partners. The result was a significant piece of the student support component of the IUSE proposal, smoothing the transition of high school and community college students to the culture, operation, and expectations of being STEM majors at a large university.