Chapter 6
Improving Undergraduate STEM Education:
A Four-Dimensional Framework

ABSTRACT

Improving STEM education in the U.S. stands to address one of the nation's priorities, increasing the STEM workforce. Rural students are a previously untapped source of potential; yet, these students lack STEM experiences, engagement, and scaffolding to stay motivated to complete an undergraduate program in STEM. Motivation is a key element for rural student interest and persistence in STEM; however, these students also must develop certain knowledge and skills to succeed as STEM professionals. The authors propose a model, Improving Undergraduate STEM Education Framework, as a means to maintain motivation and prepare rural students for the rigors of a STEM major/career. In this chapter, the four-dimensional framework is unveiled along with examples of Project Engage's efforts to address each dimension.

INTRODUCTION

Through the support of a U. S. Department of Education Minority Science and Engineering Program grant, Project Engage programs and activities were designed and applied to achieve the ultimate goal of improving rural undergraduate STEM programs' capacity of retaining undergraduate students in STEM majors, cultivating STEM talents, and producing motivated and

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dedicated STEM graduates. These programs and activities introduced in previous chapters include a Strategic Mentoring Program, Professional Exploration Trips, Competitive STEM Events, Invited STEM Speakers, Team Building Training, Career Exploration Course, Career Panel Discussion, Undergraduate Research, Sisters of the Academy "Priming the Pipeline," High School Student Outreach, Invention Convention and STEM Challenge. Based on its experience in these programs and activities, Project Engage developed a four-dimensional practice-and research-based framework that can be used to guide future efforts of improving undergraduate STEM education in rural areas. The four dimensions of this Improving Undergraduate STEM Education Framework are: motivating, experiencing, engaging, and scaffolding (See Figure 1).

THE "LEAKY" PIPELINE

Using the analogy of a "STEM pipeline" representing the pathway from K-12 education to college STEM majors to future STEM careers, recent efforts have focused on increasing the flow of students through the pipeline.

Figure 1. The Improving Undergraduate STEM Education Framework