Chapter 3
Scaffolding Undergraduate STEM Majors:
A Strategic Mentoring Program

ABSTRACT

Project Engage utilizes a scaffolded approach to strategic mentoring grounded in the social constructivist theory of Vygotsky. Peer mentors, a career counselor, and STEM faculty serve as three scaffolding layers of more knowledgeable others (MKOs) who are responsible for assisting the mentee in achieving his/her zone of proximal development (ZPD), a higher level of learning or understanding than could be achieved alone. Detailed information is shared in this chapter on the selection, training, and responsibilities of the peer mentors, given that they serve as the first level of scaffolding (i.e., primary mentors for the freshmen). The career counselor and Engage faculty members constitute levels two and three of scaffolding. A survey was administered to evaluate the effectiveness of the mentoring program. Results from the survey of the mentees revealed positive perceptions of the mentoring program.

INTRODUCTION

A structured mentoring program provides needed academic and social support, as rural students transition from secondary to post-secondary schooling. In this chapter, the authors present a three-tiered strategic mentoring process for scaffolding the learning and development of freshmen STEM students. A

mentoring strategy consisting of peer mentors, a career counselor, and STEM faculty creates a hierarchical community of mentors (MKOs) who guide students through their first year as college freshmen majoring in a STEM field. In this chapter, peer mentor selection, training, and responsibilities are described. Along with the description of the peer mentor, attention is given to the career counselor and STEM faculty mentoring roles. Finally, the authors present data from a mentoring survey administered to the freshmen mentees in order to gain their perspectives on the overall effectiveness of the program, academic benefits, persistence in the STEM major, and the likelihood of pursuing a STEM profession. The chapter's purpose is to recommend a mentoring program for improving the freshman year experience of STEM majors.

SCAFFOLDING FROM A CONSTRUCTIVIST VIEW

Social constructivism is a branch of cognitive constructivism emphasizing the social collaborative nature of learning. Unlike cognitivists such as Piaget who view knowledge as assimilated by learners through interacting and making sense of external stimuli, social constructivists see knowledge as constructed actively by learners through interaction and negotiation among people under a social cultural environment (Rogoff, 1990; Vygotsky, 1978). Social constructivism theory was developed by Vygotsky. His theories stress the fundamental role of social interaction in the development of cognition (Vygotsky, 1978; Wertsch, 1985). Contradicting Piaget's view of universal stages and content of cognitive development (i.e., sensorimotor, preoperational, concrete operational, and formal operational period) (Piaget, 1952; 1959), Vygotsky's cognitive development theory conceptualizes human cognitive structure as essentially socially constructed. Knowledge is therefore not simply constructed but co-constructed.

From a social constructivism point of view, learning is more than the assimilation of new knowledge. It is a collaborative process in which learners are integrated into a knowledge community of mutual thinking, problem solving, and decision making. Social constructivists see motivation as both intrinsic and extrinsic and believe that learners receive extrinsic motivation through the social learning process in the knowledge community. Social constructivism underpins learning environments that facilitate a community of learners encouraging interaction, discourse, and thoughtful reflection. In constructivist learning environments like this, scaffolding is an essential

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