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Conceptualizing Engagement: Contributions of Faculty to Student Engagement in Engineering

This article was guided by a shared interest in building a comprehensive perspective of the role of faculty in designing, facilitating, and supporting the environments and activities that foster student engagement. As a multidimensional concept, the descriptions of student engagement range from behaviors such as time-management and study skill strategies to how students utilize attentional, cognitive, and affective resources in the classroom. For the purposes of the current discussion, we operationalize student engagement as referring to a student's *quality of effort*. Our working hypothesis proposes that high levels of faculty engagement, broadly defined, will promote student engagement and student learning in engineering. Much of our work builds upon the long intellectual history of student engagement developed by Pace (1998), Astin (1975, 2003), and continued by George Kuh (2007) and the collective work of the National Survey of Student Engagement (NSSE).

We present three views of faculty engagement and their potential impact on student engagement by drawing upon several research efforts: 1) *Engineering Change: A Study of the Impact of EC2000*; 2) the National Science Foundation (NSF) supported Academic Pathways Study of the Center for the Advancement Engineering Education (CAEE); and 3) studies at the United States Air Force Academy focusing on increasing opportunities for meaningful and timely faculty-student exchange in the classroom (Hamilton, 2006a; 2006b; 2007).

As part of a national effort to evaluate the impact of EC2000 accreditation criteria on undergraduate engineering programs and student learning, the Engineering Change study provided insights into how faculty engagement in program-level educational improvement efforts contributes to student engagement (Lattuca, Terenzini, and Volkwein, 2006). The findings suggested that choices about curricular content, instructional approaches, and assessment practices – the educational activities designed for students by engineering faculty – not only create higher levels of curricula coherence at the program level (Harper, 2008) but also have an impact on what students learn via those experiences. These findings from the Engineering Change study were reiterated by emerging analyses from CAEE's Academic Pathways Study (APS) (Sheppard et al., 2004; Clark et al., 2008). In spring 2007, the APS deployed the Academic Pathways of People Learning Engineering Survey (APPLES) to a cross-section of engineering students at four institutions with the intention of identifying and characterizing the fundamental factors that influence students' to pursue an engineering degree. Findings from the APPLES study demonstrated the importance of faculty-student interactions as a predictor of satisfaction and personal development among college students. The practical implications of these collective findings support programs such as undergraduate research which can result in more frequent and meaningful faculty interactions and opportunities for students to actively connect with their learning (Pascarella and Terenzini, 2005).

In contrast, the studies at the United States Air Force Academy (USAFA) offered an alternative but corresponding view of the shorter episodes of active engagement in classroom activities and the role of faculty in increasing and sustaining that active engagement. USAFA's exploration of these concise classroom engagement episodes were gathered from instructor interviews, student self-reports via the Experience Sampling Method (ESM), and video (Hamilton, 2006a) and show that if an instructor can provide expanded and precise feedback to students on an individual basis and at opportune moments during class time, engagement will rise. Together, the USAFA and APPLES findings demonstrate how the frequency and quality of instructor-student interaction can enhance students' confidence in open-ended problem solving and reinforce the theme of feedback for continuous improvement as described in the Engineering Change study.

By drawing from the above examples, we contend that engineering faculty matter – their engagement in the teaching and learning functions of their programs affects the quality of student engagement. Evidence from the nationally-representative Engineering Change study show how direct and indirect influences of faculty activities such as curriculum planning, assessment, and professional development can influence student learning. The APPLES data provided a closer look at how advising, research opportunities, office hours, and even informal interactions with faculty can influence students' engineering experiences with respect to confidence and extracurricular involvement. The U.S. Air Force Academy's experiments with technologies designed to extend instructors' abilities demonstrate the impact of direct instructor feedback on students' engagement during class time. Collectively, these research efforts suggest that good instruction is a complex construct that encompasses: a) what faculty do in class; b) what faculty do with students both inside and outside of the classroom; and c) what faculty do individually and with their colleagues to improve engineering courses and programs. These findings will hopefully spur colleges and universities to recognize the importance of out-of-class contributions of faculty to student learning while also supporting targeted professional development efforts and collaboration on issues relating to effective curriculum planning, design, assessment and revision practices.

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