Developing Mentoring Programs in Engineering and Technology Education

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ABSTRACT

Mentoring relationships have long been viewed as essential to encourage the career development of engineering and technology students. The purpose of this article is to examine and analyze the concepts of shared power, self-directed learning, critical reflection, and potential for transformative learning in mentoring models and programs, exploring research and models that reflect these concepts in their program design and “curriculum” for mentoring. The article concludes with an analysis of mentoring models and suggestions for future research and practice for mentoring in higher educational institutions engineering and technology programs that may lead to active and transformative learning among mentors and protégés in these programs.

KEYWORDS

Communities of Practice, Mentoring Programs, Mentoring, Peer Mentoring, Shared Power, Transformative Learning

INTRODUCTION

Students in higher education in engineering or technology undergraduate and graduate degree programs usually engage in a prescribed curriculum of courses throughout their programs of study. Frequently these programs of study help learners construct new understandings and knowledge of concepts and theories, encourage self-directed and andragogical learning principles (Knowles, 1980), and perhaps provide conditions for learners to critically reflect upon their assumptions and growing knowledge as they progress through the phases of transformative learning (Mezirow, 2009; Taylor & Cranton, 2012). Although academic courses may foster conditions for learning, students may also learn outside of the classroom through mentoring relationships between faculty members and students, professionals as students, as well as peer-to-peer mentoring among the students themselves. Indeed, “Mentoring is useful in career development or the sciences and professions due to the cultures, skill sets, and experience-based learning principles (Knowles, 1980), and perhaps provide conditions for learners to critically reflect upon their assumptions and growing knowledge as they progress through the phases of transformative learning (Mezirow, 2009; Taylor & Cranton, 2012).”

Although academic courses may foster conditions for learning, students may also learn outside of the classroom through mentoring relationships between faculty members and students, professionals as students, as well as peer-to-peer mentoring among the students themselves. Indeed, “Mentoring is useful in career development or the sciences and professions due to the cultures, skill sets, and experience-based learning in these fields” (Santora, Mason & Sheahan, 2013, p. 427). Mentoring relationships may also be particularly helpful to women and minorities in engineering and technology programs in undergraduate and graduate education (Pisimisi & Ioannides, 2005). Opportunities for students to participate in good mentoring relationships may be essential to students (Hansman, 2002, 2012, 2013, 2014) so they can build their own successful careers, and formal mentoring programs may provide essential support to those who wish to have successful careers as engineers. Mentoring programs have been noted as being particularly “useful in the sciences, in which the mentor serves as a role model for students by working with them collaboratively…to frame a problem, chart a path to a solution, draw from appropriate theories needs to solve the problem or address the hypothesis, and formulate questions that require heuristics learned through experience and guided practice” (Santora et al., 2013, p. 428).
Although one-to-one informal hierarchical mentoring relationships have historically provided support to students, because of the diminishing numbers of full-time faculty members or others available for one-to-one mentoring, formal mentoring programs may better provide needed guidance to students. However, there are many issues that planners of formal mentoring programs must consider as they plan the mentoring program curriculum. Thus, the purpose of this article is to examine and analyze the concepts of shared power, self-directed learning, critical reflection, and potential for transformative learning in engineering and technology mentoring programs, exploring research and models that reflect these concepts in their program design and “curriculum” for mentoring.

DEFINING MENTORS AND FORMAL MENTORING PROGRAMS

The terms “mentor” and “advisor” are sometimes used to discuss helping relationships in institutions of higher education; however, in this article, advisor and mentor are not interchangeable and each describes distinct roles in relationship to work with students. An Advisor is “a person (not necessarily a faculty member) who is typically assigned to the department or program to meet with the student, to provide advice on degree plans and what courses to take, and address other academic issues or concerns” (Mullen, 2008, p. 270). Mentors may also fulfill some of the duties of advisors described above, but on the other hand and at least for the purposes of this article, mentors are those faculty members or peer students who can help prepare students for their future careers and work in academe. The work of mentors or peer mentors may include activities such as chairing or serving on thesis or dissertation committees, guiding students through research processes, co-writing research articles or refereed conference presentations, giving feedback on other engineering or technology projects, and engaging in discussions or other activities that might help students understand and engage in the work needed to prepare for their future careers.

Many other definitions of mentoring exist in the literature and vary depending on the type of mentoring attributes that are being described, for example psychosocial support and/or career growth. Kram’s (1985) definition reflects a career focus as she discussed mentoring as an intense relationship between experienced colleagues working with less experienced persons to promote professional and/or psychosocial support and growth. Daloz (1999) describes the role of mentors as more psychosocial, having “the magic that allows us to enter the darkness: a talisman to protect us from evil, a gem of wise advice, a map, and sometimes simply courage” (1999, p. 18). Guest (2006) claims a mentor is “is a wise and trusted counsellor; is suitably experienced; has usually travelled the mentee’s path; acts as a confidential adviser and guide; stimulates professional development (p. 277). Other definitions of mentoring take into account the expanding types of mentoring relationships in the literature, such as co-mentoring, peer mentoring, and e-mentoring (Crow, 2012; Mullen & Lick, 1999; Scandura & Pellegrini, 2007), and all mentoring relationships may allow for psychosocial and/or career growth for mentors and protégés, but psychosocial support and career mentoring may not be the only focus of all mentoring relationship. However, mentoring relationships of all types and programs have the potential to promote critical reflection among participants and relationships that may lead to transformational learning of all involved.

Both Brookfield (2006, 2009) and Cranton (2003, 2005, 2009) discuss the important role of critical reflection in learning in higher education and in adulthood, and mentoring relationships may provide a vehicle for encouraging critical reflection among mentors and protégés. Brookfield (2009) describes critical reflection as “a social learning process involving a great deal of peer learning… people come to a better understanding of their own assumptions and develop the ability to judge their accuracy and validity only if they involve peers as critically reflective mirrors who provide them with images of how their practice looks to others” (p. 133). Cranton (2009) advances these ideas of critical reflection, proposing that the essential to the critical reflection process is to “expose individuals to alternative perspectives” (p. 185) through reading, discussions, movies and other media, and additional activities that are designed to encourage self-reflection as well as reflection within the group.
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