Chapter 3
Enculturation into Engineering Professional Practice:
Using Legitimate Peripheral Participation to Develop Communication Skills in Engineering Students

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ABSTRACT

The importance of communication skills for engineering professionals is widely acknowledged. Research in the authors' group indicates that along with other cognitive and behavioral skills, employers of new engineering graduates place high value on communication skills. Here, the authors argue that becoming a professional engineer means entering in to a particular community of practice, one that communicates in a way that is specific to that community of practice. Engineers employ, consciously or sub-consciously, a variety of Vygotskyian psychological tools, and becoming an engineer necessitates new graduates understanding the nature and use of such tools within that community. Recent research in the authors' group suggests students that engage in experiential learning as part of a work-integrated learning program in engineering are rapidly enculturated into the community of practice that forms the engineering community. This, it appears, occurs by means of legitimate peripheral participation in the community as these 'newcomers' work alongside practicing engineers in a form of cognitive apprenticeship. In doing so they gradually adopt mores of communication, eventually becoming legitimate, fully-participating members of the engineering community, and they developed a sense of belonging that is not easily achieved in conventional programs of study in higher education.

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INTRODUCTION

Worldwide there has been much concern expressed about falling student interest in economically-enabling disciplines of study such as engineering and the sciences (European Commission, 2002; Roberts, 2001), with falling enrolments and lack of interest or uptake of engineering careers reported for such disciplines in higher education (Coll, 1996; Coll & Eames, 2008; Fensham 1980; Scott, 2003); a situation likely to become compounded high rates of retirement of engineers and scientists anticipated in the next 20 years (Gago et al., 2004). Several reasons have been suggested for the decline in student interest in engineering. Engineering, like science, is seen as an unpopular and difficult subject at least in part because of its high mathematical content (Dalgety & Coll, 2004, 2005). Like science, it seems engineering has something of an image problem, with engineers perceived by many as engaging in dangerous or unpopular work (e.g., Brunton & Coll, 2005), being odd or unusual people that are hard-working, socially-inept, and not particularly well rewarded financially compared with other disciplines like the law and management studies (Dalgety & Coll, 2004). It also seems that many of the general public holds highly stereotypical images of engineers and scientists (Coll & Taylor, 2004; Dalgety & Coll, 2004). In this work, we argue that engineers and scientists are seen as belonging to an exclusive male-dominated 'club' or cultural group. We explore the nature of this subculture, and describe how students working alongside professional engineers as part of purpose-designed work-integrated learning (WIL) programs help students, develop a sense of belonging to the subculture of engineering. One of the facets of this enculturation is the way engineers communicate with their community of practice, and this forms the focus of this work.

WHAT DOES IT MEANS TO BE AN ENGINEER?

Our conceptualization as to what it means to be an engineer, or other professional, is dependent on our world view; how we conceptualize knowledge, how we think we come to gain knowledge, and so on. Much current educational research in education about learning and self-concept now draws on sociocultural theories of learning (Eames & Bell, 2005). Adherents of such theories argue that to understand learning we need to be cognizant of the importance of contextual factors, especially sociological factors. There are three particular facets of sociocultural theories of learning that are of relevance here. First is the notion of *legitimate peripheral participation*. The notion here is that a student, whether he or she knows it or not, learns not just content but values and ideas of what it means to become a professional in the area they are studying as they work alongside experts (Lave & Wenger, 1991). In doing so they appropriate the knowledge, skills and *culture* of that workplace, and this leads to a deeper understanding of what it means to work in, for example, engineering (Rogoff, 1995). Second, socioculturalists also speak of the notion of learning being *situated*, and occurring via *mediated action*. What this means is that learning is a feature of the particular social circumstances, and learning is influenced or *mediated* by those circumstances or situations. This mediation occurs via the use of Vygotskyian technical and psychological *tools* (see, Vygostsky, 1986),[1] and the most common psychological mediating tool is language, both written and verbal. An example illustrates our meaning here. In each engineering learning community or workplace, there is a particular style of communication; for example, a particular way to present data, and write technical reports. The use of language thus features strongly—meaning that there is a way of using language that is specific to the sociocultural context in which learning or communication occurs (Eames & Bell, 2005). So acronyms like CAD,