Table 18.1. Summary of Outcomes and Benefits for Engineering Students in Community Engagement

Desired Student Outcome	*CE Benefits and Examples*
Design a system or process within realistic constraints such as economic, environmental, social, political (ABET, 2008)	Greater complexity and range of constraints in CE settings deepened these abilities among students in capstone design courses (Bielefeldt, 2007a, 2007b).
Cultural competency	Developed as students work to understand the needs of communities with different cultural backgrounds from their own, both subtle or significant[9]; international community service experience beneficial in MTU D80 program (Paterson, 2008; Paterson & Fuchs, 2008).
Understand the impact of engineering solutions in a global and societal context (ABET, 2008)	Enhanced by working directly with a community (Duffy et al., 2007, 2008; McCormick et al., 2008; Pritchard & Tsang, 2000); >95% of students engaged in a CE capstone design experience self-reported high awareness of the social impact of engineering, significantly higher than non-CE project participants (Kremer & Burnette, 2008).
Understanding professional and ethical responsibility (ABET, 2008)	Enhanced on CE projects, even if not a central theme of the project (Bielefeldt et al., 2009; Duffy et al., 2008; McCormick et al., 2008; Pritchard & Tsang, 2000).
Attitudes toward community service (ACS)	Higher ACS scores for EWB-USA participants and high for students in Engineering for Developing World course (Bielefeldt, 2008).
Self-efficacy, self-confidence, self-esteem	Confidence in own abilities is enhanced, particularly as students achieve success and see the true benefits to a community (Gokhale & O'Dea, 2000).
Critical thinking/scientific reasoning	Critical thinking gains demonstrated for CE outside engineering (Astin et al., 2000; Sedlak et al., 2003).
Engineering identity	Redefine engineering as a helping profession particularly effective in first-year projects courses.
Ability to communicate effectively (ABET, 2008)	Students required to communicate with community members who are often nontechnical and across language and cultural differences (Bielefeldt, 2007a).
Function on multidisciplinary teams (ABET, 2008)	Greater stresses on CE projects may force students to learn better interaction skills; many CE projects are more multidisciplinary, including non-engineers (McCormick et al., 2008).
Recognize need for and ability to engage in lifelong learning (ABET, 2008)	Because CE projects are often less structured and can go in many directions, students commonly forced to a just-in-time learning model.
Sustainability; analyze systems of engineered works for sustainable performance	Length of time working with communities on service-learning projects directly influences usage and diversity of sustainability concepts (Paterson & Fuchs, 2008); evident in reflective essays from students in senior design who worked on CE projects (Bielefeldt, 2007a).
Leadership (ASCE BOK)	Students' have stronger understanding of leadership and skills to motivate others to achieve a common vision (Duffy et al., 2007, Duffy et al., 2008; McCormick et al., 2008).
Creativity; creative design	Open ended nature of many CE projects with vast array of non-technical and technical constraints forces students to be creative to find best solutions for communities (Christy and Lima, 2007).