SUPPLEMENTAL MATERIALS

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Bringing Social Justice Context into Civil Engineering Courses for First-Year and Third-Year Students

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An Introduction to the Social-Situated Nature of STEM

An understanding of social issues may seem far removed from the technical skills needed to design a bridge, describe molecular movement, or study ecosystem function. A physical object like a bridge may be thought of narrowly, as something made of materials and designed for a goal, such as holding a specific load while minimizing costs. But, bridges also make connections between people.

Practices in STEM fields are rooted in values and assumptions, which may be explicitly stated but often are not. For example, many bridges prioritize vehicle traffic over pedestrian or bicycle traffic, and bridge location influences who and what is impacted during construction and how easily different people can travel. The situated nature of bridges and roads becomes a life-and-death context in situations such as the evacuation of New Orleans for Hurricane Katrina, where the assumptions made during infrastructure development interacted with a climate-change driven hurricane and many other factors to prevent the effective evacuation of people without access to cars and who lived in particular areas.

The people who designed the infrastructure of New Orleans did not set out to consciously limit who could leave. However, in all aspects of our lives, including how we think about and do STEM-related activities, we are influenced by our life experiences and our assumptions about a situation influence the factors we consider, and if we are not being intentionally inclusive, we may be inadvertently exclusive. It is not possible for the knowledge we possess to exist outside of our experiences; therefore, our knowledge is situated within our experiences, and cannot be neutral or decontextualized. While we can work to move beyond our own limited perspective by specifically seeking different perspectives and thinking about the needs of those who are different from ourselves, we still cannot be neutral. While neutrality is often claimed in STEM

fields, this claimed neutrality erases the context in which knowledge is created and used (Harding, 1992; Tuana, 1996). What is usually considered "neutral" in STEM fields is situated in Western ways of thinking and doing science (Wilson, 2008). Questions surrounding benefit – how will something help, who needs to be able to use it – as well as questions about potential harm – who will be harmed or excluded, what is the larger environmental and social impact, and who decides what tradeoffs are most important – may be considered from only one or few perspectives.

Due to the culturally embedded nature of everything, including STEM, STEM activities manifest existing biases that benefit those in power (Tuana, 1996). Gender, race, ethnicity, abilities, social class, age, language and other factors play an important role in how people have access to resources (Finch et al., 2010; Laska & Morrow, 2006). The biases and power dynamics that influence ecological system function and people's access to resources are already being exacerbated by climate change, which will only increase as we move through the 21st century (Rockstrom et al., 2009). One way this manifests is in the increasing frequency of 'natural disasters' combined with limitations in accessing needed resources for survival (Rockstrom et al., 2009). It is vital that we consider the situated nature of science and engineering as we work to address both the root causes of climate change, as well as the ways we address existing social, environmental, and infrastructure challenges and plan for the future. To move toward equitable STEM practices and confront climate change we must not only reflect upon how our identities influence our own perspectives and decision-making, but also create space for collaborative work that includes all the voices of those involved, rather than working from a controlling, top-down strategy (Reid et al., 2009; Tengö et al., 2014). Addressing inequities in our existing physical and social structures will not happen if outsiders drop in to fix only the problems they

identify; rather, this collaborative work must shift existing power structures to create space and power for all involved (Straubhaar, 2015; Tengö et al., 2014).

Hurricane Katrina Case Study Follow-up Questions

1) Will what you learned from this activity affect the way you work in teams for future engineering projects? Please Explain why or why not.

2) What did you learn from this activity?

3) What did you like about this activity?

4) What would you suggest to improve this activity?

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