Sustainable development: convergence and innovation in engineering education and practice

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Societal challenges articulated in the UN Sustainable Development Goals (SDGs) require a convergent approach for their optimal solution. Convergence combines the "knowledge, tools, and ways of thinking…" from multiple disciplines including engineering, policy, and computational, natural, social and behavioral sciences to solve societal problems (NRC, 2014). For solutions to these problems to be optimal, lived experiences of people who represent a broad cross-section of society, including persons from the most marginalized groups, are needed within and in addition to diverse disciplinary expertise.

Unique to the American Society of Civil Engineers (ASCE) Code of Ethics is emphasis on the need for engineers to "consider the diversity of the community, and … to include diverse perspectives, in the planning and performance of their professional services" (Code of Ethics, 2017). Thus, Canon 8 promotes convergent, user-centered, universal design approaches to engineering practice, the benefits of which are far-reaching and "include improved safety and quality of life… reduced costs… [and bridging] the disconnect between the public's perception of engineers and societal impacts, attracting a more diverse population to the profession" (Pearson, 2019).

The purpose of this paper is to stimulate action on inclusion among mainstream technical audiences as it relates to innovative problem solving towards attainment of the SDGs and the pursuit of equitable standards of living for everyone. It has been long recognized that diversity of thought, background, skills, and experiences improves innovation (NAE, 2002); yet conversations on diversity and inclusion in engineering are often resigned to special focus conferences and sessions that primarily attract engineers from groups that are marginalized and those who actively advocate for those groups. Using examples from academia and practice, this paper presents case-based convergent, user-centered strategies for including diverse perspectives in addressing targets delineated in multiple SDGs (e.g., sustainable cities) for mainstream audiences of educators and practitioners.