

Educating the Citizen Engineer of 2020: Challenges and Opportunities for Japan and the US

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Reflecting on the National Academy of Engineering's 2004 report *The Engineer of 2020*, Carl Mitcham suggests that the reforms to engineering education recommended in the report might be extensive enough to warrant a shift toward a discourse of what he calls "post-engineering." Bernard Amadei, founder of Engineers Without Borders, underscores the challenge for educators and practitioners alike in his call for an engineering education and practice "designed to cover a wide range of technical and nontechnical issues to train *global citizen engineers* and *whole persons*, capable of operating in a multicultural world, not just narrow-minded technical experts." In my own teaching of engineering ethics, I challenge my students to become citizen engineers who engage with and understand the political process, are sensitive to cultural context, and determined to uphold the highest standards of ethical behavior in their professional practice.

Like their counterparts in the US, engineers in Japan face the challenge of shifting from a mindset that prioritizes economic growth and material comfort to one focused on sustainability, human health and welfare, and responsible stewardship of nature's resources. At the same time, new technologies of artificial intelligence (AI), genetic engineering, and smart networks create new possibilities for stimulating the economy, rethinking the meaning of community, and transforming the relationship between the natural and built environments. Japan's Fifth Basic Plan for Science and Technology, in effect for the period 2016-2020, calls for building "Society 5.0," which has a goal of integrating cyberspace with physical space, humans and machines. Clearly, the engineering community in Japan will play an important role in helping realizing these national policy goals. Yet they will also see increasing opportunities to work outside of Japan, and to practice in cultures very different from their own.

My presentation will start with a definition of the "citizen engineer" that I use in my engineering ethics work. I will explain how the concept links to and draws from the work of other engineers and architects, including Bernard Amadei, Donna Riley, Gene Moriarty, and Jason McLennan. I will also show how the citizen engineer supports both ABET and NSPE positions on engineering ethics and the relationship between engineers and society. From there, I will shift to the situation in Japan and explain how the citizen engineer concept not only can be adapted to the Japanese context, it can also be derived independently from Japan's own philosophical and cultural traditions.