ChE book review

Engineering and Sustainable Community Development

by Lucena, J., J. Schneider, and J.A. Leydens,
Morgan & Claypool, 216 pages, 2010, ISBN 978-1608450701

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Many prospective students, in particular, female students and students from underrepresented groups, are attracted to engineering because they want to "help people." Colleges of engineering have responded by developing programs and projects variously known as humanitarian engineering, engineering for developing communities, service learning, engineering for sustainability, design for the poorest 80%, design for extreme affordability, etc. Do these types of service projects genuinely help the communities being served?

The authors, faculty members at the Colorado School of Mines, present an overview of engineering as it relates to sustainable community development (SCD) and raise challenging questions about the underlying assumptions behind many well-intended projects. This book is part of a series of Synthesis Lectures on Engineers, Technology, and Society, edited by Caroline Baillie of Queen's University in Kingston, Ontario, Canada.

The authors frame the text around some entrenched myths:

- *Technological development will lead to economic growth and progress.*
- *Technological development happens independently from culture, politics, or society.*
- *Communities are homogenous and can be treated as a "client" or "customer."*
- *Technological applications are universal and can be easily transferred across cultural contexts.*

Chapter 1 highlights the tension when engineers, who see themselves as problem solvers tackling problems that have right or wrong answers, approach the more complex challenge of meeting a community need. The authors pose a series of guiding questions for both students and faculty.

Chapter 2 provides a history of engineers' involvement in development from the 18th century to the present. It traces the evolution of the engineer's role, from that of transforming and controlling nature, mapping territory, building national infrastructure, acting as agents of economic competitiveness, to a growing awareness of sustainable development.

In Chapter 3 the authors discuss why the assumptions, methods, concepts, and practices used in industry may not be appropriate for SCD projects. The basis for the discussion is a student project that won an "Exceptional Student Humanitarian Prize." By stepping through the project report, the authors highlight the "hidden assumptions" typically present in a traditional design project that may be inappropriate for a community-development project. (After reading this chapter, I became painfully aware of some of the shortcomings of several recent design projects in my own class).

Chapter 4 uses a short (2 ½ page) case study to illustrate that community should be at the center of engineering for SCD. The authors highlight typical engineering mindsets—overreliance on the scientific method, intense focus on work and achievement, industrial work contexts, and commitment to objectivity—that make it difficult for engineers to effectively consider community. Practical, concrete suggestions are provided for students and faculty to avoid some of these problems.

Chapter 5 motivates the need for listening to community members by describing projects in which ineffective listening occurred to the detriment or failure of the project. The authors define and describe the dimensions of contextual listening and suggest an alternative problem-solving, listening-centered approach well suited to SCD projects. This approach might also be useful in industry, depending on the context of the project.

The detailed case studies in Chapters 6 and 7 highlight practical problems in implementing community-development projects. Chapter 6 describes an engineering professor and her graduate students who partnered with a village in India to implement a windmill, and Chapter 7 describes a practicing engineer who undertook a community mapping project in Honduras to inform the community on how to use water safely and effectively.

In Chapter 8 the authors describe their course "Engineering and Sustainable Community Development" and reflect on the students' transformation during the course. Chapter 9 offers recommendations to students who are interested in pursuing SCD and poses relevant research questions for faculty.

The book is written with a student audience in mind; key terms and critical questions are highlighted throughout each chapter, and multiple exercises are included as possible writing and discussion prompts. The book also addresses faculty questions about how to best structure such courses and projects. In addition, administrators responsible for assessing the usefulness, effectiveness, and cost of these programs can benefit from this discussion.

While this book would most likely be used as a textbook in the context of a course on sustainable development or engineering ethics, it would also be a useful resource for chemical engineering faculty who teach a design course, either at the capstone level or in a freshman engineering course. It challenges the traditional assumptions inherent in a design project and gives a practical example of how ABET criteria might be concretely addressed. In addition, students who are interested in a career involving sustainable development would find this book valuable; in particular, the list of current engineering programs with this focus could direct students to graduate programs in a relevant area. ❐