120th ASEE Annual Conference & Exposition
FRANKLY, WE DO GIVE A D*MN
June 23-26, 2013

Paper ID #8224

Learning to Listen: An Ethnographic Approach to Engineering Ethics Education

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On a daily basis, the 3.5 million engineers and scientists working in the United States make complicated and critical decisions that ultimately affect the public – their often-unseen client whose health and welfare they are expected to hold paramount. In response to an array of professional, organizational, financial, and political pressures, engineers' and scientists' obligation to protect the wellbeing of individuals they might never meet can be difficult. Indeed, it was at least in part the failure to treat the public's health and welfare as the overriding concern in a series of catastrophic events during the 20th century (e.g., the DC-10 crash in 1974, the Ford Pinto case in 1981, the Union Carbide explosion in Bhopal in 1984) that drew public attention to the ethical duties of engineers and scientists, propelled vigorous writing of professional codes of conduct, and established the academic discipline of engineering ethics.[1-2] As a growing number of documented real-world cases suggests, engineers and scientists who become alienated from their public clients, are also much more vulnerable to self-interest, self-delusion, and institutional pressures that can contribute to unethical conduct and suboptimal professional decisions.[3-8]

The growing multi-cultural and international dimensions of engineering and science;[9-10] an increasing reliance on interdisciplinary, inter-organizational, and team-based collaborations;[11-12] rising competition in the technological marketplace;[13] and the trend toward reduced financial resources for science[14] create additional pressures that can widen the gap between technical experts and the diverse publics they serve. Indeed, a recent review of scientists' perceptions of "the public" revealed that scientists who have limited professional experience engaging with non-scientists tend to "believe the public is uninformed about science and therefore prone to errors in judgment and policy preferences."[15]

An increasing awareness that successful engineering and science require more than technical proficiency has led engineers, scientists, and public stakeholders in communities across the country to make calls for a new generation of technical experts.[16-27] Today the engineers and scientists of the 21st century are advised to develop expertise in collaboration with the diverse social world in which they practice, and competence in integrating their specific technical knowledge with other types of knowledge that are often overlooked.[2,28-30] "Marginalized" knowledge includes "local" knowledge (i.e., individual and collective histories, observations, experiences, assessments, values, and goals of non-experts), which is increasingly recognized as having the capacity to provide crucial insights into engineers' and scientists' areas of technical expertise and moral responsibility, and improve the effectiveness of their work.[31-37] It also includes "scientific counterknowledge" (i.e., contested knowledge of technical experts who occupy subordinate positions in officially-sanctioned networks of scientific knowledge), a phenomenon that has received less scholarly attention.[38]

Recent efforts to "connect" engineers and scientists to society have given rise to an increasing number of interdisciplinary educational initiatives that bring humanities, social sciences, and even art into technical curricula. Often embodied in project-based service learning (PBSL) components, projects, and programs and facilitated by academic and non-academic institutions alike, these initiatives aim to cultivate what some have termed "humanistic" scientists and engineers.[39-40] They are designed to foster in students cultural competence, civic responsibility, and the ability to reflect critically on the professional "cultures" and often-invisible "values" informing science and engineering practice. They also attempt to sensitize participants to non-technical worldviews and alert them to the need for ethical conduct and sustainable innovation.[28-29,39-40]

With the support of the Ethics Education in Science and Engineering (EESE) program of the National Science Foundation (NSF), we have developed a graduate engineering ethics course that might take these initiatives a step further by making the case that the connection of engineers and scientists to society is *a central pillar of ethical professional practice*. The course brings together engineering, science, ethics, and ethnographic research methods to demonstrate that listening to marginalized stakeholder voices is necessary for morally-sound decision-making. The goal is to cultivate a generation of technical experts who understand the social context of their profession, question the societal relevance of their work, and appreciate the potential human impact of their actions by training students to engage with the public in order to understand "*what is locally at stake*"[41] (emphasis in original). In this context, "active listening" becomes a necessary ingredient of competent moral reasoning and engineering practice.

To foster an approach to ethical dilemmas that helps students see themselves *in* society rather than *apart* from it, the course introduces a 3-dimensional exploration of ethics that allows engagement with real-world unfolding cases not only cognitively, but also emotionally and interactively. This places students in direct contact with a community's diverse stakeholders, and requires them to use ethnographic interviewing to understand a case from their interviewee's perspective. Moreover, it allows students to define and refine their own ethical values, and promotes a first-hand understanding of principles embodied in professional codes of conduct, moral theories, and multidisciplinary studies of human behavior. By "listening" not only to official publications, but also to unofficial documents and stakeholder experiences, students are confronted with the technical and moral relevance of the public's experiences, knowledge, values, and needs; gain appreciation for the day-to-day impacts of engineering and science on individuals and communities; and begin to recognize the personal, professional, and institutional values that underlie the production of expert knowledge and the development of regulatory solutions to large-scale problems.

A main objective of the course is to promote the goals of engineering ethics education – increased ethical sensitivity, clear understanding of professional codes of ethics, improved ethical judgment, and a strengthened ability to act morally[42-43] – by demonstrating that engineers who are open to marginalized points of view will invariably gain insights that can expand their personal and professional perspectives. Ultimately, the course attempts to help students identify the engineer's and scientist's broader scope of professional responsibility from a strictly technical to a moral domain, which often encompasses multiple disciplinary perspectives, diverse values, and often contested views about what is “real” and “right.”

Our hypothesis is that listening will put a human face on ethical dilemmas and reduce tolerance for conduct that can harm the public, by showing students how engineering and science affect the lives of ordinary people, professionals and non-professionals alike. By extension, we hypothesize that listening can help students better appreciate the interconnections between engineering and society, the technical and ethical relevance of stakeholder perspectives, and the crucial role engineers can play in improving quality of life through an ethic of public engagement and care.

As part of this effort, we are developing four educational modules for use by other institutions. Topics are: 1) Witnessing wrongdoing and the obligation to prevent harm, 2) Aspirational ethics and learning to listen, 3) Responsible conduct of research, and 4) Responsible conduct of practice.

We believe that our imperative for the incorporation of “ethnographic listening” in engineering ethics instruction can have promising applications in PBSL initiatives and, conversely, that PBSL initiatives can have promising applications in engineering ethics instruction. Both of these “marriages” would be fruitful areas for future research.

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