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ChE teaching tips

Humanities and Social Relevance for Chemistry and Chemical Engineering Students: The Leonardo Project

The goal of the Leonardo project is to prepare educational materials at the interface between chemical technology and society for use by chemical engineering or chemistry professors in their regular courses.

For effective practice in industry, government, or education, chemists and chemical engineers today and tomorrow must understand how technology interacts with the society that it serves. They need to understand (and be sensitive to) the culture in which they practice their profession. Because chemists and chemical engineers increasingly interact with a variety of people who often have little or no scientific background, chemical and chemical engineering education should expose students to the cultural implications (including ethical, international, legal, and political implications) of chemical science and practice.

Chemical engineering programs also need to demonstrate that students have satisfied ABET criteria 3f ("understanding of professional and ethical responsibility") and 3h ("broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context").

All too often, current methods for including humanities and social studies in chemical and chemical engineering education have limited success because these subjects are taught apart from regular science and engineering courses; there is a lack of integration. In large universities, professors who teach history, philosophy, literature, etc. are rarely interested in the education of scientists and engineers. Further, special (service) courses for students outside the College of Letters and Science are often taught by part-time lecturers; these courses are frequently not taken seriously because they (and their instructors) carry little academic prestige. Regrettably, chemistry and chemical engineering faculty tend to have little interest in such courses, regarding them as a "nuisance" or, at worst, a "waste of time." Students naturally pick up on the low opinion of their professors towards these courses, and erroneously see little connection between humanities or social studies "requirements" and their professional careers.

The Leonardo Project suggests that chemistry and chemical engineering professors introduce relevant social and humanistic content directly into their existing courses. The Leonardo Project suggests that typically, twice a month, a professor may devote 10 or 15 minutes to show how a particular science or engineering topic interacts with human concerns as indicated by history, politics, ethics, or religion, etc. However, to do so, professors need help; they need case studies or examples. The purpose of the Leonardo Project is to prepare and provide a number of pertinent case studies (reports) that cover a wide range of technology-society interactions as encountered in the chemical and related industries. After careful editing, all reports are posted on the internet where anyone may use them free of charge.

For example, in a chemical kinetics course, the professor may use the report "Catalytic Converter for Automobile Emissions: A government-Supported Chemical Invention" or in an introductory course "Pain Relief for Everybody: Large Scale Production of Aspirin" or "Human Aspects of Chemistry and Chemical Practice: The Life and Work of Primo Levi." For a list of reports, see <http://www.cchem.berkeley.edu/leonardo-project/>.

Although the Leonardo Project reports do not directly provide assessments to satisfy ABET, the reports can provide the basis for assessment of criteria 3f and 3h. For example, a group of students may be asked to develop a role play based on "Love Canal: Failure of Chemical Engineering Ethics" and assess their understanding of ethical responsibility. Or, the professor may assign the detailed and lengthy Manhattan Project report to the class. After in-class discussion, students can write short analyses that can be assessed for ABET criteria 3f, 3h, and 3g (communication). ❐

—John M. Prausnitz, University of California, Berkeley