The Role of Undergraduate History of Engineering in the Formation of Engineers: A New Interdisciplinary, Experiential Approach

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From prehistoric times to the present, engineering and engineers have played a pivotal role in the course of human development. Although the terms engineering and engineers are of recent vintage, the underlying activities that these terms represent are timeless. To borrow the phrase from Henry Petroski, "to engineer is human." Being a human activity, engineering has always shaped, and been shaped by, societal institutions and geographic realities. The IEEE History Center has long sought, through its public outreach, to raise awareness of engineering's fundamental importance to the story of humanity. Our outreach efforts are aimed at two audiences, the engineers themselves and the broader general public, neither of whom understand the historical importance of engineering, and one of our public outreach tools has been the teaching of the history of engineering and technology at the university level. At our previous strategic partner, Rutgers University, the courses were largely geared toward a general student audience, which did have the advantage of an interdisciplinary

Our relocation in 2014 to the Stevens Institute of Technology, however, led us to rethink how history of technology should be taught to engineering undergraduates specifically. As an institution focusing almost exclusively on the formation of engineers and related professionals, but with a vibrant and dynamic humanities faculty whose mission is to enrich the educational experience of its undergraduates and to create bridges between the Arts & Letters and engineering, Stevens is an ideal laboratory to explore the role of history in engineering education . Based on earlier pilots and research, in the fall of 2014, IEEE History Center staff offered a new course on the pre-modern history of engineering and technology that integrated traditional lectures in history with hands-on engineering labs. From writing on clay tablets, Roman arches, sundials, sand clocks, the students were given an opportunity to appreciate the challenges of problem solving in different historical contexts. Rather than require students to write the standard history term paper, we assigned a term project to study the relationship of design to performance in ancient naval vessels. The students were challenged to make connections between their hands-on experiences and the larger historical and geographic contexts. In other words, interdisciplinary, experiential learning was applied not to the technical component of engineering education, but to the ethics and social context component.

While this is not the only course or program to make history of engineering available to the engineer (for example, the National Academies "Educating Engineers" report cites Olin College's lecture/discussion course "Stuff of History"), the results of our first semester teaching suggest that the innovative approach of including an engineering lab component directly in a history course has significant impact. In this talk we will discuss how we came to design the course, assessment of the class learning outcomes—indicating that this hybrid history/engineering approach gives students profound insight into the way that solving technological challenges involves engineering systems that must engage society—and how such a course promotes a more diverse appreciation of the engineering process. We will also discuss the institutional requirements needed to make this kind of course work the challenges of designing labs and linking them to the formal lectures, and the role of the students themselves. Finally, we will explore what revisions we are pursuing to make the course even more successful in the future, and ideas for addressing modern engineering in a similar context and exporting the concept to other institutions.