Combining Hands-On Design, Engineering Analysis, and Computer Programming in a Freshman Civil and Environmental Engineering Course

Abstract

As part of an ongoing project supported by the NSF to increase student retention in the College of Engineering, we are implementing course curriculum enhancements into our second semester freshman Introduction to Civil and Environmental Engineering course. The larger project seeks to improve retention of first and second-year College of Engineering students through development of new opportunities for high school students and College of Engineering freshman, as well as course enhancements to the existing freshman engineering curriculum.

This paper describes efforts to further develop the discipline-specific Introduction to Engineering course taught within the Department of Civil and Environmental Engineering. In particular, we are interested in creating a new environmental-themed culminating group design project for the course that retains the desirable features of the existing structural design and computer simulation project. The focus of this paper is to assess how well our current project is meeting our objectives, and to what extent the desirable features of the current project can be retained in a new project. The paper describes the existing project, summarizes its desirable features, and statistically analyzes some characteristics of the student designs so far. Statistical analysis of past student designs demonstrate the effectiveness of the current project. Assessment of learning objective achievement by students shows, however, that the course overall fails to meet objectives with respect to computer programming instruction. The new culminating hands-on design experience will involve design and testing of a flocculation and sedimentation basin. It was found that some but not all of the desirable characteristics of the existing project can be mimicked in the new sedimentation design project. Together the existing and new course sections are intended to engage freshman Civil and Environmental students in a hands-on design experience that introduces fundamental engineering analysis concepts while providing instruction on computer programming based analysis tools, and provides content engaging to all Civil and Environmental Engineering majors.