Interdisciplinary, Industry-University, and Flipped Classrooms in Engineering Education: A First-Hand Report

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Abstract

In this presentation, we provide a first-hand report of our efforts in undergraduate engineering education at Villanova University to create (1) an intercollegiate collaboration in teaching a freshman biomedical engineering mini-project, (2) an industry-university partnership to develop and teach a senior course in biomedical device design, and (3) flipped classes for two sophomore core courses in circuits. Faculty from nursing, biology, chemical engineering, and electrical and computer engineering teaches the freshman biomedical engineering multidisciplinary design and development mini-project, the Automatic Blood Pressure Measurement (ABPM). Freshman engineering students can take ABPM to fulfill part of their freshman engineering requirements. Full-time faculty and industry engineers and entrepreneurs teach the senior technical elective course, Biomedical System Design. This senior course in biomedical device design further increases the course offerings in the university's bioengineering minor and significantly increases the viability of the ECE department's biomedical engineering track. The flipped classes in circuits represent some of the first undergraduate engineering courses that the engineering college attempts to flip in its efforts to further increase faculty teaching effectiveness and student engagement. From these, we will highlight the following points. First, we can impart the interdisciplinary nature of engineering immediately upfront to freshman engineering students if the teaching is interdisciplinary. Second, we can put real world considerations in the course if industry is directly active in the classroom. Finally, we can foster more and better classroom interactions if we can enable more time in the class for these interactions.

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