

Environmental Sustainability: More than an Afterthought in Biomedical Engineering Curriculum

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For presentation only.

Background: The undergraduate Biomedical engineering program at [redacted] is a newly accredited program that integrates expertise from several engineering disciplines with biology and anatomy to provide students with the depth and breadth needed to improve human health. Traditionally, design in this field prioritizes human safety without consideration of environmental sustainability. With a growing awareness of the devastating effects of climate change, there is pressing demand for better integration of environmental sustainability in the biomedical engineering curriculum.

Two common mechanisms to integrate sustainability into engineering programs exist [1,2]. Vertical integration introduces content in a single course while horizontal weaves content throughout the curriculum. Horizontal integration is believed to yield "broader, deeper, and more connected knowledge" from students, since sustainability is not taught in isolation from engineering fundamentals, nor is it at risk for being considered an afterthought [2]. To achieve horizontal integration, the objective of this work is to identify the needs and resources for teaching sustainability and how best to integrate sustainability in the curriculum.

Method: We distributed separate student and faculty surveys within the biomedical engineering program at [redacted]. The student survey assessed the self-reported importance, knowledge of, and confidence in, applying environmental sustainability topics and processes in biomedical engineering design tasks. Data were gathered using a Likert scale (1 = strongly disagree, 5 = strongly agree) and aggregated by year in the program. The survey also asked students where in the curriculum they learned about sustainability and where they identified gaps. The faculty survey additionally focused on faculty members' knowledge of environmental sustainability teaching resources in biomedical engineering, and their expertise in creating such resources in the future.

Results: The student and faculty surveys recorded 105 and 9 responses respectively (approximately 25% of each population). Students and faculty overwhelmingly considered environmental sustainability an important topic in biomedical engineering (Likert scores 4.440.78 and 4.430.73, respectively). Interestingly, students considered themselves more knowledgeable on sustainability topics (2.861.10) in biomedical engineering than faculty (2.000.53). Students were also more confident in applying sustainability processes in their careers (3.231.10), which increased with their year level in the program. In contrast, students described minimal exposure to environmental sustainability content in the curriculum, and faculty reported a lack of teaching resources.

Discussion: Survey results depict a clear need for greater integration of sustainability in our biomedical engineering curriculum. Open-ended responses suggested that design courses are ideally suited to integrate environmental sustainability and create a coherent knowledge-base and skill set throughout the curriculum. We recognize that understanding the student-perceived overconfidence in applying sustainability to design, when there was a recognition of the lack of formal training in the curriculum, is multifaceted. We hypothesize that students assume prioritizing environmental sustainability is simple, and minimal effort can lead to a positive environmental impact. Thus, design instructors in the program are currently working on developing a plan to horizontally integrate environmental sustainability throughout the curriculum [2].

References: