Biomedical Engineering at University of Nebraska: Perspectives on Advising, Courses, and Design

Biological Engineering Education

Angela Pannier, University of Nebraska-Lincoln

Corresponding Author: Angela Pannier, University of Nebraska-Lincoln, 231 L.W. Chase Hall, Lincoln, Nebraska 68583-0726 United States

Abstract

In this presentation, the integration of biomedical engineering emphasis area into the Biological Systems Engineering degree program at the University of Nebraska-Lincoln, will be discussed, including a history (nearly 20 years), course development, advising challenges, enrollment and recruitment issues, ensuing meaningful design experiences, and interactions with other engineering degree programs throughout the college.
EngineeringBio.com - An Effort in Outreach and Education

Biological Engineering Education

Sean Bedingfield, Alan Hodges, Tyler Gladwin, Utah State University

Corresponding Author: Sean Bedingfield, Utah State University, 70 S 200 E, Hyde Park, Utah 84318 United States

Abstract

High schoolers, college students, career jumpers, and employers are prone to misconceptions of biological engineering. While some of these misconceptions are benign, others result in lost opportunities, poorly managed student expectations, and aimlessness in career planning. EngineeringBio.com is a non-commercial site dedicated to defining the field of biological engineering, spotlighting representative research, and offering a guide to related technical skills. The site was developed by undergraduate students, and based heavily from the curriculum offered by the Biological Engineering program offered at Utah State University. Website analytics and content strategies will be discussed.
Human Behavior in Management and Technology: A graduate course in the new Penn State Biorenewable Systems Graduate Program

Biological Engineering Education

Jeffrey Catchmark, Pennsylvania State University

Corresponding Author: Jeffrey Catchmark, Pennsylvania State University, 109 Agricultural Engineering Building, University Park, Pennsylvania 16802 USA

Abstract

Ethical leadership and decision-making (ELDM) continue to be key issues in our society and are topics of growing interest to the public and researchers alike. Our world more than ever needs ELDM to address critical sociotechnological problems such as climate change, sustainable energy and materials, quality food and water, population growth, prejudice, and global conflict to name just a few. Our modern world brings new issues such as technological complexity, new social media, diversity, scope and sheer number of issues which face our leadership. This course was developed to provide students with an improved mechanistic understanding of basic human behavior foundational to ELDM, with a focus on its application to management and technology development. This presentation will review motivations for course development, course structure, educational outcomes, and some examples of course content.
Abstract

We have developed a plan to implement a ‘Just-in-Time’ teaching method in a flipped class design for an elective junior-level course, Principles of Process Engineering, for undergraduate students in Agricultural Engineering and Biological Systems Engineering at the University of Nebraska-Lincoln. A series of short videos (5-15 minutes in length) were produced and uploaded to YouTube. The lectures were recorded using a Surface Pro 3 Tablet and a noise cancelling USB microphone. Students are motivated to watch the video through post-video, pre-class assignments. The first assignment consists of two questions. The purpose of the first question is to identify details of the video presentations that were unclear or where more information is needed. They are next asked to describe in more detail one topic from the video. This assignment is useful in identifying areas that need reinforcement. The second short question asked them to develop an exam question with solutions. This portion of the assignment allowed the extent of understanding to be probed. For each of the questions, a rubric was used to assess and capture the responses of the students. A second assignment consisting of a few multiple choice questions were given to test the understanding of concepts from the video lectures. The assignments were due in the morning of the class. The pre-work performed by the students were summarized prior to class and the instructor adjusted the class activity that reflected the students’ needs. The first one-third of the class was used to clarify misconceptions and to reinforce concepts identified by the students. The second-third of the class was used as a problem solving period and collaborative learning. The final third of the class was used to introduce new material and prepare the students for the next out of class activities. This paper explains data collection schemes for the in-class and out-of-class experiences of the students and their evaluation of the just-in-time teaching. Further, the paper reports on the instructor’s evaluation of the learning achieved by the students and the level of effort required to produce just-in-time teaching.
Abstract

The Institute of Biological Engineering (IBE) was formed in 1995 to provide an intellectual forum/home where engineers, scientists and practicing professionals working in the bio-based industries can engage in conceptualizing and sharing their perspectives and experiences in the emerging discipline of biological engineering. We had recognized that engineering sciences were created by the translation of the knowledge of natural sciences and they provide foundational information for creating designs and testing their performance and reliability for assured quality. Originally physics was the primary source for building knowledge of engineering sciences. Later chemistry became an important source as the need for new materials and designing new process became critical needs. While most engineers questioned, many of us in the 1990s were envisioning that the untapped knowledge of the science of biology could provide rich information and would add to the existing engineering science. In other words, as biology was increasing its knowledge and understanding of principles of molecular-level reactions and as the growing computer speeds and computational techniques were providing ways to represent complex behaviors in predictive model, molecular biology was becoming quantitatively; and the development of engineering science in the context of biology was becoming inevitable. Quantitative biology was emerging and it would provide engineers opportunity to translate it for adding to engineering sciences knowledge. There were few takers of this view then. The existing engineering societies were looking at these developments mostly from the sidelines. Some were reacting, but mostly in ways and hope that this fad de jour too would pass. IBE was formed to fill this emerging need and to provide environment for developing the discipline of biological engineering. This was a unique, bold vision that even today remains solely within IBE. In these twenty years existing societies and nearly all engineering academic curricula have had change of heart and mind the they have added biology to their mission. However, in most cases these additions narrowly add biological perspectives to the fields. IBE still remains The Society for the vision of the discipline of biological engineering. In the 20 years IBE has had limited impact and that is significantly lesser than the potential of its vision. In this presentation I will provide a brief historical perspective of IBE, where IBE stands today in its effectiveness to capture its unique vision of the
biological engineering discipline, its activities, its ups and downs particularly from the point of view of membership and programs, and the alternate future it holds based on actions it takes now.