Developing a Biomaterials Science Course for Health Science and Human Performance Undergraduate Students

Kari Brossard Stoos
Ithaca College

Statement of Purpose: As technology advances, we need to make knowledge of Biomaterials science accessible to a wider audience of undergraduate students. There is a special need to extend this knowledge to students studying in the fields of Health Sciences and Human Performance (HSHP). Traditionally, Biomaterials courses at the undergraduate level tend to be designed for students with a bioengineering background, or for students with intentions of utilizing biomaterials in a clinical setting, for example, pre-dental and pre-medical students. However, this leaves out students that are preparing for patient/client or student education centered careers. Individuals pursuing majors such as Physical Therapy, Exercise Science, Public Health, and Physical and Health Education may not have the extensive backgrounds in Chemistry, Biology, and Physics that would allow them to be successful in a traditional Biomaterials science course. These students, although their futures' may not include physically implanting devices into patients or directly designing new devices, may benefit from the knowledge and understanding of the materials used to make devices, the body's response to an introduced material, and the mechanical strength of an incorporated material.

Methods: To fulfill this need, I have developed a Biomaterials course specifically designed for the HSHP student population. The instructional design for the course incorporates independent e-learning with assessment, in class viewing of videotaped surgical procedures, case study analyses, and a service-learning project. Since the majority of affordable Biomaterials science textbooks are written with the assumption that the reader has basic Chemistry knowledge, these texts are often not suitable for HSHP students. To overcome this obstacle, e-learning presentations of basic chemical, physical, and biological properties of materials are prepared in advance. This model reverses the traditional classroom. Students view the presentations before attending class, with the expectation of applying the knowledge in class. Student learning outcomes are assessed through the administration of quizzes based on e-learning material. Technology is incorporated in the classroom both by viewing videos of surgical procedures and by activities involving hands on learning experiences with biomaterials. Students improve their team building skills by working in groups analyzing case studies involving the successes and failures of biomaterial implantation. The final component of the course is a service-learning activity. Students are expected to develop a project, within their discipline, that will provide a service to the community while at the same time enhance their own knowledge of Biomaterials science. This activity is expected to be a meaningful, memorable, and engaging experience. For example, a student majoring in Physical and Health Education may develop and deliver a Biomaterials science lesson plan for a local high school. Also, students majoring in Exercise Science or Physical Therapy may design and implement an approved exercise plan for individuals with hip replacements at a local elder care facility.

Results: Early assessment analyses demonstrate that the class as a whole fits the standard Bell curve distribution. Students on the low end of the curve perform poorly on assessment activities due to incomplete e-learning assignments, absenteeism, and a poor grasp of the subject material. As with any course, individuals with a poor grasp of subject material improve understanding with extra tutorials during office hours.

Conclusion: Early results, based on assessment outcomes, indicate that the instructional design will prove successful as a pedagogical model for Biomaterials science courses developed for HSHP undergraduate students. The knowledge that is gained will help students in the their future interactions with patients and clients in the Physical Therapy and Exercise Science setting as well as inspire future scientists in the field of Biomaterials in the high school classroom.