The importance of programming skills in achieving biomedical solutions in the modern world

As globalization continues to flatten our world, challenges and opportunities increasingly operate in a broader domain. Biomedical engineering solutions have the ability to profoundly influence society on a global scale. Consequently, students should be encouraged to become global citizens—able to work in multi-cultural teams, provide solutions to increasingly complex problems, and be comfortable with the computational skills they need to facilitate problem-solving.

Programming, and other computational skills play a critical role in answering the ever increasing complex problems arising in health and wellness in our local communities. In the health industry, the advent of smart devices and continuous connectivity provides an opportunity to gather personalized health data at a large scale. For health care providers, taking advantage of this additional stream of information will undoubtedly provide the opportunity for providing personalized medicine and more effectively detecting changes in health conditions. Through the exposure to programming, and other computational skills, students embarking upon careers in the allied health sciences, biomedical engineering, and medicine, can then have a common framework to communicate and address complex problems.

In order to facilitate the learning necessary for students to become global citizens and provide them with insight into the greater social, environmental, and economic contexts that constrain appropriate technical solutions, I have sought to facilitate the development of real-life problem-solving skills, fostering of critical thinking skills, and spurring of interdisciplinary teamwork. Within the past two years, since

joining the faculty at the University of Illinois, I have nurtured students' analytical skills by challenging assumptions and incorporating activities that emphasize adequate problem definition. In special topics courses on Neuromechanics and on Occupational and Rehabilitation Biomechanics, I have provided capstone projects for students to pursue interdisciplinary projects that necessitate programming skills for the simulation of neuromechanical systems, and developed materials for case studies of falls in the workplace, which necessitate biomechanical modeling.

In addition to refining the technical skills that students will need to succeed in a modern workplace, I have been a proponent of the incorporation of service-learning pedagogy, where possible. Based on prior experience with a project-based course as a graduate student at the University of Michigan, I have seen the benefits of facilitation of student learning through hands-on experiences in international and local community development, and providing in-depth learning opportunities for students through interdisciplinary team-based projects. Through the use of a problem based learning approach, I have promoted the use of both in-class and online discussion to develop critical thinking skills about the issues brought up in class. Considering the wide variety of learner types, the use of both introvert and extrovert forms of discussion have hopefully provided a comfortable learning environment for students. Through, the use of multiple milestones throughout the design and project implementation cycle, such as preliminary and final group presentations and reports, feedback on technical knowledge, as well as problem identification and problem-solving can be provided in a timely manner. This is particularly important in the early stages of the project where additional oversight is needed to maintain a focus of effort in the project.

When both the technical and non-technical skills are presented within a cohesive structure, students can then better appreciate the breadth of skills that are needed to tackle challenging problems and be better prepared to profoundly influence society on a global scale.