

Project Year

2013-2014

Project Title

Modeling and Design Pre-lab Videos & Animations

Project Team

Eileen Haase, Whiting School of Engineering, Biomedical Engineering, Faculty
BaDoi Phan, Whiting School of Engineering, Biomedical Engineering, Fellow
Emily Rencsok, Whiting School of Engineering, Biomedical Engineering, Fellow
Monica Rex, Whiting School of Engineering, Biomedical Engineering, Fellow

Audience

Freshman BME students taking the required *Modeling and Design* course.

Pedagogical Challenge

During their first semester at Hopkins, freshman BME students are required to enroll in the BME *Modeling and Design* course. In this class, the students participate in five labs where they are required to model a biological system or independently design a project. The students are required to model the circulatory system, movement of the arm, heart rate and acceleration on a field trip to Six Flags amusement park. They also must design a foam core project to move a ping pong ball three meters down and three meters back without touching the ball. Finally, each student in *Modeling and Design* must work with their team to create a modeling project of their own. The goals of this class are to challenge students to 1) learn how to design their own experiments, and 2) learn how to model the complex systems of the body. Most students in this class have not previously been exposed to either challenge.

Currently a brief one-page background is uploaded to the Blackboard page for the *Modeling and Design* class with information about each lab. It is up to the students in the class to determine the experimental procedures for the lab. Because each student has a different background in physics, biology, and computer programming, the students are not all on the same page as far as prior knowledge of the information and skills necessary to complete the lab. There is a need for these students to efficiently learn about the wide range of topics necessary for the completion of the lab. For example, in the arm model lab, students who did not have AP/ IB Physics find the statics and dynamics concepts overwhelming. There is a need to fill in any gaps that the student may have, to get the students up to speed on topics ranging from muscle contraction to blood pressure control, and to help teach them the design process.

Solution

Our solution is to create informational videos for the six *Modeling and Design* lab experiments. These videos will present background information and technical instruction for using the many programs and devices in the laboratory. The visual aspect of the video component will add a dimension of clarity and efficiency that information on a page cannot. For example, the circulatory lab requires the students to create a circuit. For students without electrical engineering knowledge these simple engineering tasks can be confusing. Our goal for these videos is to give students enough background so that every team member can contribute to each project, regardless of their expertise on the subject. The purpose of this project is not to hand out the answers or develop a lab manual with cookie cutter steps for what to do in

the lab, but to give the students enough technical knowledge and background on the topic to allow them to think and work effectively and creatively with their team.

Faculty Statement

In *Modeling and Design*, BME freshmen are exposed to the vast field of biomedical engineering and the Hopkins approach of learning in groups via a series of labs and hands-on design projects. This quasi-seminar/lab course is both informative and instructive to aspiring biomedical engineers. It is important for students to gather from both the labs and lectures the broad picture of BME for a better understanding of how they will continue in BME at Hopkins. Therefore, it is important that students have an understanding of the purpose and overarching goals of the labs. In the past, we have received several CER Technology Fellowships to develop a suite of online videos that provide background information on *Molecules and Cells* lectures. These short (less than 5 minutes), easy-to-understand videos were extremely popular, as judged by the number of “hits” using Blackboard’s statistics tracking and based on student feedback. We are applying for another Technology Fellowship Grant to provide similar videos for students in *Modeling and Design* to brief students before each of their labs.

To better address the needs of students, we propose to provide a suite of mini-lectures, computer simulations and animations to illustrate key concepts of the course. This suite of software applications will be developed by students, for students. We believe the suite will provide an extremely effective method to deliver content in an engaging way. Many of the talented BME students are visual learners, noted by the *Spatial Reasoning and Assessment Survey* in the 2012 *Modeling and Design* year; therefore using digital media in our project will allow for greater understanding of the material. We plan to work closely with the CER and the DMC to make exceptionally informative videos and simulations.

Our project objective is to help each student in *Modeling and Design* succeed in the class and understand more about the required labs.