

BME 402 Outreach Presentation  
Drill Stop System  
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### Overview

Mr. Spychalla teaches the AP biology class at Nicolet High School in Glendale, Wisconsin and helped to organize this outreach event. He enabled us to present to a large group of interested high school students. The audience consisted of over 70 students from various AP level classes including Biology, Chemistry, Physics, and Environmental Science. A selection of other biology classes were also present whose students ranged from the sophomores to senior levels. The presentation was offered as an extra credit opportunity; For full participation, the audience was additionally required to write a reaction paper. The event occurred in room F128, a small lecture hall, in the high school at 2:30pm on April 26, 2012. Let it be noted that Nicolet High School is a large contributor to UW-Madison with about 80 students per year.

The outreach activity consisted of a 35-minute presentation. This presentation included two demonstrations lasting approximately 5 minutes each followed by a 20-minute question-answer session. There were no constraints placed on our presentation. We were asked for the slides we were to present, which were OKed by Mr. Spychalla prior to the presentation date.

A small portion of the students in the audience were solely there for the extra credit, most of the students didn't seem to have any commentary or questions, and a small portion were very much interested in the presentation. There unforeseen A/V problems leading up to our presentation that led to a feeling of indifference and restlessness throughout the audience. When we arrived the presentation system was not set up and we were standing waiting in front of the audience for about 15 minutes. During the interim, one student continued to ask us off-topic questions, which we did not know how to answer given their sophomoric nature. We tried to solicit general questions from the audience without any success in this waiting period.

If the presentation equipment had been prepared before our arrival and if we were given a proper introduction, the audience would have respected us more allowing for a better presentation tone. Unfortunately, Mr. Spychalla had no help as the staff member who usually performs these duties was recently laid-off and he was teaching in the last hour of school ending just 8 minutes before our presentation time. This prevented him from bringing the presentation situation to our attention at an appropriate time.

### Presentation

Kenny started the presentation by introducing our team and our affiliation with UW-Madison. He continued by explaining the importance of science and engineering in society by introducing the benefits and effects of a well-learned population. Next, a range of engineering majors was introduced with special emphasis given to Biomedical engineering. Biomedical engineering was then further defined by

its definition, the motivation required to succeed, and the work it takes to be a good BME student. Further explanation was given by depicting BME as a very large field with many subgroups and that in our education we specialize in one such sub-group. The four largest specialties were introduced: Tissue and materials, biomechanics, bioinstrumentations, and medical imaging. Kenny introduced material and tissue engineering by defining the sub-field, its alternative names, the goals of the subfield, and a number of examples. The main example included discussion of a de-cellularized heart and the preparations necessary for successful implantation.

Jack continued the presentation by explaining biomechanics, bioinstrumentation, and medical imaging. For each of these categories, he defined the sub-field, its alternative names, the goals of the subfield, and a number of examples. For biomechanics, the main example was to show the benefit of the analysis of physical motion. Specifically, a foot strike pattern of running barefoot versus with shoes was discussed. A video giving the details of each motion was shown. For bioinstrumentation the main example was a monkey feeding himself with a bionic arm controlled via an electrode-brain interface. For shock value, a video of this was also included. Explanation of Medical Imaging included a discussion of a new breakthrough in 3D imaging produced a radiologist; additionally, Pixar animation technologies were presented via video. Jack then explained how each semester teams of four are able to work on real-world projects through our BME Design class. He explained how clients presented problems and how teams choose projects and work on design of a device to solve the problem. This was followed by examples of seven design projects that our team had experienced.

Josh introduced two of the design projects in further detail through demonstrations. He began by showing the class the BuckyBag and explained its role in radical nephrectomy surgery. First, the need of the bag was explained and the standard bag was shown. This was accompanied by a show of the normal and cancerous kidney models that were then passed around the classroom. He explained our reasoning for redesigning the bag and then detailed our design progress through our three iterations of the device. The three prototypes were passed around the classroom along with a pair of surgical graspers, which are instrumental in understanding the need for the device. He finished the first demonstration by showing a video from pig lab testing and explaining the importance of testing. The personal benefits of being involved with a patentable device were stressed. Josh then explained the problem of plunging in current orthopedic procedures and detailed the need for an anti-plunging device and the benefits of a device that also measured the depth of the hole through the bone. The final prototype was then introduced with all of its features explained followed by a video of the device in action. A number of prototypes were then passed around the classroom.

Sarah ended the presentation by introducing other aspects of being a well-rounded biomedical engineer, what is expected after graduation, and how to prepare for college. She explained how the collaborative nature of the field and the need for specialties makes the class experience quite broad despite the necessity of a specialty. Joining a research lab and participating in a REU, internship, co-op, and competitions further supplements the class work allowing for more depth in the biomedical education. The presentation then took a step back by telling the students that our education did not monopolize our weekly schedules, but that we has plenty of time to explore and have fun. Opportunities after graduation with a biomedical degree were discussed. The students were presented with the

possibilities of a continued education and industry after receiving their bachelor's degree. Sarah then gave advice to the students, telling what steps they could take to become accepted to the BME program at Madison and, after that, a practicing engineer. She finished the presentation by giving the students resources for further investigation and opened the floor to questions about the presentation, our major, and college life and preparation.

### Demonstrations/Visuals

In each of the two demonstrations, the project was demonstrated via video. Then, the supporting materials were passed around the class for each student to appreciate. The demonstrations themselves are detailed in Josh's section of the presentation.

Kidney Retrieval Bag demonstration materials:

- First, second, and final prototype of BuckyBag
  - Surgical graspers
  - Models of normal and cancer-state kidneys
  - Video*: BuckyBag in use in pig lab testing
- contact for materials: Sarah Sandock (sandock@wisc.edu)

Drill Stop Device demonstration Materials:

- Final prototype of device
  - Large bovine femur (acquire from butcher in future)
  - Video*: Drilling with device
  - Slides*: Design of device
- contact for materials: Kenny Xu (kkxu@wisc.edu)

## Evaluation Form for Outreach Deliverable

Team: \_\_\_\_\_

Advisor: \_\_\_\_\_

### **Overview:**

	NI	S	DW	N/A
Includes basic description of outreach (place, grade level, contact info, type of class, time span)				
Evaluates efficacy of outreach activity				
Provides thoughtful suggestions for presentation/activity improvement				

### **Presentation:**

	NI	S	DW	N/A
Powerpoint slides electronically submitted				
Provides sufficient information for lecture re-creation				

### **Demonstration:**

	NI	S	DW	N/A
Provides description of all materials, where obtained, and who to contact for them				
Provides sufficient information for activity re-creation				

### **General:**

	NI	S	DW	N/A
Writing style				
Spelling and grammar				
Thoroughness and accuracy of report: i.e. could another team re-create the presentation from the documentation and resources provided?				

Overall Score: \_\_\_\_\_

Comments: