Liver Retractor

Outreach Report

Presenters: **Kevin Hanson** – Team Leader
Kara Barnhart –Communications
Dan Jonovic – BWIG
Nick Ladwig – BSAC

Teacher / Client: **Daniel Toomey**

Presentation Details: Edgewood Middle School
Friday, April 23, 2010
7th Grade Classroom
Two 45 minute presentation: 12:30pm – 1:15pm & 1:20pm – 2:05pm

Overview

We performed our outreach activity with two seventh grade science classes at Edgewood Middle School on April 23, 2010, each with approximately 24 students. We were provided with the entire course period, 45 minutes, to work with the students. Keeping the age group in mind, we developed a presentation to facilitate group brainstorming, multimedia, and hands-on activities.

Presentation & Description

A PowerPoint presentation was used to provide visuals and facilitate the flow of the presentation. The flow of the presentation was as follows:

- Definition of Engineering
- Future of Engineering (Grand Challenges)
- Video (Did You Know 4.0) http://www.youtube.com/watch?v=6ILQrUrEWe8
- Explanation Biomedical Engineering
- Demonstration of BME equipment (obtained from BME310: Bioinstrumentation Lab)
    - Ultrasonic Flow meter
    - Blood pressure cuff
- Explanation of design project
- Highlight ways to get involved in engineering
    - Science Olympiad
    - Attend Engineering Expo
    - Competition based teams
- Activity (Tower building)

The classes seemed very engaged throughout the presentation, and students were participative whenever we asked for suggestions. This led to a short period of time, about two minutes, for the final activity during the first presentation. Despite this short timeframe, they were eager to put something together and "compete" against the other teams. During the first presentation, we had some problems getting a good signal with the blood pressure cuff. As a result, half of the class didn't have much of an

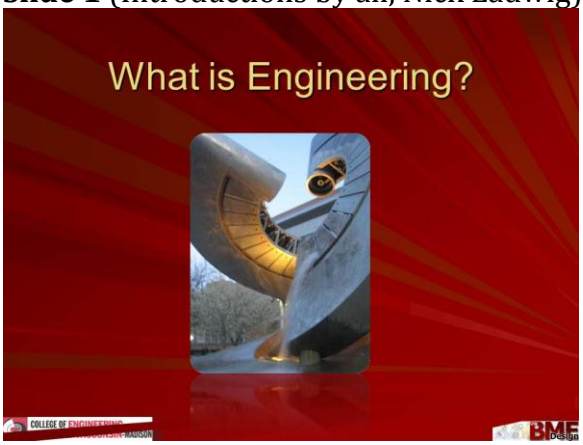
opportunity to listen. This was modified to be a demonstration with participation by a few students the second time around.

Conclusion

The presentations flowed smoothly and allowed the students multiple opportunities to provide ideas and ask for clarification. One problem that could be further improved is time management. Between the two presentations, we were able to speed up the presentation in order to provide more time for the activities. It was rewarding to watch the students work together in teams to problem-solve and develop different strategies for building their towers. They seemed to enjoy our presentation and gain knowledge of engineering, making the overall outreach activity a success.

Presentation dialogue

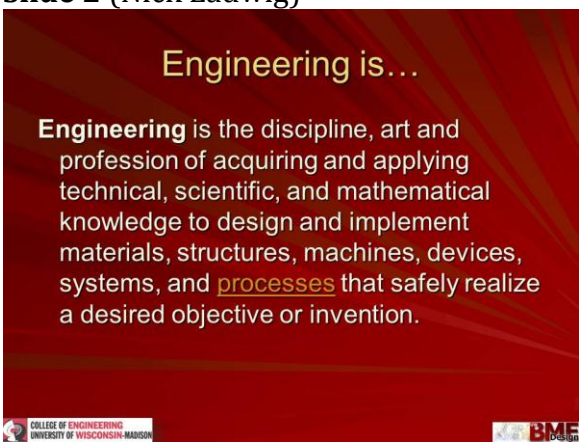
Slide 1 (Introductions by all, Nick Ladwig)



Each group member introduced themselves, motivation for pursuing a degree in BME, and future plans.

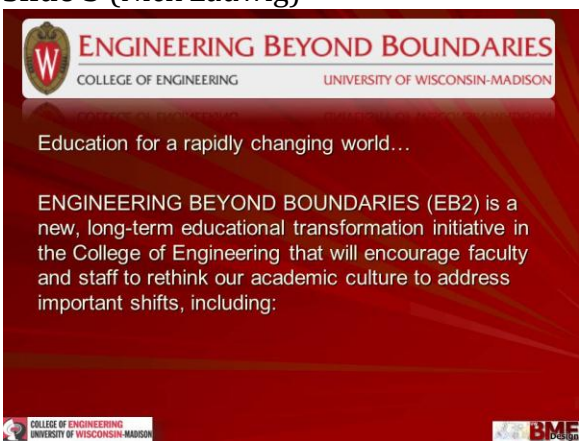
The class was broken up into four groups of about six students each. Each group was asked to write a one-sentence definition of what they think engineering is. Each team member supervised a different group to ensure they stayed on track. Brainstorming was allowed for about five minutes, at which point each group was asked to read their definition aloud to the class.

Slide 2 (Nick Ladwig)



Students were asked to provide qualities of engineers for a few minutes. The necessary characteristics were then summarized as a need for curiosity, desire to solve problems, and want to help others. It was then mentioned that each student in the room has those abilities.

Slide 3 (Nick Ladwig)



Engineering was introduced as a rapidly changing discipline. Engineering Beyond Boundaries is the College of Engineering's (CoE) effort to keep up with changing technology and stay current with new disciplines and fields of study, such as biomedical engineering.

Video: Did You Know 4.0 (Nick Ladwig)

This video (4:46) is part of a sequence called "Shift Happens" and presents statistics showing how rapidly technology and multimedia are changing.

Following the video, the class was asked what statistics stood out to them. This was then brought around to show that engineers bring about much of the change they see – through developing new devices, processes, and technology.

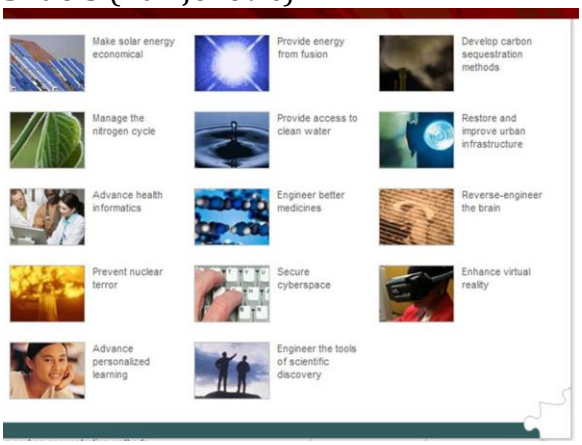
http://www.youtube.com/watch?v=6ILQrUrEWe8

Slide 4 (Dan Jonovic)

The Grand Challenges of engineering are nationally agreed upon themes to focus on in order to best improve society.

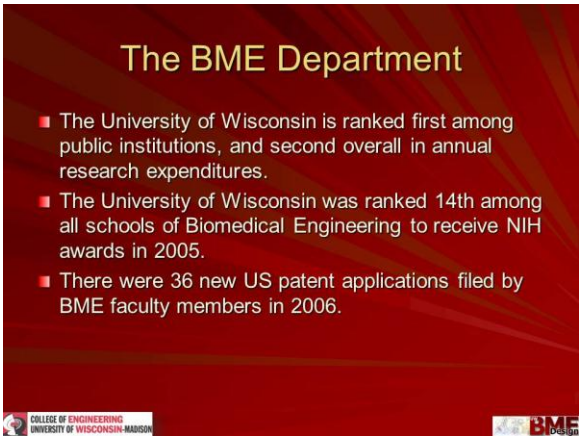
Students were asked to brainstorm some subjects that would fall under each of the four categories: sustainability, health, vulnerability, and joy of living.

Slide 5 (Dan Jonovic)



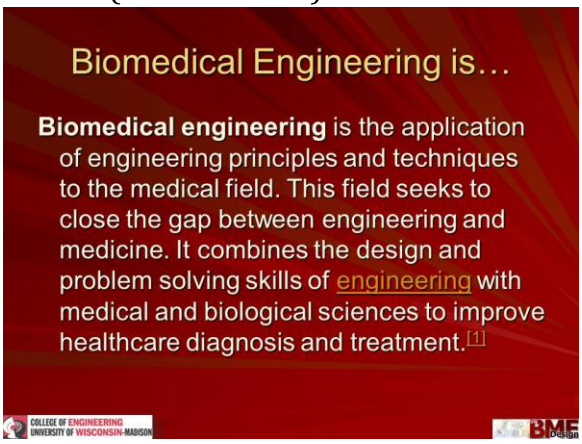
After brainstorming subjects of engineering, these topics were displayed. They are some of the specific projects considered important.

Slide 6 (Kevin Hanson)



Biomedical Engineering was introduced along with some of the highlights from the department. The students were unfamiliar with what patents are, so it was explained that they protect inventions so that they can be sold. Since a lot of research doesn't result in directly marketable items, it's important to take advantage of the successes.

Slide 7 (Kevin Hanson)



BME was further defined, and students were asked to provide some ideas for what they think biomedical engineers work on and develop.

Activity: Blood Pressure Cuffs & Ultrasonic Flow meters (Intro by Kevin Hanson)

Supplies:

- One ultrasonic flow meter
- Two blood pressure cuffs
- Recorded audio file of the flow meter

Due to the difficulty in finding a good vein with the flowmeter, we recorded a 20 second clip before the outreach presentation. The analogy of an ambulance siren was used to explain the change in pitch that accompanies blood flowing through the veins.

Next, the class was broken into two groups, and the utility of a blood pressure cuff in measuring vital signs was explained. The students were allowed to listen to the change in heartbeat as the pressure drops. During the first presentation, approximately five minutes were spent on this task. The pulse was barely audible through one of the stethoscopes, so only a few students were selected for the second presentation to come up to the front of the class, listen, and explain what they heard.

Introduction of Design Project

We introduced our design project in a fun manner with terms that would be more understandable to a middle school audience. The slides were kept similar to the midsemester presentations, but the titles and bullets were rephrased to sound less technical and more exciting.

Slide 9 (Kara Barnhart)

Our design project was introduced as a device for surgery.

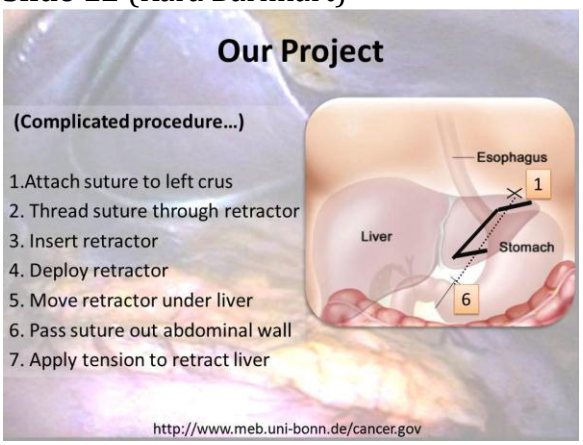
Slide 10 (Kara Barnhart)

We highlighted the fact that we've been working with a surgeon at UW Hospital for over a year now. The students were very interested in the fact that we were able to test a device in a pig lab.

Slide 11 (Kara Barnhart)

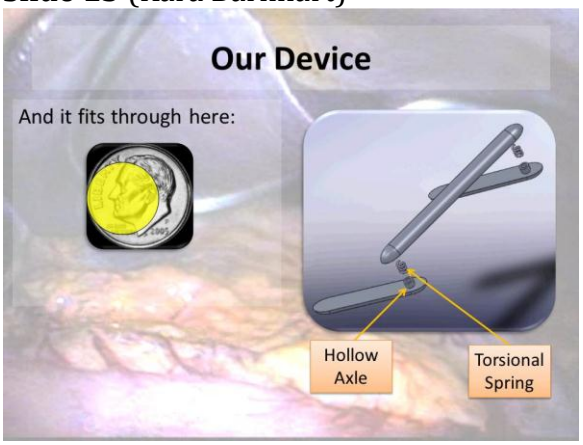
The motivation for our project was explained in relation to the cosmetic improvements. The image of scarring provided an understanding for this project.

Slide 12 (Kara Barnhart)



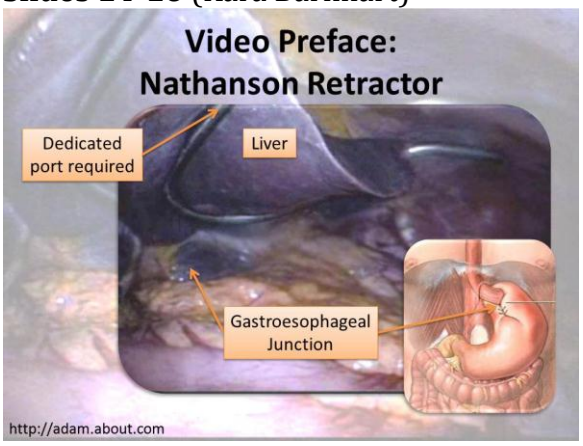
The retractor prototype was shown as the procedure was explained. It was highlighted that the device folds flat to fit through a 1cm port (image on next slide) and is held up by sutures.

Slide 13 (Kara Barnhart)



In continuing the explanation of how the retractor works, the dime provided a good visual for the small size being worked with. The students were impressed by the SolidWorks drawing demonstrating the components of the retractor.

Slides 14-16 (Kara Barnhart)



To demonstrate how the retractor works, we decided to show the videos of the current surgical method (Nathanson retractor). The key elements, liver and retractor, were pointed out to facilitate in viewing.

The following two slides showed the Nathanson retractor lifting the liver, and an attempt at retracting the liver using a Red Rubber Robinson. The students were fascinated by the videos since they had not seen anything of a similar nature before.

Slides 17-24 (Dan Jonovic)

After discussing what engineering is and our project, we showed some of the activities they can get involved in both currently and as a college student. Engineering Expo was highlighted as a great way to learn more about engineering, and many of the students had attended in 2009. Science Olympiad was also brought up as an organization they can get involved in. Some of the competition teams, concrete canoe, steel bridge, Rube Goldberg, and formula SAE, were highlighted as great ways to get hands-on experience as a college student. While these organizations are not BME related, they provide more understandable examples of extracurricular activities than med school trips, industry speakers, and outreach activities. Finally, the competition prizes such as the Tong and Schoof's were brought up as exciting opportunities for students to win up to $10,000 to pursue an invention.

Activity: Tower Building Competition (Intro by Nick Ladwig)

Supplies:

- 25 sheets of colored paper
- 4 rolls masking tape (one per team)

At the end of the class, each group that was formed at the beginning was provided with 25 sheets of computer paper in a color of their choosing as well as a roll of scotch tape. They were instructed to build the tallest free-standing tower that they could in the allotted time. This was approximately 2 minutes during the first presentation and 10 during the second. One presenter watched over each group to make sure that they understood the goal. The students had a lot of fun building the towers, and did will with a short amount of time.