BME 402 Outreach Presentation

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As a team, we performed our outreach activity at Kromrey Middle School. We delivered a presentation to 8th grade students in a 42 minute long "Choices and Careers" class. The teacher informed us that the class of 25 could be quite active and talkative, so we decided to do an extremely interactive presentation. As such, we did not use PowerPoint slides and we spoke in a two-way, conversational manner. In addition, we did one hands-on activity that allowed the students to work together and discuss an engineering problem in small groups. This activity took approximately 15 minutes total, with about 8 minutes of small group work. Overall, about half of the presentation involved asking questions of the class or having them raise their hands to actively participate in the presentation. All group members spoke equally during the presentation and interjected information where they felt it to be appropriate.

We began the presentation by introducing ourselves, where we are from, and the purpose of our presentation: To teach the students what biomedical engineering is and all of the cool things that biomedical engineers do. We asked the students to tell us any ideas that come to mind when they hear the words "biomedical engineering." The class participated immediately, giving ideas such as doctors, surgical equipment, inventing new medical products, and improving on existing medical products. This part of the presentation went extremely well, because the students were asked to participate immediately and therefore became engaged in the presentation. After all ideas were exhausted and recorded on the chalk board, we hung a large sheet of paper at the front of the classroom with the definition of biomedical engineering written in colors: "Biomedical engineering is the application of science and technology to solve problems in biology and medicine."

Next we introduced the concept of design and informed the students that an integral part of the biomedical engineering curriculum at UW-Madison is a series of design classes. Although biomedical engineers typically work on medical devices, we decided to use a more familiar device for our activity: a video game controller. We asked the students to brainstorm ideas about what they would want in the ideal video game controller. This portion of the presentation went well; many of the students were eager to participate, however, the class was so excited about their ideas that many side-conversations began. The presentation could have been improved by only allowing one student to talk at a time. As students voiced their ideas, all ideas were recorded on the chalk board and the students received a piece of candy to reward participation. Some of the ideas given included making the controller fuzzy so it's more comfortable to hold, projecting it on the floor, and making it magnetic so it can be placed on the refrigerator to prevent misplacement.

Following this brainstorming, we continued to describe the design process. We told the students how all of the ideas that arise during brainstorming can be put together to make several possible designs. These designs are then evaluated based on the desires of the final user. In the case of our current academic design project, we are designing a device for a doctor, so we have to select the design that best fits his needs and wants. In the case of a video game controller, the end user is anyone who might buy the controller, such as the students in the class.

To demonstrate the process of evaluating designs using a design matrix, we brought in 4 different video game controllers. These included controllers from the original Nintendo, Play Station 1, Play Station 3, and Xbox. We borrowed these controllers from friends so the cost of the activity was minimal. We divided the students into 4 groups and passed out one controller to each group. In addition, each group was given a sheet of paper with the following matrix on it:

Controller Type	Function	Cost	Looks	Ergonomics	Easy to learn
	0 = Doesn't do much 5 = Lots of abilities	0 = Cheap 5 = Expensive	0 = Ugly 5 = Attractive	0 = Uncomfortable 5 = Easy to hold/use	0 = Needs a manual 5 = Pick up + play

The students were given about 8 minutes to talk about their controller and fill out the corresponding matrix. After all groups were finished, we collected the results and showed each controller to the class one by one. As the controller was presented, we recorded the rating given by the students on a prepared design matrix drawn on a large sheet of paper. We discussed the differences between controllers and explained the reasons for the ratings. This part of the presentation went extremely well. The ratings assigned by the students were very reasonable and made sense when compared to the other controllers. We were impressed to see this, since it is difficult to make such logical comparisons when one controller is being evaluated independently of the others. The design receiving the highest overall score was the xbox controller, so we explained that the xbox controller is the design that best meets the criteria of the end user. In the design process, a functional prototype would be constructed and tested. Testing would involve using the controller with all of the games that it should be able to control, as well as mechanical testing to ensure that it can withstand repeated pressing of the buttons, etc.

Next, we informed the students about the different tracks that can be studied within the biomedical engineering program at UW-Madison. Sara talked about her track, biomechanics, and discussed the idea of analyzing forces and materials to design orthopedic implants. Emily introduced her track, health care systems, and talked about how engineers are needed in hospitals to improve the productivity and organization of the people and the equipment. Michele discussed her track, biomaterials, and spoke about the complexity involved with putting a foreign material in the body, as well as cutting edge technologies such as stem cell bioengineering and tissue engineering. Michele also briefly introduced the remaining tracks of bioinstrumentation and medical imaging, and gave the students examples of devices that are created by engineers in these areas.

Following the introduction of the tracks within BME, we brought up the numerous positions that can be held by biomedical engineers within industry. We listed different skills and interests that are required for each position, and asked the students to raise their hands when they heard something that sounded attractive. The following questions and responses were used: Do you like doing creative projects or thinking of new ways to do things? Then you might be interested in a career in research and design. Do you like to build things, take things apart, or just get your hands dirty? A career in manufacturing utilizes these hands on skills. Do you enjoy working with other people and trying to convince them that your ideas are right? Jobs in sales and marketing require knowledge of the product and the ability to prove that your product is the best option available. Do you like designing and conducting experiments, or are you good at paying attention to details? You might be interested in a job in validation and verification, where the product is tested to make sure it is safe, reliable, and functional.

After bringing up the many different career paths within industry, we explained that BME majors actually end up in a variety of areas. First, many students may continue their education by going to graduate school for BME or a related field. Often times, graduate students are given the opportunity to design their own research in areas that nobody else is studying. Many BME majors also go on to medical school, which requires at least 4 more years of school, allowing the individual to become anything from a dermatologist to a surgeon. Finally, BME majors may go on to law school to study patent law, or go to business school and get an MBA. The options are essentially limitless!

At this point in the presentation we had just under 10 minutes remaining in the class period. We gave the students the choice between asking questions and hearing about our senior design project. They elected to learn about our senior design project, so we unrolled the poster from last semester and gave a brief overview about the project. First we introduced the purpose of the project: automatically deliver inhaled asthma medication through existing CPAP tubing while the patient is sleeping. Next, we briefly explained the mechanical device, electrical components, and computer program that we have developed to accomplish this goal. This took us to the end of the class period. Overall, the presentation was quite successful, and the main improvement could have been stronger discipline to keep the students from talking over one another when presenting ides.