1.2 Engineering 5 Senses and Success From Failure

Summary

Students experience the influence of engineering in their lives by using all five senses. This importance of failure as a contributor to ultimate success and how this topic relates to engineering is discussed.

Learning Objectives

After this class, students will be able to:

* Identify the influence of engineers on the things in which they come in contact and they way in which they live.
* Relate how failure is a critical part of the engineering process.

Materials

Items for the 5 senses activity:
* Hearing: none
* Smell: an orange or bottle of vanilla
* Taste: freeze-dried food or chewing gum, enough for each student to have a piece
* Touch: Velcro or other synthetic fabric
* Sight: none

Time

80 minutes

Procedure/Pacing

Engineering Through 5 Senses

1. Have students use their five senses to stimulate a discussion about how engineering is everywhere.
2. Hearing: Begin by having students close their eyes listen to observe what they can hear. Listen for clocks ticking, computers humming, airplanes or cars passing. Use what the students hear to discuss different engineering disciplines. Take, for example, a computer. Electrical engineers were involved in the design of the microchips. Chemical engineers were needed to manufacture those microchips. Computer engineers designed the components of the computer that use the microchips and may have designed the operating system. A

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mechanical engineer may have been involved in designing the cooling system of a computer. A computer scientist would have written the code for the programs that run on the computer.

3. Smell: Cut into an orange or open a bottle of vanilla to release a scent and talk about engineering and agriculture, food processing... For example, engineers are involved in the design and manufacture of farming machines; the design and production of the herbicides, pesticides, and fertilizers used by farmers; and the processing of the food after it is harvested.

4. Taste: Students will get a kick out of eating freeze-dried food, chewing gum or licking stamps. Lead to a discussion on engineering and packaging, adhesives... Questions to explore: How do they package freeze-dried food so that it is shelf stable? Engineers had to figure out what materials to use and how to seal them, so that the food would not be exposed to moisture and oxygen. How do they make gum not stick to it's packaging? Engineers determined what wrapper to use, what could be applied to the outer surface of the gum that would not stick to the wrapper and that could be ingested, how much of substance was needed, and how best to apply it. How do they decide the size and shape of packaging?

5. Touch: Synthetic fabrics, Velcro, and paper are only a few items leading to discussions of engineering and manufacturing...
   - **Velcro** is a company that produces the first commercially marketed fabric **hook-and-loop fastener**,[1] invented in 1948 by the Swiss electrical engineer George de Mestral. The idea came to him one day after returning from a hunting trip with his dog in the Alps. He took a close look at the burrs (seeds) of burdock that kept sticking to his clothes and his dog's fur. He examined them under a microscope, and noted their hundreds of "hooks" that caught on anything with a loop, such as clothing, animal fur, or hair. In all, it took ten years to create a mechanized process that worked.

6. Sight: Try this one last. For a slightly different twist, ask students to identify something they are wearing or carrying. Then ask them if they can guess how engineers have helped make that product a reality.

Success From Failure
1. Help students understand that failure is an important part of the engineering process. From the video, students should have seen that engineers learn from their failures by understanding what didn't work and why, then redesigning. Some points to discuss:
   - What do you think about failure?

- Is failure a bad thing?
- Do successful people fail?
- From the video, what was their initial reaction to failure? What did Honda do when their engines were failing? What did the company decide to do? What was the result? (Danica Patrick, the IndyCar driver from the beginning of the video, went on to become the first female driver to win an IndyCar race in 2008. Honda is now the sole provider for engines to IndyCar.)
- Failure is a part of life.
- How will you decide to view and respond to failure?
- What will you choose to do afterward?
- Choose to learn from your mistakes.

2. If there is time, read the following examples of famous people who have experienced failure and have students guess who the person is.
   a. He did not speak until he was four years old, and couldn't read until he was seven. His parents thought he was "sub-normal." He was expelled from school and his teachers described him as "mentally slow, unsociable and adrift forever in foolish dreams." (Albert Einstein)
   b. She was broke, living on welfare, severely depressed, divorced and a single mother while attending school and attempting to write her first novel. (J.K. Rowling)
   c. A professor suggested he drop out of the English department and college altogether. At his very first job, he was paid in cases of shaving cream, soda and nail clippers. His first book was rejected by 27 publishers before printers accepted it. (Dr. Seuss)
   d. Failed 1,000 times before he created a successful prototype. (Thomas Edison. When asked how it felt to fail 1,000 times, he replied, "I didn't fail 1,000 times. The light bulb was an invention with 1,000 steps.")

In-Class Assignment
Assignment 1.2i: Success From Failure

Resources

Homework
Assignment 1.3h: Engineers vs. Scientists vs. Engineering Technologists

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