1.10 Engineering Design Process Part 4 – Reflect: Testing and Redesign

Summary

Students will observe the role of testing in the engineering design process. They will generate their own testing criteria based on their Design Requirements and Constraints and make a testing plan. Student groups will present their prototypes to the class.

Learning Objectives

After this class, students will be able to:

- Describe the types of testing that engineers might perform on prototypes.
- Describe the types of standards to which products must adhere.
- Describe why quality assurance testing would be done on a prototype.

Materials

Continue to make the following available for students to prototype their design.

- Playdoh
- Pipe cleaners
- File folders
- Tape
- Markers
- Cardboard
- Card stock
- String
- Scissors
- Straws
- Popsicle sticks

Time

80 minutes

Procedure/Pacing

Testing

1. Review with students that testing takes on different characteristics during different phases of prototyping. Early prototypes will be tested

to see if they will work as designed, if they are user friendly, and if they have the necessary features. Later, more refined prototypes will be tested to see if they meet mandatory safety standards and voluntary standards. Prototypes (and final products) will be tested for quality, to make sure they will withstand both expected and unlikely use. This type of testing is called quality assurance testing.

2. Discuss with students that there are standards that may be set by governmental regulating agencies or independent safety and standards organizations that will likely affect any design. Standards may be required by law or may be voluntary. Often voluntary standards are usually those agreed upon by an industry so that all designs will work with one another. For example, the standardization of screw thread sizes. Ask students to describe what it might be like if screws did not have a standard thread size.
3. Ask students to consider what kinds of quality assurance tests a product might go through. You may use the videos in the resources section to spur discussions.
4. In their groups, look back at their Design Requirements. Have students discuss how they will need to test their prototype to make sure the requirements have been met. Also, have students discuss the usual use of their and other conditions heir design might experience. Students should report how they might test their design to make sure it will withstand satisfactorily. (Assignment 1.10i)
5. Help students understand that based on testing results, engineers may redesign all or part of their prototype. The cycle of the Engineering Design Process may be repeated many times before a final solution is reached.
6. Allow students to finish prototyping their designs.

In-Class Assignment

Assignment 1.10i: Testing Plan

Resources

Standards:

Consumer Product Safety Commission http://www.cpsc.gov/en/Regulations-Laws--Standards/

Underwriters' Laboratory (UL) http://ul.com/aboutul/

American National Standards Institute http://www.ansi.org/

Quality Assurance Testing Videos:

A380 Airbus toilet testing facility

https://www.youtube.com/watch?v=0Oxtc4o0Q1I

Redwing Shoe testing https://www.youtube.com/watch?v=Urt1PYjkf84
Packing Container Testing
https://www.youtube.com/watch?v=WxKwF06U3Rw

Homework

None for today