

1.3 Engineering Jobs

Summary

Students learn the difference between Engineering, Science, and Engineering Technology. They experience different types of jobs that exist within many of the engineering disciplines.

Learning Objectives

After this class, students will be able to:

- Identify the differences between engineers, scientists, and engineering technologists.
- List and describe types of engineering jobs that exist within many engineering disciplines.

Materials

- Several constructed designs of paper airplanes.
- Several constructed Gyro-Planes of varying sizes.
- Paper
- Drinking straws
- Scissors
- Tape
- Tape measure

Time

80 minutes

Procedure/Pacing

Engineers vs. Scientists vs. Engineering Technologists

1. Discuss the difference between the three emphasizing that scientists study the world as it is, engineers use math and science to solve practical problems and create what has not been before, and engineering technologists primarily use and extend existing technology and emphasize the application of engineering techniques.
2. You may want to use the following definitions that will be easier for students to understand and remember:
 - Scientist: Uses math and science to explore the world as it works.
 - Engineer: Uses math and science to create things that change the world.

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- **Engineering Technologist:** Uses tools created by engineers to solve specific problems.
3. Have students as a class or in small groups come up with their own descriptions of what a scientist, engineer, and engineering technologist might do. Some examples are:
- **Scientist:** studies the human brain to understand the processes associated with learning, memory, etc. **Engineer:** studies the human brain in order to design an interface between the brain and an artificial eye to allow a blind person to see. **Engineering Technologist:** determines the best sensors, and signal processors to assemble the artificial eye.
 - **Scientist:** studies the movement of tectonic plates to understand how to predict earthquakes. **Engineer:** studies the movement of tectonic plates to design buildings that can safely withstand earthquakes. **Engineering Technologist:** identifies the materials and construction methods that can be used to build safer buildings.

Engineering Jobs

Set up stations for the engineering jobs below. Help students understand that these jobs are common to many of the engineering disciplines. Students will investigate some of the types of jobs available to engineers using the Gyro-Plane model (see Resources). Student groups rotate between stations. At each station students will:

- Read the station narrative.
- Write the Job Title and its definition.
- Do the activity representing the job.
- Answer the questions at the station.

Research Engineer:

Narrative: You work as a research engineer for a toy manufacturing company. Your company would like you to investigate characteristics of paper airplane flight. As a research engineer, you need to try several different paper airplane designs and record how they fly.

Definition: Studies and characterizes possibilities. Much like a scientist, a research engineer does basic research not necessarily connected to a specific project.

Station Set-up and Activity: Have a few different designs of paper airplanes, including the Gyro-Plane folded and ready to fly. Number each design, so students can refer to them easily. Have a tape measure available for distance measurement. Students throw each type of airplane to see the flight characteristics of each.

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Question: What are the flight characteristics of each airplane design? (List the design number, how far it flew, and describe the flight.)

Design/Development Engineer:

Narrative: You work as a design/development engineer for a toy manufacturing company. Based on paper airplane research, your company has decided to start manufacturing Gyro-Planes. As a design/development engineer, you need to determine which of the design configurations will work best and make drawings that will be used to manufacture the final product.

Definition: Uses results of science and research to determine the best solution to a specific (marketing) need. Creates documentation to fully define the final product.

Station Set-up and Activity: Have a few Gyro-Planes with varying sizes of front and back circles, and lengths of straws constructed. Students experiment with different construction configurations to determine the best.

Question: Which design configuration of the Gyro-Plane flies best? Draw the best design configuration so that it can be manufactured. This drawing should include drawings of all of the parts and their measurements, as well as a drawing of the assembled Gyro-Plane with measurements of how it is put together.

Test Engineer:

Narrative: You work as a test engineer for a toy manufacturing company. Your company would like to know if the Gyro-Planes they are manufacturing will withstand the treatment they will receive during play. As a test engineer, you need to determine if the Gyro-Plane design will perform as specified.

Definition: Verifies through tests and statistics whether a prototype or product meets the design's quality objectives.

Station Set-up and Activity: Have a Gyro-Plane constructed for each student group to test. Students should perform tests that will simulate the conditions the Gyro-Plane will experience during the product lifetime.

Question: What types of conditions might it experience when being used? Will it still fly if it crashes into the wall, the floor, if it is stepped on? How long can the Gyro-Plane be expected to last? (If you can't do a test to answer this question today, how might you test the plane to find the answer?)

Manufacturing Engineer:

Narrative: You work as a manufacturing engineer for a toy manufacturing company. Your company would like to make Gyro-Planes for as low a cost as possible. As a manufacturing engineer, you need to determine how the parts of the Gyro-Plane should be cut out of an 8 ½ x 11 sheet of paper to minimize paper waste and cutting time.

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Definition: Determines the best way to produce a product in order to meet design, cost and quality objectives.

Station Set-up and Activity: Have sheets of 8 ½ x 11 paper, pencils, erasers, and rulers available. The manufacturing drawing (see Resources) should be also available at the table. Students should use the manufacturing drawing and measurements to determine the best layout for parts to be cut out of a sheet of paper in order to minimize paper waste and minimize cutting time.

Question: How should the paper strips be arranged out on the 8 ½ x 11 sheet in order to be able to cut as many parts as possible and minimize the scrap paper wasted? Determine the layout of parts and draw it on sheet of paper.

In-Class Assignment

Assignment 1.3i: Engineering Jobs

Resources

<http://www.instructables.com/id/How-to-Make-a-Gyro-Plane/>

Homework

Assignment 1.4h: Engineering Notebook, Description, and Sketch

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