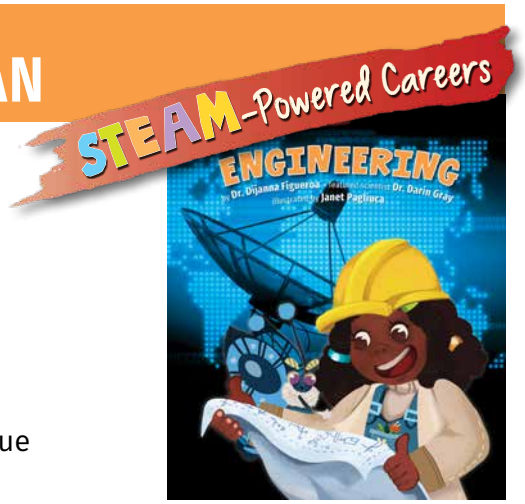
ENGINEERING LESSON PLAN



Author: **Dr. Dijanna Figueroa**
Scientist: **Dr. Darin Gray**

Subject / Grade Level: Earth Science / Lower elementary

Materials:

- paper
- colored pencils
- 15 balloons
- 2 party helium tanks
- nylon kite string
- an old CD
- action camera, such as an Akaso EK7000 Pro camera
- cardboard
- film canister
- duct tape, masking tape, hot glue
- Google Earth images of school and surrounding areas
- computer
- internet connection
- projector (optional)

NGSS Essential Standards and Clarifying Objectives:

- **K-2-ETS1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- **K-2-ETS1-3:** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Crosscutting Concepts:

- Interdependence of the science, engineering, and technology worlds
- Influence of engineering, technology, and science on society and natural science and engineering practices
- **ETS1.B:** Developing possible solutions

Lesson Objectives:

- Students will use the engineering design process to design and build a model satellite.
- Students will learn about remote sensing and satellites using Google Earth.
- Students will make observations about how land is used at their school and in surrounding neighborhoods.

Differentiation Strategies to Meet Diverse Learner Needs:

- Think-pair-share, for students who learn best when engaging with classmates
- Multisensory learning, to accommodate auditory and visual learners, and encourage students' use of their senses as they learn

ENGAGEMENT

Option 1 (computer option)

- Students can explore a Google Earth tour that zooms in on their school.
- The teacher will go to earth.google.com and type in the school address. They can use the + and - buttons on the bottom right of the page to zoom in and zoom out from the school.
- The teacher asks students the following questions:
  - Where are we on planet Earth?
  - What do you notice in the images?

Room to Read

- What is the land being used for within and around our school?
- What colors do you notice?
- Do you see any patterns?
- Where do these images come from?
- Response examples:
  - Students may see houses, buildings, cars, parks, and freeways. They may notice that different surfaces have different colors. They may wonder how we get pictures like this.

Option 2 (no computer option)

- Human satellite: Kids can have a "satellite" perspective on the insect world. Have your students "map" out a small patch of grass or dirt in the schoolyard as if they were a butterfly looking down on the land below.
- The teacher asks students the following questions:
  - What do you notice?
  - Do you see any patterns?
  - What do you wonder about?
  - What would it be like to look down on the earth from the sky?
  - Response examples:
    - Students may see grass, insects, different-colored grasses, leaves, etc.

EXPLORATION

- Students will use the **engineering design process** to design and build a DIY model satellite. The engineering design process can be simplified to IMAGINE, BUILD, TEST for this activity.
  - Show students the materials (nylon kite string, action camera, old CD, cardboard, balloons, party helium tanks) that you have in the classroom to build the model satellite (these are the constraints).
  - Students imagine what the model satellite will look like.
  - Students draw a blueprint and label the materials used.
  - Students share the blueprint with a partner or the class.
  - The teacher selects a combination of different designs and the class works together to build a model satellite.
    - Secure the camera to the platform.
    - Secure the platform evenly to the balloons.
    - Check for stability (avoid wobbles).
  - Students draw the final design.
  - The teacher measures the nylon string so they know how high the model satellite will go. Students can assist with the measurement.
  - The class sends the model satellite up (be sure to secure string to the ground for easy recovery).
  - The teacher recovers the model satellite.
  - The teacher downloads and views the images from the computer.
  - The teacher asks students the following questions:
    - What do you notice about the different surface types you observe?
    - What types of activities do you imagine are happening in different areas that you observe?
    - What did you learn?

EXPLANATION

- Students share maps. Students should explain their key and what function the identified surfaces may have.
- As students share, the teacher can ask the following questions:
  - What surface type takes up the most space on your map?
  - What is the function of the different surface types?
  - What surface type takes up the least amount of space on your map?
  - What impact do these surface types have on the environment?
  - What surface type gets hot faster?
  - What surface type collects water?
  - What surface type do you use most often?
- Teacher explanations:
  - We have just explored land use. **Land use** is the term used to describe the human use of land. It represents the economic and cultural activities (such as agricultural, residential, industrial, mining, and recreational uses) that are happening at a given place.
  - The images of the land we use come from satellites. A **satellite** is a human-made machine that has been sent into space in order to send, receive, or collect information. We used images that were collected from a model satellite to see our school from a bird's-eye view and explore the different surface types around our school.
  - What information did you learn about land use at and around our school by observing the images we collected?

ELABORATION

- Students will identify the different types of surfaces at their school (i.e., buildings, playgrounds, gardens, lawns, parking lots).
- Students will make a key for the surface types. Each surface type they identify will be a different color.
- Students will make a bird's-eye/butterfly's-eye view map of their school and use colored pencils and their keys to identify the different types of surfaces they observed.

EVALUATION

- Have a class discussion about how students used the engineering design process (IMAGINE, BUILD, TEST) to build the model satellite.