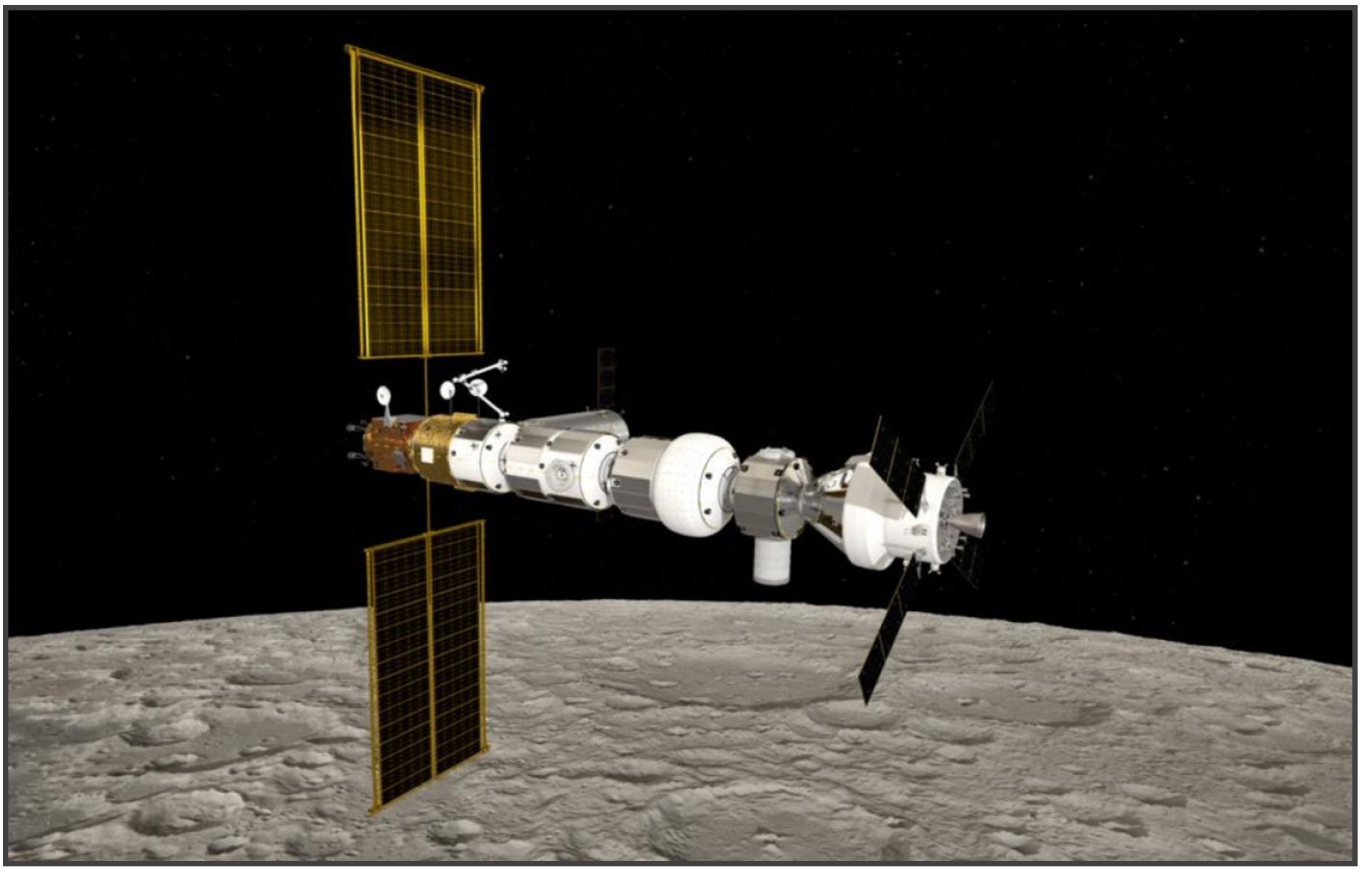
Spacegate Station Season 3

Episode 15



Matching the Method

Resource Content

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- **Activity**
- **Next Generation Sunshine State Standards (Florida)**
- **Next Generation Science Standards**

Spacegate Station Episode 15

Matching the Method

Word Bank

aerospace	airports	biomedical	bridges	buildings
chemical	civil	dams	engineer	engineering design
environments	mechanical	nature works	production	products
roads	scientific method		tunnels	websites

Guided Notes

Overview

An _____ is a profession that involves the application of science and mathematics to solve real world problems and to innovate new products and processes across a wide range of industries and applications.

There are six major types of engineers, they are:

_____ _____

_____ _____

_____ _____

A Civil Engineer is an individual who specializes in the development, design, building, supervision, operation, construction and maintaining of infrastructure projects and systems. On Earth such programs would include:

_____ _____

_____ _____

_____ _____

and systems for water supply and sewage treatment.

The Methods

Scientists use the _____ to make testable explanations and predictions about the world. A scientist asks a question and develops an experiment, or set of experiments, to answer that question.

Engineers use the _____process to create solutions to problems. An engineer identifies a specific need: Who needs it, what is needed and why do they need it? And then, then they create a solution that meets that need.

While scientists study how_____, engineers create new things, such as _____, _____, _____, and experiences. Because engineers and scientists have different objectives, they follow different processes in their work.

Scientists perform experiments using the scientific method, whereas engineers follow the creativity-based engineering design method.

Engineering Design (no word bank)

The Engineering Design Process consists of seven general steps. These steps will vary depending on the area of Engineering in which they are used, these steps are as follows:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

Matching the Method Activity

Paper Table Challenge

Duration: 45-60 min

Instructions: The task is to hold up a book using only paper and tape!

Material List

- 20 paper sheets
- 1-3 Heavy Books
- 2 meters of masking tape
- Meter stick

Development

- **Phase 1**: Define the engineering problem.
- **Phase 2:** Develop possible solutions.
- **Phase 3:** Optimize the design solution.
- **Phase 4:** Construct the support structure.

Instructions

In this activity you need to design a system to hold a book 15 centimeters above the table using up to 20 sheets of paper and 2 meters of tape.

Before you construct your support system you need to develop possible solutions, which can include research, designing on paper, on a computer. Most designs are not perfect the first time, so you can then optimize the design solution to improve it.

Next Generation Sunshine State Standards (Florida)

SC.1.N.1.4	Ask “how do you know?” in appropriate situations.
SC.2.N.1.2	Compare the observations made by different groups using the same tools.
SC.2.N.1.6	Explain how scientists alone or in groups are always investigating new ways to solve problems.
SC.3.N.1.3	Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.
SC.3.N.1.6	Infer based on observation.
SC.4.N.1.3	Explain that science does not always follow a rigidly defined method (“the scientific method”) but that science does involve the use of observations and empirical evidence.
SC.4.N.1.5	Compare the methods and results of investigations done by other classmates.
SC.5.N.1.1	Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations; experiments requiring the identification of variables; collecting and organizing data; interpreting data in charts, tables, and graphics; analyze information; make predictions; and defend conclusions.
SC.5.N.1.2	Explain the difference between an experiment and other types of scientific investigation.
SC.5.N.1.5	Recognize and explain that authentic scientific investigation frequently does not parallel the steps of “the scientific method.”
SC.5.N.1.3	Recognize and explain the need for repeated experimental trials.
SC.6.N.1.3	Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.
SC.6.N.1.4	Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.
SC.7.N.1.2	Differentiate replication (by others) from repetition (multiple trials).
SC.7.N.1.3	Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.
SC.8.N.1.2	Design and conduct a study using repeated trials and replication.
SC.8.N.1.4	Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.

Next Generation Science Standards (National)

K-2-ETS1-1 Engineering Design

Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2 Engineering Design

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.

3-5-ETS1-1 Engineering Design

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2 Engineering Design

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Engineering Design

Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

MS-ETS1-1 Engineering Design

Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, considering relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2 Engineering Design

Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3 Engineering Design

Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4 Engineering Design

Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.