**Space Stations (Lesson 1 of 4)**

**Introduction to Space Stations and Water Surface Tension**

**STEM Topics -** Performing an experiment, Calculating basic statistics, Surface Tension of Water, Learning about Space Stations

**Author:** Matt Katterman

**Grade Level:** 6-8 Grade

|  |  |
| --- | --- |
|  |  |

**Goals**: Learn about what a space station is and the different types of space stations. Learn the challenge of working with water on the space station.

**Learning Objectives:**

1. SWBAT accurately describe a space station and three of the major ones built or being built.
2. SWBAT execute a simple experiment of counting water droplets placed on objects such as pennies and bottle caps.
3. SWBAT record data, perform simple statistics such as averages with the data, explain significance of their results (comparing data among sets).

**Materials:**

Videos :

1.What is a Space Station? Dr Binocs Show Pekaboo Kidz : - <https://www.youtube.com/watch?v=IagxIpCvMl4> - 6 min 17 s

2.Take a Tour of the Space Station : - <https://www.youtube.com/watch?v=SOCixRhRGDw> - 3 min 14 s

3. STEMonstrations : Surface Tension : -

<https://www.youtube.com/watch?v=34bFgA3H3hQ> - 2 min 43 s

4.Surface Tension Experiment (Instructions) – 12 min

Power points:

Introduction to Space Stations, Surface Tension Experiment

Documents:

Surface Tension Water Droplets Table - Data Table for Experiment

Experimental Materials (for each student):

1 plastic 4 oz cup

1-2 2 mL plastic pipette(s)

Stack of 4 pennies

3 caps from 500 mL plastic bottles

Paper towels or piece of clothing

Small container of water

Demonstration Materials:

One 200 mL jar with cap or lid

1 2 mL plastic pipette

1 plastic 4 oz cup

Bottle of food coloring (Red)

Small container of water

**Vocabulary:**

**Space Station:** 1) A large artificial satellite used as a long term base for manned operations in space., 2) An artificial structure placed in orbit and having the pressurized enclosure, power, supplies and environmental systemsnecessary to support human habitation for extended periods.

**Astrobiology:** Concerned with the origins, early evolution, distribution and the future of life in the Universe.

**Dark Matter**:  Nonluminous material that is postulated to exist in space and that could take any of several forms. A form of matter thought to account for approximately 85% of the matter in the universe.

**Extremophile:** a microorganism that lives in conditions of extreme temperature, acidity, alkalinity, or chemical concentration.

**Setup:**

Start with introduction to space stations lesson and then go into the experiment. You should view the video recording of the power point lesson – **Introduction to Space Stations** before teaching the lesson to give you some ideas. To introduce the experiment, do the **oil and red colored water demonstration** first. This introduces a discussion as to how water behaves in space with microgravity environments. It is a great way to show the connection between spheres of water in space and the topic of surface tension.

Have your own materials ready to demonstrate or go through the experiment along with the students. You can show the video recording that shows the experiment and gives instructions. It is called the **Surface Tension Experiment** (12 minutes). You don’t have to show the whole video. Just show certain segments if you wish or are rushed for time.

**Lesson Plan Procedure:**

1.Introduce space stations by showing **What is a space station?** Video. [7 minutes]

2.Give power point presentation **Introduction to Space Stations**. Watch the video Space Stations Lecture to get an idea of what content you would like to share with them while presenting. Show **Tour of a space station** video afterwards. [20 minutes]

3.Do **oil and red colored water demonstration** with glass bottle containing oil and red water from food coloring. [5 minutes]

a. Make your own red colored water by adding a drop or two of red food coloring into some water put into the 4oz cup.

b. Add about 10 – 15 drops of red food coloring water into the bottle of oil. Show students the red water droplets traveling down into the oil. Turn upside down a few times to show red water traveling in the oil.

c. Ask them what process on the space station this would be if the oil was the air. What in the space station would behave like the red water spheres in the oil.

4.Give power point presentation **Surface Tension Experiment** to introduce experiment. Emphasize examples of water beads on glass and meniscus in cylinders. Touch on how water tension allows water to behave the way it does for astronauts to wash their face and brush their teeth. Go over what the students are expected to do procedure wise with the pennies and bottle caps shown in the pictures. [7 minutes]

5.Show **STEMonstrations – Surface Tension** video for more background material about experiment. [3 minutes]

6. Show some of **Surface Tension Experiment** video recording to help give them some instructions on what to do for the experiment. You may want to skip some of the parts such as counting the number of drops especially towards the end so it may be a surprise for them to arrive at the right number of the drops when they do the experiment themselves. You can show how the data table works or do it yourself [10 minutes]

7. Have students execute experiment on their own. Perform experiment yourself alongside them to give them more guidance. Emphasize they need to do each set of materials 3 times and record the values on their data table (so count the number of drops 3 times for pennies and bottle caps). Show them how to calculate an average with each of the three numbers. [25 minutes]

8. Give a few students the opportunity to share their results. Double check their average calculations as well. [10 minutes]