STEM Lessons with ILITE

Week 2

K-4

ILITE's Mission

To inspire young people to become leaders in science, technology, engineering, and mathematics by providing them with hands-on engineering challenges with the mentorship of industry professionals, to build a foundation of both technical and business skills, to create leaders in technology and engineering.

Week 2 STEM Activity: Earth Science

Welcome meteorologists and geologists! Today we are going to do experiments to study the Earth and weather

Mission details:

- Cloud in a Jar
- Layers of the Earth
- Rainbow in a Glass
- Weather Fronts

Cloud in a Jar

Objective 1: Cloud in a Jar

- **Materials for Cloud in a Jar**
  - Jar with lid
  - ⅓ cup hot water
  - Ice
  - Hairspray

Objective 1: Cloud in a Jar

Procedure for Cloud in a Jar

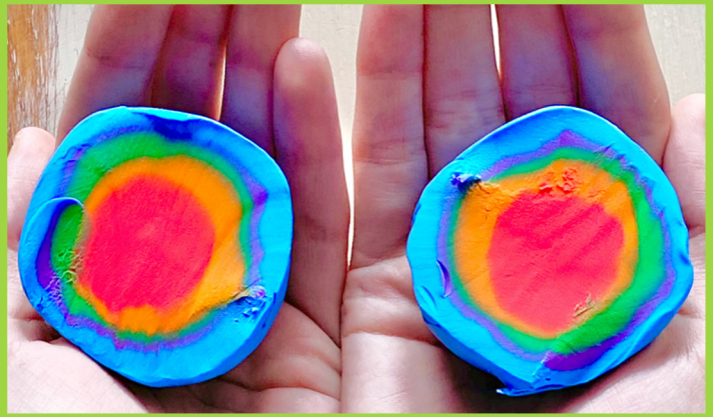
1. Start by pouring the hot water into the jar. Swirl it around a bit to warm up the sides of the jar.
2. Turn the lid upside down and place it on the top of the jar. Place several ice cubes onto the lid, and allow it to rest on the top of the jar for about 20 seconds.
3. Remove the lid, quickly spray a bit of hairspray into the jar, and then replace the lid with the ice still on top. Watch the cloud form.
4. When you see a good amount of condensation form, remove the lid and watch the “cloud” escape into the air.

How does it work?

Explanation for Cloud in a Jar

1. When you add the warm water to the jar, some of it turns to water vapor. The water vapor rises to the top of the jar where it comes into contact with cold air, thanks to the ice cubes on top. Water vapor condenses when it cools down. However, a cloud can only form if the water vapor has something to condense on to. In nature, water vapor may condense onto dust particles, air pollution, pollen, volcanic ash, etc. In the case of this activity, the water vapor condensed onto the hairspray.

Layers of The Earth



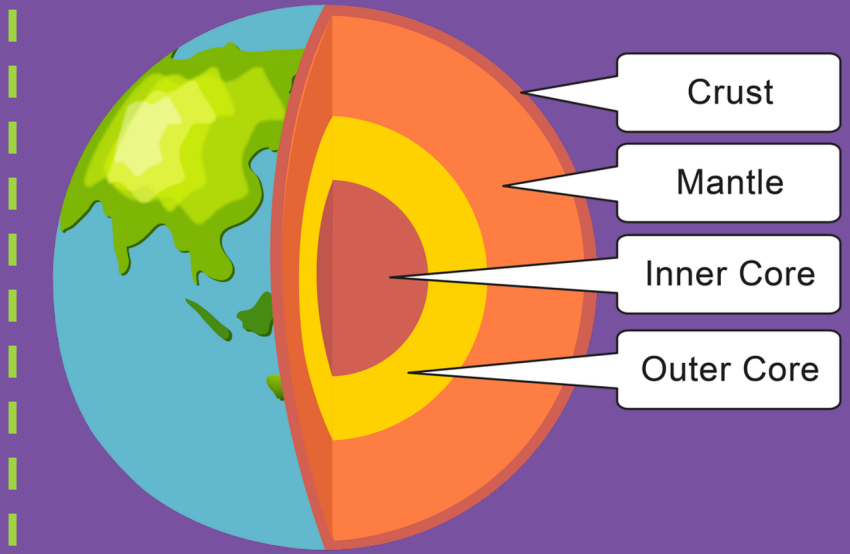
Objective 2: Layers of the Earth

- **Materials for Layers of the Earth**
  - 5 different colors of modeling clay
  - Waxed dental floss

Objective 2: Layers of the Earth

Procedure for Layers of the Earth

1. Form a ball to represent the inner core. We chose red to represent the intense heat of the **inner core**.
2. Next, roll out a circle of another colour and wrap around the ball and roll gently. This next layer represents the **outer core**.
3. Each subsequent colour will need more modelling clay than the last. You will need a colour to represent the **lower mantle**, another for the **upper mantle**, and the outer layer for the **crust**.
4. Once your ball of 5 layers of modelling clay is complete, use a piece of waxed dental floss to cut the ball down the middle, revealing all the layers underneath.



Layers of the Earth

You can think of the Earth as being made up of a number of layers, sort of like an onion. These layers get more and more dense the closer to the center of the earth you get. See the picture below to see the four main layers of the earth: the crust, mantle, outer core, and inner core.

Rainbow in a Jar

Objective 3: Rainbow in a Jar

Materials for Rainbow in a Jar

1. 1 jar
2. 1/2 cup blue dishwashing liquid
3. 1/2 cup olive oil
4. 1/2 cup rubbing alcohol
5. 1/2 cup light corn syrup
6. Food coloring
7. 5 spoons
8. 5 bowls for mixing

Objective 3: Rainbow in a Jar

Procedure for Rainbow in a Jar

1. Make your purple layer by mixing 1/2 cup of the light corn syrup with 1 drop of blue and 1 drop of red food coloring.
2. Carefully pour it into the bottom of your jar.
3. Carefully pour the blue dish soap down the side of the jar.
4. Mix 1/2 cup of water with 2 drops of green food coloring.
5. Carefully pour in your green water down the side of the jar.
6. Gently pour 1/2 cup olive oil down the side of your jar.
7. Mix 1/2 cup of rubbing alcohol with 2 drops of red food coloring.
8. Carefully pour the red rubbing alcohol down the inside of your jar.
9. Being careful not to disturb your liquids, set your jar down on the table and enjoy your rainbow!

How does it work?

Explanation for Rainbow in a Jar

So what keeps all these layers all separated from each other? It's how dense, or heavy, each liquid is. The corn syrup is heaviest, and sits nicely on the bottom. The dishwashing soap is not quite as heavy as the corn syrup, but it's heavier than the olive oil, and so on.

Weather Fronts

Objective 4: Weather Fronts

Materials for Weather Fronts

1. 2 cups or glasses
2. A clear container (plastic or glass)
3. A piece of cardboard
4. Red food coloring
5. Blue food coloring
6. Water
7. Ice
8. A spoon or stirrer for mixing

Objective 4: Weather Fronts

Procedure for Weather Fronts

1. Fill one of the glasses with hot water, or microwave a glass of room temperature water for 2-2 1/2 minutes.
2. Fill the other glass with cold water, or add ice cubes to room temperature water and allow to dissolve.
3. Add 3-4 drops of red food coloring to the hot water and 3-4 drops of blue food coloring to the cold water.
4. Cut the piece of cardboard so that it will fit snugly in the center of the container. Place it in the middle of the container, standing up, so that it acts as a partition.
5. Pour the hot water on one side of the cardboard and the cold water on the other side. The cardboard should keep them mostly separated.
6. Quickly remove the cardboard piece and see that the two liquids separate, with the blue one moving to the bottom and the red one moving to the top.

How does it work?

Explanation for Weather Fronts

This happens because the density of water changes with it's temperature. The cold water moves underneath the warm water because it is denser than the warm water.
This process can also show how a cold front develops - or what happens when a cold mass of air approaches a warm mass of air in nature.
The denser cold air cuts a "wedge" under the less dense, warmer air. This lifts the warmer air mass and allows the cold air mass to overtake the warm one. If a cold front is strong, it can often result in events such as thunderstorms and tornadoes.

Great Job Meteorologists and Geologists!

Congratulations on a successful mission! Check back weekly for more fun STEM lessons and activities with ILITE robotics!