Fall 2021

STEM Club

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Lesson Plan Week 1

Subject: STEM, Science

Title: Toppling Towers (1 hour 15 minutes)

Objective: To help students understand what makes buildings stand and determine the best way to create a stable structure

Materials: Pipe cleaners, straws, marshmallows, and toothpicks.

Activity: Students will be given the materials and be given the choice of which ones to use. They may make two towers if they want to. The objective is to let them explore what creates a stable structure and let them see how high they can get their tower with help and encouragement on the way.

Vocab Words:

Gravity – The tendency for things to fall to the ground given their weight·

Support – The internal parts of a structure that makes it less likely to fall

Stability – An objects ability to stay static

Pre-Activity Questions:

- Ask students about their knowledge on buildings (Example: present pictures of the skyscraper in Dubai, The Leaning Tower of Pisa, and the Eiffel Tower)
- Ask what keeps towers standing since they're so big.
- Prompt the vocab words then explain them.

Activity Plan:

- Have students come and talk to them with snacks (10 minutes)
- Head to the classroom and divide students into groups (5 minutes)
- Introduce the topic (5 minutes)
- Ask pre-activity questions relating to the topic (10 minutes)
- Explain activity (5 minutes)
- Pass out materials (5 minutes)

- Give students a chance to build their own structures using given materials (20 minutes)
- Debrief (5 minutes):

  -ask students what they struggled with during the process, what they learned, relate back to pre-activity questions

- Clean up areas and get lined up and ready to leave (5 minutes)

Alterations - Some difficulty getting students to really focus and understand how to make their own towers. Suggest making an example tower to give them an idea of how they could make their own towers work.

Lesson Plan Week 2

Subject: STEM, Science

Title: Density intensity (1 hour 15 minutes)

Objective: Help students understand how different substances will interact with each other. To observe and identify what objects and liquids are denser than the others.

Materials: Clear cups, Water, canola oil, isopropyl alcohol, wax candle, paperclips, marshmallows.

Activity: Each group of students will be given a clear cup. The cup will be filled with water, then oil, and then alcohol. They will observe where each of the liquids reside. Once they observe this they will add in their solids one by one predicting where they will end up in the cup.

Vocab Words:

Density: Describes how much an object will weigh given the volume.
Mass: how much of something there is.
Volume: how much space that a given object has.

Pre-Activity Questions:

- What makes something sink in water?
- Prompt vocab words and explain.

Activity Plan:

- Have students come and talk to them with snacks (10 minutes)
- Head to the classroom and divide students into groups (5 minutes)
- Introduce the topic (5 minutes)
- Ask pre-activity questions relating to the topic (10 minutes)
- Explain activity (5 minutes)
- Pass out a cup to each student (5 minutes)
- Have students pour water in the cup, followed by canola oil, and then iso purple alcohol.
- Have students drop-in paper clip. Where did the paperclip end up?

- Have students drop in marshmallows and candles, repeating the same process.
- Debrief (5 minutes):

  -ask students why the objects ended up where they did? Relate this back to the density of the objects.

  Clean up areas and get lined up and ready to leave (5 minutes)

Alterations - The dead time between each step is hard to deal with if you have a rowdy bunch of students. Maybe something to fill the time in between may be of help.

Lesson Plan Week 3

Subject: STEM, Science

Title: Super Solar Systems (1 hour 15 minutes)

Objective: Help students gain an understanding of where different planets are in the solar system and what they look like.

Materials: Markers, Crayons, Construction Paper, Glue, Big Pieces of Paper.

Activity: The activity will be students creating their own solar system.They will be given the order of the planets and examples of the planets and they will be given the task to recreate the planets however they see fit using materials given.

Vocab Words:

Rotation: an object spinning around its own axis.
Revolution: an object spinning around something else.
Names of planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, maybe Pluto

Pre-Activity Questions:

- Prompt vocab words and explain.

Activity Plan:

- Have students come and talk to them with snacks (10 minutes)
- Head to the classroom and divide students into groups (5 minutes)
- Introduce the topic (5 minutes)
- Ask pre-activity questions relating to the topic (10 minutes)
- Explain activity (5 minutes)
- Pass out construction paper, markers, and glue to students.
- Have them recarat the solar system by cutting out planets or drawing on the paper.
- Clean up areas and get lined up and ready to leave (5 minutes)

Alterations - N/A.

Lesson Plan Week 4

Subject: STEM, Science

Title: Rolling Ramps (1 hour 15 minutes)

Objective: Help students learn how different slopes and weights of cars will determine how far they will go.

Materials: Tracks, toy cars, and weights. (were provided by the school)

Activity: Students will be given ramps and will be given time to explore how to make their cars go the farthest. They will be able to change the slopes of their tracks and will be able to change the weights of their cars to identify what will make them roll the farthest.

Vocab Words:

Slope: How steep something is.
Velocity: The speed and direction of an object.
Friction: The force applied that is in the opposite direction of the movement of the object.

Pre-Activity Questions:

- What causes things to speed up or slow down?
- Prompt the vocab words

Activity Plan:

- Have students come and talk to them with snacks (10 minutes)
- Head to the classroom and divide students into groups (5 minutes)
- Introduce the topic (5 minutes)
- Ask pre-activity questions relating to the topic (10 minutes)
- Explain activity (5 minutes)
- Divide everyone into two groups, each with ramps and a car.
- Have students, as a tea, create a ramp and then see how far their car can travel past the ramp.

- Conduct competition between groups to see whose team can get their car the farthest.
- Debrief (5 minutes):

  -ask students what they learned from making the ramps. How did angles or ramp design affect how far the car went?

  Clean up areas and get lined up and ready to leave (5 minutes)

Alterations - Students were really excited to get their hands on the cars and really start rolling them. Make sure to set boundaries of what you can and cannot do with the cars because we did have cars being thrown off tables.

Lesson Plan Week 5

Subject: STEM, Science

Title: Oobleck (1 hour 15 minutes)

Objective: Understand the different states of matter.

Materials: Bowls, corn starch, water. (things to keep areas clean)

Activity: Students will be given a bowl and will have corn starch put into it. And then finally be given some water. The combination will be 2 parts corn starch to 1 part water. Students will be able to interact with the non-newtonian liquid being able to identify when it's solid and when it's liquid

Vocab Words:

- **Solid:** A state of matter where atoms are rigid and will not conform to different shapes
- **Liquid:** A state of matter where atoms are more fluid and will easily conform to different shapes
- **Gas:** A state of matter where atoms are more excited and volatile and will evenly distribute to take up space.
- **Plasma:** A state of matter where atoms are so excited that they start to break a part and give on energy and light.
- **Non-Newtonian Liquid:** A substance that changes it's state of matter depending on the pressure applied to the substance.
- **Atom:** Smallest particles that make up everything in the universe.

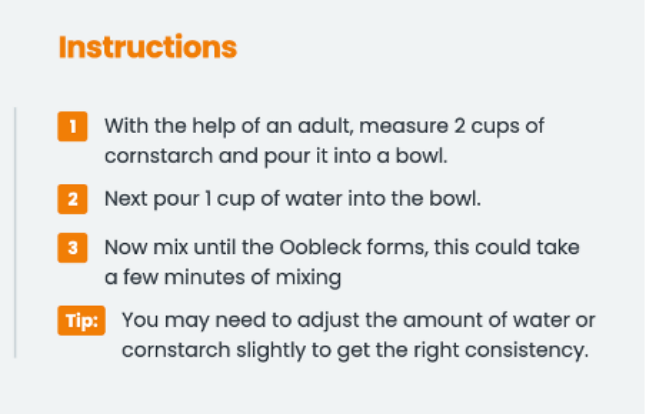
Pre-Activity Questions:

- What is matter?
- What are the states of matter? What are some examples of each state?
- What's an atom?

Activity Plan:

- Have students come and talk to them with snacks (10 minutes)

- Head to the classroom and divide students into groups (5 minutes)
- Introduce the topic (5 minutes)
- Ask pre-activity questions relating to the topic (10 minutes)
- Explain activity (5 minutes)
- Pass out materials (5 minutes)
- Walk students through making Oobleck:



- Debrief (5 minutes):

  -ask students what happened when they interacted with the oobleck in different ways. Why was it solid when you applied pressure but became liquid-y without pressure?

- Clean up areas and get lined up and ready to leave (5 minutes)

Alterations - Students really enjoy playing with the oobleck but it is something that is very messy. Be sure to bring equipment to keep the floor clean.

Lesson Plan Week 6

Subject: STEM, Science

Title: Erupting Volcanos (1 hour 15 minutes)

Objective: Give students an opportunity to witness a reaction. A mix of learning about volcanoes while doing a reaction.

Materials: Small water bottles, printer paper, markers, baking soda, vinegar, big tins

Activity: Students will be given a piece of paper to make into a cone, with the base wide enough for the bottle. Once they have that they can decorate it as a volcano. Next, students will have baking soda placed in their small water bottles. Finally, the volcanos will be put into the big tin containers and will have vinegar poured inside of them. Students will see the reaction and watch their volcanoes erupt.

Vocab Words:

Reaction: When new bonds are created in atoms so energy is released

Magma: molten rock underneath the crust of the earth

Lava: molten rock above the surface of the earth.

Pre-Activity Questions:

- Ask students what they know about volcanoes.
- Ask if they know what a reaction is.
- Prompt the vocab words then explain them.

Activity Plan:

- Have students come and talk to them with snacks (10 minutes)
- Head to the classroom and divide students into groups (5 minutes)
- Introduce the topic (5 minutes)
- Ask pre-activity questions relating to the topic (10 minutes)
- Explain activity (5 minutes)
- Pass out materials (5 minutes)
- Make paper into a cone (5 minutes)

- Decorate cones (5-10 minutes)
- Have students assemble their volcanoes and put baking soda into a water bottle. (5-10 minutes)
- Put volcanos into the big tin containers and have vinegar poured inside of them. Repeat for each student's volcano (5-10 minutes)
- Debrief (5 minutes):

  -ask students what they observed when teh vinegar was poured in and why.

- Clean up areas and get lined up and ready to leave (5 minutes)

Alterations - Activity worked out well. There is a lot to do so manage time well and keep the students moving.

Lesson Plan Week 7

Subject: STEM, Science

Title:Ghastly Ghosts (1 hour 15 minutes)

Objective: To have students gain an understanding of what makes an object fall slowly. They will get creative and make ghosts and see what makes them float in the air.

Materials: markers, balloons, tissue paper, tape

Activity: Students will decorate tissue paper with faces of a ghost. Once they have done that the students will tape it onto the medium size balloon. The students will then be able to bounce the balloons to observe how the balloon will fall

Vocab Words:

Surface area- the area that makes up the outside of an object.

Terminal velocity- the fastest an object can fall in the air

Air resistance- the force applied by the air to slow something from falling

Pre-Activity Questions:

- Ask students why balloons fall slow.
- Prompt the vocab words then explain them.

Activity Plan:

- Have students come and talk to them with snacks (10 minutes)
- Head to the classroom and divide students into groups (5 minutes)
- Introduce the topic (5 minutes)
- Ask pre-activity questions relating to the topic (10 minutes)
- Explain activity (5 minutes)
- Pass out materials (5 minutes)
- Have students blow up balloon
- Let students decorate balloons with tissue paper, markers, etc.
- Allow students to release balloons and observe how they float.

- Debrief (5 minutes):

-ask students what they struggled with during the process, what they learned, relate back to pre-activity questions. Ask what made the balloons float.

- Clean up areas and get lined up and ready to leave (5 minutes)

Alterations - Lacked a lot of substance to keep kids occupied for the whole hour. Not too much interest in decorating and balloons were too big.

Lesson Plan Week 8

Subject: STEM, Science

Title: Cool Catapults (1 hour 15 minutes)

Objective: to help students understand how energy is transferred through objects and turns into kinetic energy.

Materials: popsicle sticks, fuzzy balls or cotton balls, rubber bands, plastic spoons.

Activity: Students will create a catapult by attaching a spoon to some popsicle sticks where a stack of popsicle sticks will be used as leverage to bend the spoon back and launch a fuzzy ball

Vocab Words:

- **Elasticity: an object's ability to bend and return back to its original form**
- **Kinetic energy: the energy a moving object has.**
- **Potential energy: the energy that an object has when put in a high position because of gravity or in our case the spoon being pulled back**

Pre-Activity Questions:

- Ask students what gives something energy
- Prompt the vocab words then explain them.

Activity Plan:

- Have students come and talk to them with snacks (10 minutes)
- Head to the classroom and divide students into groups (5 minutes)
- Introduce the topic (5 minutes)
- Ask pre-activity questions relating to the topic (10 minutes)
- Explain activity (5 minutes)

- Pass out materials (5 minutes)
- Walk students through making catapults like the picture above.
- Have students put a fuzzy ball in a spoon and then have them launch the catapult by bending the spoon back.
- Have students observe the trajectory and motion of the fuzzy ball.
- Debrief (5 minutes):

-ask students what they struggled with during the process, what they learned, relate back to pre-activity questions. Ask what type of energy they observed and what made ball fly.

- Clean up areas and get lined up and ready to leave (5 minutes)

Alterations - N/A

Lesson Plan Week 9

Subject: STEM, Science

Title: Buoyant Boat (1 hour 15 minutes)

Objective: to help students gain an understanding of what keeps things afloat and staying above water.

Materials: tin foil, containers of water, pennies or paper clips

Activity: students will be given tin foil to fold into a boat to try to keep afloat above water. They will then be challenged to see how much their boat can hold before sinking.

Vocab Words:

- **Buoyancy- the pressure exerted by the displacement of water**

Pre-Activity Questions:

- Ask students what makes boats float.
- Prompt the vocab words then explain them.

Activity Plan:

- Have students come and talk to them with snacks (10 minutes)
- Head to the classroom and divide students into groups (5 minutes)
- Introduce the topic (5 minutes)
- Ask pre-activity questions relating to the topic (10 minutes)
- Explain activity (5 minutes)
- Pass out materials (5 minutes)
- Give each group a tub of water.
- Have students create their own boat out of tin foil.
- Have students place pennies or paper clips in the boat until they sink.
- Have students observe how long it took to sink and consider why.
- Debrief (5 minutes):

-ask students what they struggled with during the process, what they learned, relate back to pre-activity questions. Ask what made the boats sink.

Clean up areas and get lined up and ready to leave (5 minutes)

Alterations - N/A

Lesson Plan Week 10

Subject: STEM, Science

Title: Crazy Crystals (1 hour 15 minutes)

Objective: Let students observe the crystallization of the borax solution onto a pipe cleaner to make a holiday ornament.

Materials: Plastic cups, plastic lids, straws, sting, borax, water.

Activity: Students will be given pipe cleaners to create a snowflake ornament or whatever shape they would like. Once they have their own snowflake they can create their borax solution which will be concentrated into a solution. They will set their snowflakes into the cups attached to a string that is attached to a straw set outside of the lid to take home.

Vocab Words:

- **Crystallization:** The formation of solids out of an aqueous solution
- **Aqueous Solution:** A solution that contains water and a solid that is dissolved into the water but not reacted.

Pre-Activity Questions:

- Ask students about their knowledge on crystallization.
- Prompt the vocab words then explain them.

Activity Plan:

- Have students come and talk to them with snacks (10 minutes)
- Head to the classroom and divide students into groups (5 minutes)
- Introduce the topic (5 minutes)
- Ask pre-activity questions relating to the topic (10 minutes)
- Explain activity (5 minutes)
- Pass out materials (5 minutes)
- Have students shape pipe cleaner into snowflake shape or whatever shape they please.

- Once they have their own snowflake they can create their borax solution by mixing three tablespoons of Borax for every cup of water.
- They will set their snowflakes into the cups attached to a string that is attached to a straw set outside of the lid to take home.
- Have the snowflake sit in the cup for at least 24 hours.
- Debrief (5 minutes):

  -ask students what their crystals will look like when they are done forming and how long it will take their crystals to be done forming.

- Clean up areas and get lined up and ready to leave (5 minutes)