Telekinesis or Static?

Illusion - Can we move objects with our minds?

For students in grades K through 6th

'Impossible Science' lessons aim to be 75-90 minutes long for grades 3 through 6, and 60-75 minutes long for grades K through 2. The final 15 minutes for K-2 will be filled with a 'wind down' drawing activity (see "Evaluate" section for details).

Objectives

By the end of this lesson, students will:

- **know** atoms consist of protons, which are positively charged, neutrons, which possess no charge, and electrons, which are negatively charged
- **understand** that electrons can be gained or lost, thus creating areas of excess charges on an object known as static electricity which attract toward oppositely charged objects, and repel from objects with the same charge
- **be able to** use everyday objects to generate static electricity which can be used to move objects without direct physical contact

Big Ideas:

- A **force** is a push or a pull on an object.
- Some forces are invisible, capable of pushing or pulling on objects without direct contact.
- **Static electricity** is a type of invisible force. It occurs when there's an imbalance between electrical charges on the surfaces of objects
- An **electrical charge** is caused by the movement of **electrons**, negatively charged particles that exist within atoms
- Atoms also consist of positively charged particles, called **protons**, and neutral particles called **neutrons.**

- Electrons can move from atom to atom, and object to object. When electrons leave an atom, the protons give that atom a positive charge. When electrons join an atom, they cause a negative charge.
- When enough electrons gather in one place on an object, it produces a **static charge**. This charge is capable of exerting a force.
- Positively charged objects **attract, or pull on** negatively charged objects and **repel, or push away** positively charged objects.

Essential Questions:

- How do 'invisible forces' apply a push or pull on objects without direct contact?
- What are atoms made of, and how do the charges of their components (protons, neutrons, electrons) affect their behavior?
- What happens when electrons leave atoms and accumulate somewhere else?
- How does the imbalance of electrical charges lead to the movement of objects without direct contact?
- Why does static electricity cause objects to attract or repel each other?

Engage:

Warm Up Activity [2-3 minutes]

Ask the students to list how many ways they can think of to get an object to move without touching it. Write their answers on the board or on chart paper. Group their answers by similarities.

Impossible Science Demo - Telekinesis Straw [5 minutes]

Includes "Teach Like A Magician" progression of steps with recommended script.

- *[TLAM]: "Believe it or not, we all possess the power to make objects move."*
- Set up the salt shaker
- Rub the straw with the provided napkin.
- *[TLAM]: "We just need a clear mind, clean hands, and objects appropriate to our skill level."*
- Place the straw over the top of the salt shaker so that it is balanced at its center.
- *[TLAM]: "If we really concentrate, we can make the impossible possible."*
- Place your hands near the straw as trained to induce the straw to move, spinning around the top of the salt shaker.

Think | Pair | Share [5 minutes]

- *Think [1-2 min]:* Ask students to, individually, consider how they think this illusion works. Then, under Prompt #1 in their workbooks, have them model their answer.

- *Pair [1-2 min]:* Students pair up and take turns sharing their thoughts. They ask each other questions after sharing and formulate their combined responses to the question prompts.
- *Share [2-3 min]:* The larger group comes together and the pairs take turns summarizing their combined responses. On the board or chart paper, write down a couple of statements that summarize the group's various hypotheses.

Explore:

Activity 1 - Static Charge and Static Attraction [10 minutes]
Students will work in pairs on this activity. Distribute the materials for "Activity 1" from the Materials Page.

Students will work together to produce a static charge and use that change to attract objects toward each other.

- Inflate a balloon
- Rub the balloon on your head for 15-20 seconds, and then release it. What happens?
    - *The balloon should stick to their heads!*
- Try to pull the balloon away from your head. What happens?
    - *They should feel the balloon resist the movement. Additionally, those with longer hair will see their hair seem to adhere to the balloon. As they get further away, their hair may continue to stand up on its own!*
- Rub the balloon with the provided napkin. Then, hold it up against a wall. See what happens.
    - *Again, the balloon should seem to stick to the wall*
- At this point, have students return to their workbooks and, under Prompt #2, attempt to explain with a model and words why the balloon is sticking to things after being rubbed.

Activity 2 - Static Charge and Static Repulsion [15 minutes]
Students will work in pairs on this activity. Distribute the materials for "Activity 2" from the Materials Page.

Students will use two objects that share the same static charge to induce levitation! To do so:

- Inflate a balloon
- Cut a strip of plastic from the open end of a plastic bag. This will produce a circular strip of plastic.

- Using the provided napkin, rub both the circular strip of plastic and the balloon.
- One student should hold the circular plastic strip by its end, while the other holds the balloon by its knot.
- The student holding the circular strip of plastic should hold it over the balloon, and then release.
    - *If done correctly, the circular strip of plastic should appear to levitate above the balloon!*

Activity 3 - Telekinesis Straws [15 minutes]

Students will work in groups of 3-4 to recreate the Impossible Science demonstration. Distribute the materials for "Activity 3" from the Materials Page.

- Set up the salt shaker
- Place the straw on top of the salt shaker such that it is balanced at its center.
- Using your hands, attempt to move the straw without touching it.
    - *Students will be unable to do so, as the straw has not yet received a static charge*
- Rub the straw with the provided napkin.

- Again balance the straw across the top of the salt shaker, ***using only the ends of the straw to hold it while doing so***
    - *Note: students will discharge the static build up if they fail to hold the straw correctly during this step*
- Holding your hands near the straw, attempt to move it without touching it.
- Try to move the straw in different ways with different hand positions. Experiment with:
    - How long you could get the straw to continuously move
    - How fast you could get the straw to rotate
    - Can you get the straw to roll off of the salt shaker lid?
    - Could you use an object other than your hands to get the straw to move?

Explain:

Watch and Discuss [10 minutes]

Link: *Telekinesis or Opposites Attract? | Impossible Science At Home*

After watching the video, guide the students though a brief reflection:

- What did they notice in the video?
- How was Jason able to make the illusion work?

Define and clarify the following terms while watching the above video. Pause video and elaborate on definitions as deemed necessary based on student engagement, using the "Big Ideas" and "Essential Questions" as a guide:

- Electrons
- Negatively charged versus positively charge objects
- Static electricity
- Force of attraction between oppositely charged objects

At this time, have students return to their journals and, under Prompt #3, explain with models and words how the three Activity experiments demonstrated static electricity to produce movement.

Elaborate:

Experiment - Revive a Ghost [20 minutes]:

Students will work individually on this task. Distribute the materials under "Experiment" on the Materials Page.

Students will use their understanding of static electricity to bring a ghost to life! To do so:

- Using the tissue paper, cut out a figure of a ghost
    - *While students are welcomed to be creative with this, please note that stick figures generally work best for this activity.*
- Carefully tape the bottom (feet, base) of the tissue paper ghost to a table or flat surface

- Using the provided napkin, rub one end of the straw to charge it
- Holding the uncharged, other end of the straw, bring it close to the tissue paper ghost and see if you can get it to stand up and dance.
    - *If done correctly, students should feel like they've made a magic wand that can bring ghosts to life!*
- If time allows, permit students to create multiple ghosts, experimenting with
    - Different sizes
    - Different shapes
    - *Encourage students to state a hypothesis for how the changes made to the new ghost figures will affect the performance of the static electricity wands*

Modify / Extend:

Modified Activity 1:

N/A

Extension Activity - Salt and Pepper Separation [15 minutes]:

Students will work in pairs on this activity. Distribute the materials for "Extension 1" on the Materials Page.

- In a small plate, pour a small amount of salt and pepper.
- Mix up the salt and pepper so that they would be very difficult to separate with your hands or a spoon.
- Using the provided straws and your understanding of static electricity, attempt to find a way to separate the salt from the pepper without directly touching it.
    - Rub the napkin on the straw
    - Hover the charged straw over the small plate
        - *The majority of the pepper, and some of the salt, should be attracted to the straw*
- Why does the pepper attract to the straw and only some of the salt?
    - *Students should know, from the experiment, that weight/density affects how hard a charge has to pull/push to move an object.*

Evaluate:

Under Prompt #4 in their workbooks, challenge students to explain with a model how static electricity works to revive their ghosts. Encourage older students to include written explanations using the new vocabulary from the lesson.

Materials

Impossible Science Demo (per class)

- Straw

- Salt shaker
- Static inducing napkin

Activity 1 (per student pair)

- Balloon
- Static inducing napkin

Activity 2 (per student pair)

- Thin, plastic produce bag (could be used by multiple groups)
- Balloon (can be reused from Activity 1)
- Static inducing napkin

Activity 3 (per groups of 3-4 students)

- Straw
- Salt shaker
- Static inducing napkin

Experiment (per student)

- Tissue Paper
- Markers
- Scissors
- Tape
- Straw

Modify 1

- N/A

Extension 1

- Salt
- Pepper
- Balloon (can be reused from previous activities)