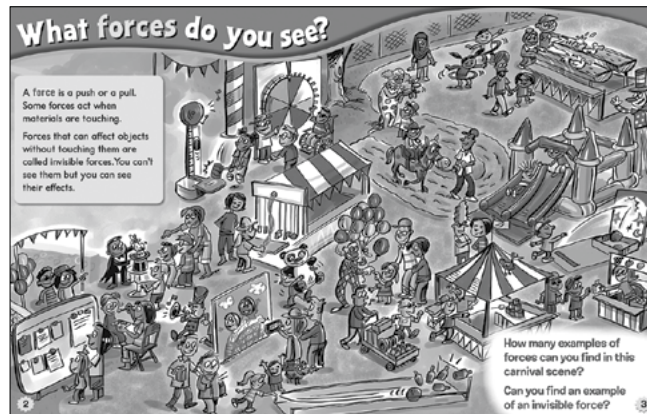


Exploring Invisible Forces



Focus: Students investigate the effects of forces when materials are touching and when materials are not touching.

Specific Curriculum Outcomes

Students will be expected to:

- 1.0 pose questions that lead to exploration and investigation [GCO 2]
- 2.0 communicate using scientific terminology [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- pose and post inquiry questions to the I Wonder Wall
- use scientific terminology to communicate their observations

NOTES:

Attitude Outcome Statements

Encourage students to:

- show interest in and curiosity about objects and events within their immediate environment [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- speak and listen to explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experiences [GCO 1]
- interpret, select, and combine information using a variety of strategies, resources, and technologies [GCO 5]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• <i>The Golden Goose</i> (Read Aloud, digital version) • Student Magazine, pages 2–3 • IWB Activity 1 • Anchor Video: <i>Invisible Forces</i>	• magic trick materials including an inflated balloon, a Ping-Pong ball, magnets, two magnetic coins • materials for the Curiosity Centre such as balloons, felt, foam plates, fur, silk, wool, plastic combs and rulers, electrostatic dusters and cloths, variety of magnets, magnetic and non-magnetic objects • students' Science Journals	• Prepare for the magic show by gathering the necessary materials. Charge the balloon immediately before the first trick. • Provide a variety of materials related to static electricity and magnetism at the Curiosity Centre. • Prepare a large KWLM chart. • Create and make copies of a Wordle using terminology from the unit.	• force • invisible force • push • pull • static electricity • magnet • magnetism

Safety

- If any students have a latex allergy, modify the materials or the activity accordingly to avoid the use of latex balloons.

Science Background

- A force is a push or pull that starts something moving, changes the direction of a moving object, changes the speed of a moving object, or causes a moving object to stop.
- Some forces are invisible. We can see the effect, but not what caused it. Static electricity and magnetism are examples of invisible forces.
- If you include coins in the Curiosity Centre for student explorations, note that nickels minted after 2000 and pennies minted since 2002 are mainly steel and so are magnetic. Including pennies and nickels that offer different

results when tested for magnetic attraction may generate more questions about the types of metals attracted by magnets.

Possible Misconceptions

- Students may think of a magnet sticking to or moving towards a magnetic object but they may not recognize this as the effect of a pull or force. Likewise, students may have rubbed a balloon on their hair and stuck it to a wall but they are unlikely to think of this as involving forces.
- Students may think that wind is an example of an invisible force. Explain that while wind is invisible, it is actually a contact force—the air is pushing against an object.

ACTIVATE

Invisible Forces Magic Show

Before the show, blow up a balloon and collect a Ping-Pong ball, a couple of magnets, and two magnetic coins. Perform some simple magic tricks involving invisible forces. You may choose to “look the part” of a classic magician by wearing a top hat. Say the magic word “Abracadabra” as you perform each trick.

Charge a balloon just before the show or charge it out of sight from the students immediately before performing the first trick. Be dramatic as you say:

- **Watch as I use this balloon to move this ball without touching it!**
- **For my next trick, I will make this balloon stick to the wall!**

Hold one of the magnets in your hand, out of sight of the students, and use it to repel another magnet. Say:

- **Watch as I move this magnet without touching it!**

Keeping the magnet hidden in your hand, pick up a coin between your thumb and index finger ensuring it is in contact with the magnet. Then use the coin to attract another coin. For dramatic effect, spin the second coin with your finger. Introduce the trick by saying:

- **For my next trick, I will use this coin to pick up a second coin!**

ACTIVATE

Read Aloud: *The Golden Goose* (digital version)



Summary

Rupert helps a stranger and is rewarded with a golden goose—but everyone who touches it gets stuck together! What can be done to break the spell?

Note: This text is available in digital format only and can be found on the Teacher’s Website. scholastic.ca/education/nlscience

Before Reading



Remind students that a force is a push or a pull. Invite volunteers to name a few examples of a force. Add the words “force,” “push,” and “pull” to the Word Wall.

Explain to students that the story you are going to read is based on a traditional fairy tale. Invite students to share examples of fairy tales they know. Ask:

- **Does everything that happens in a fairy tale happen in everyday life?**

Set a focus for listening by asking students to identify the force being used in this story.

During Reading

As you read the story aloud, pause to discuss the text and illustrations. Clarify any vocabulary as necessary. Prompts for discussion could include:

- **Why are the people sticking to the goose and to each other?**
- **Do you think there is glue or another adhesive on the goose?**
- **Do you think the force is strong or weak?** (It must be strong to link so many people together.)
- **Is the force a push or a pull?**
- **Why do you think the train of people can't get “unstuck”?**
- **Is there an invisible force at work here?**
- **What happens when Gwendolyn sees the crazy train of people?**
- **Why did her laughter allow everyone to go free?** (It broke the spell.)

After Reading

Tell students that this book is fiction but that there are real invisible forces that can make things attract or “stick together.” Explain that an invisible force can't be seen but we can see the effects of the force, such as things being “stuck” together. Ask:

- **What invisible forces do you know that make things stick together?**

If necessary, prompt students by asking:

- **Have you ever used a magnet to pick up other objects? The objects seem to stick to the magnet. This is called magnetism.**
- **Have you ever noticed that sometimes clothes stick to each other when they come out of a hot dryer? This is called static electricity.**



Invite students to share instances when they have experienced invisible forces. Add the term “invisible forces” to the Word Wall.

Push and Pull

Invite students to experiment and then list how many ways they can move an object such as a pencil. Have students sort their actions as pushes and pulls. Ask:

- **What is a force?**
- **Can you always see a force?** (Sometimes we can only see the effect of a force.)
- **How can you see that a force has been exerted?**

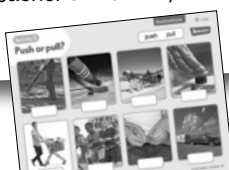
Introducing Invisible Forces

Introduce the Student Magazine to students. Have them review the Contents page and remind students that the words in bold, red font throughout the magazine are defined in the Glossary.

Have students examine the illustration on pages 2–3 of the Student Magazine. Challenge them to identify pushes and pulls shown in the image. Ask students if they can identify a push or pull resulting from an invisible force (papers held to a magnetic board by magnets).

IWB Activity:

- Have students label images as a push or a pull using Activity 1: *Push or pull?* (see the Teacher's Website).



CONNECT

Curiosity Centre

Invite the students to explore freely at the Curiosity Centre using magnetic and/or potential static electric materials. Have students briefly report something that they learned about the materials and how they interact. Ask:

- **Were any results surprising?**
- **Why do you think that happened?**



Students can record questions they may have on sticky notes or index cards at the Curiosity Centre and add them to the I Wonder Wall.

Anchor Video

Play the Anchor Video: *Invisible Forces* which is located on the Teacher's Website. Set a focus for viewing by asking students to note the examples of static electricity and magnetism shown and to think about those they have experienced. You may choose to pause the video to allow students to answer questions or to discuss any questions which students may have.

KWLM Chart

Begin a class KWLM chart (Information we **know**; what we **wonder** or want to know; information we **learned**; **more** questions) for invisible forces. Include any specific invisible forces terminology students know.



Invisible Forces Words

Create and make copies of a Wordle, using terminology from the unit such as force, static electricity, magnetism, electrostatic charge, magnet, attract, repel, magnetize, north pole, south pole, compass, push, pull. Have students circle any words they don't know, and tell them that they'll learn about these words during this unit. Invite students to play Charades using any unit terminology they are familiar with.

CONSOLIDATE

New Trick

Referencing their explorations at the Curiosity Centre, students can create an invisible forces magic trick that could be added to the Magic Show. The trick must show the effect of an invisible force (static electricity or magnetism). Allow students to explore and choose a variety of items (such as those at the Curiosity Centre) that can be used to attract or repel objects or materials. Have students work in small groups to create and then perform their trick. After performances are complete, have each group describe how their trick showed the effect of an invisible force, or ask other class members to describe what the trick showed about invisible forces.

Question List



Invite students to generate a personal list of questions that they would like to explore and investigate throughout the unit. Students can record their inquiry questions and any reflections in their Science Journals.

EXPLORE MORE

Describing Forces



Students can record in their Science Journals how contact forces can be used to move objects directly. Then they can record any explorations they undertook to use pushes and pulls to move objects without directly touching them (magnetic and electrostatic explorations).