

Unit 1: Forces and Interactions

8th Grade Science

10 Class Meetings

Revised June 2022

Essential Questions

- What underlying forces explain the interactions between objects?

Enduring Understandings with Unit Goals

EU 1: The cause-and-effect relationship that affects electric forces are due to magnetic forces, the magnitude and signs of the electric charges on the interacting objects, and the distances between the interacting objects.

- Compare and contrast magnitude of the magnetic strength of interacting objects.
- Differentiate between the signs of the electric charges on interacting objects.
- Judge the distance between objects interacting through electric and magnetic forces.

EU 2: The forces between two objects depend on the masses of interacting objects, the relative magnitude and direction of the forces between objects, and the gravitational force within the relevant system(s).

- Analyze gravitational interactions that are attractive and depend on the masses of interacting objects.
- Evaluate masses of objects in the relevant system(s).
- Compare and contrast the relative magnitude and direction of the forces between objects in the relevant system(s).

EU 3: Fields of energy (electric and/or magnetic) exist between objects exerting forces on each other even though the two interacting objects are not in contact with each other.

- Evaluate evidence that two interacting objects can exert forces on each other even though the two interacting objects are not in contact with each other.
- Analyze data that distinguishes between electric and magnetic forces.
- Show evidence that the cause of a force on one object is the interaction with the second object

Standards

Next Generation Science Standards:

- **MS-PS2-3:** Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- **MS-PS2-4:** Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
- **MS-PS2-5:** Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Common Core State Standards:

- **RST.6-8.1:** Cite specific textual evidence to support analysis of science and technical texts, attending

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to the precise details of explanations or descriptions.

- **RST.6-8.3:** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- **WHST.6-8.7:** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

ISAAC Vision of the Graduate Competencies

Competency 1: Write effectively for a variety of purposes.

Competency 2: Speak to diverse audiences in an accountable manner.

Competency 3: Develop the behaviors needed to interact and contribute with others on a team.

Competency 4: Analyze and solve problems independently and collaboratively.

Competency 5: Be responsible, creative, and empathetic members of the community.

Unit Content Overview

1. Forces Observed on the Earth

- Identify the seven different forces on the Earth
- Describe ways these forces are observed in real-world scenarios

2. Interacting forces

- Observe what happens when forces interact
- Create an example of forces in motion

3. Magnetic and Electric Fields

- Differences and similarities of magnetic and electric fields
- Creating your own magnetic and electric field

Interdisciplinary Connection:

- Language Arts (**RST.6-8.1**) – Cite textual evidence to support analysis of science and technical texts, attending to the precise details of explanation of description
- Math – Reason abstractly and quantitatively

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Daily Learning Objectives with *Do Now Activities*

Students will be able to...

- Identify and describe what force is and the equation that defines it
 - What are some examples of forces that are in your everyday life?
- Evaluate the difference between acceleration and velocity
 - Find definitions for acceleration and velocity
- Subdivide force into different forms that occur in real-world scenarios
 - Explain the forces that are acting on an object when it is thrown
- Construct/illustrate a roller coaster that is considered safe and uses different forces
 - What are some safety features that rollercoasters need?
- Distinguish between forces that interact with and without contact
 - Can there be forces on objects that don't actually touch each other?
- Outline the differences between magnetic and electric fields
 - Define magnetic field and electric field – draw an image for each
- Evaluate what causes magnetism in certain objects
 - Categorize the following items as being magnetic or not
- Assemble an electric field that is efficient and works properly
 - Explain the flow of energy in an electric current
- Prepare for the end of the unit with a review game
 - How can we test the strength of a magnet?

Instructional Strategies/Differentiated Instruction

- Whole group instruction
- Guided notes
- Student-led instruction
- Independent problem-solving
- Collaborative problem-solving
- Graphic Organizer
- Cross-curricular problem solving (independent and collaborative)
- Accountable Talk
- Homework
- Word walls with visuals
- Small group instruction
- Manipulatives

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Assessments

FORMATIVE ASSESSMENTS:

- Warm-ups (NGSS)
- Whiteboards
- Mid-class check-ins
- Exit Slips
- Accountable Talk Discussions
- Do Now
- Student-led instruction
- Homework
- Performance Task- “Magnetic or Not?”
 - Problem-Solving Rubric

SUMMATIVE ASSESSMENTS:

- Quiz – EU 1 & EU 2
- Performance Task- “Magnetic or Not?”
- Unit 1 Test

Unit Task

Unit Task Name: “Magnetic or Not?”

Description: Students will explore the basic magnetic properties of different substances, particularly aluminum and steel. The activity provides students the chance to predict, whether or not a magnet will attract specific items and then test their predictions. Ultimately, students should arrive at the conclusion that iron (and nickel if available) is the only magnetic metal.

Evaluation: Summative Assessment and Problem-Solving Rubric

Unit Resources

- Match Fishtank
- www.map.mathshell.org
- Flipped Google Classroom Videos
- Worksheets
- Calculator
- Laptops
- SBAC Prep Online