Grade 3 Science - Unit 2 - Forces & Interactions

Unit Focus

This Grade 3 science unit, Forces and Interactions, is designed to build students' understanding of physical science concepts through hands-on exploration and inquiry-based learning. Anchored by the engaging phenomenon of an "ice board," students begin by observing and questioning how forces act in real-world scenarios. From this initial investigation, they construct conceptual models that they will revisit and revise throughout the unit as their understanding deepens.

Organized around key concepts—Forces & Motion, Friction, Predicting Motion, and Magnetism—students engage in a variety of interactive lessons drawn from Mystery Science and supported by experiments, engineering challenges, and performance-based assessments. They explore how forces act as pushes and pulls, investigate how friction impacts motion across different surfaces, and study the predictable patterns of motion. In the final portion of the unit, students delve into magnetism, discovering how magnetic forces can attract and repel and act at a distance. The unit culminates in an engineering design challenge where students apply their learning to create a magnetic toy or game, demonstrating their grasp of scientific concepts in a creative and meaningful way.

Stage 1: Desired Results - Key Understandings

Standard(s)

Next Generation Science Standards

Cross Cutting Concepts: 3

- Patterns of change can be used to make predictions. (3-PS2-2) (3.FI.CC.1.1)
- Cause and effect relationships are routinely identified. (3-PS2-1) (3.FI.CC.2.1)
- Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3) (3.FI.CC.2.2)
- Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. (3-PS2-4) (3.FI.CC.3.1)

Disciplinary Core Ideas: 3

- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1) (3.PS2.A.1)
- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3- PS2-2) (3.PS2.A.2)
- Objects in contact exert forces on each other. (3-PS2-1) (3.PS2.B.1)

Transfer

Students will be able to independently use their learning to...

T1 Create models to explore complex systems, show mastery of key science concepts, and/or develop solutions through creation of a product open to testing and redesign.

Meaning

Understanding(s)	Essential Question(s)
Students will understand that... **U1** Forces can be balanced (causing no movement) or unbalanced (causing movement or a change in motion). **U2** Objects move in predictable patterns, and we can use these patterns to predict future motion. **U3** Electric and magnetic forces can act on objects even when they are not touching. **U4** Scientific ideas about magnets can be used to design solutions to real-world problems.	*Students will keep considering...* **Q1** How do forces affect the way objects move? **Q2** How can we use patterns of motion to predict how an object will move in the future? **Q3** How can objects interact with each other without touching? **Q4** How can we use magnets to solve real-world problems?

Acquisition of Knowledge and Skill

Knowledge	Skill(s)
Students will know... **K1** Forces can be balanced or unbalanced, and this affects motion.	*Students will be skilled at...* **S1** Plan and conduct investigations to show how balanced and unbalanced forces affect motion.

Stage 1: Desired Results - Key Understandings

• Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-3),(3-PS2-4) (3.PS2.B.2) Performance Expectations: 3 • Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. (3-PS2-1) • Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. (3-PS2-2) • Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. (3-PS2-3) • Define a simple design problem that can be solved by applying scientific ideas about magnets. (3-PS2-4) Science and Engineering Practices: 3 • Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3) (3.FI.SEP.1.1) • Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4) (3.FI.SEP.1.2) • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-PS2-1) (3.FI.SEP.3.1) • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3- PS2-2) (3.FI.SEP.3.2) • Science findings are based on recognizing patterns. (3-PS2-2) (3.FI.SEP.4.1) • Science investigations use a variety of methods, tools, and techniques. (3-PS2-1) (3.FI.SEP.5.1) **Madison Public Schools Profile of a Graduate** • Design: Engaging in a process to refine a product for an intended audience and purpose. (POG.2.2)	**K2** Objects can move in patterns that help predict future motion. **K3** Magnetic and electric forces can act at a distance. **K4** The strength and direction of magnetic and electric forces can change based on different factors (e.g., distance, orientation). **K5** Magnets can be used in real-world applications to solve design problems. **K6** Vocabulary: Force, Motion, Balanced Force, Unbalanced Force, Friction, Gravity, Pattern of Motion, Magnet, Magnetic Force, Attract, Repel, Pole, Interaction.	**S2** Observe and measure motion to identify patterns and make predictions. **S3** Ask questions to explore how magnetic and electric forces interact with objects. **S4** Define a problem and design a solution using knowledge of magnets.