Name of Demonstration: Pushes and Pulls

Description of Demonstration: This program demonstrates forces and how simple machines multiply forces. Ages 8 and up.

MN SCIENCE Grad Stand/Strand/Sub-strand: Number####:

0P 2.2.1.1, 0P 4.1.1.1
2P 1.1.1.1, 2P 2.2.1.1
4P 1.1.1.1, 4P 1.1.2.1
5P 1.1.1.1, 5P 3.2.1.1
6E 3.1.1.1
8P 1.1.1.2, 8P 1.2.1.2, 8P 1.2.1.3, 8P 2.1.1.2, 8P 2.2.1.2, 8P 3.1.1.3, 8P 3.2.2.2, 8P 4.1.1.1, 8P 4.1.1.2

Grade Level(s): 1st through 8th Grades

Content Area(s): Physical Science and Energy Science

Learning Target(s):

1. I can ask questions about how things move.
2. I can identify and predict quantitative patterns of the effects of balanced and unbalanced forces on the motion of objects.
3. I can ask investigative questions and make predictions using information from observations about changes in energy, related to speed, when two objects interact.
4. I can create an explanation based on evidence relating to the speed of an object to the energy of the object.
5. I understand and can explain that a change in an object's motion depends on the sum of the forces on the object and the mass of the object.
6. I can plan and conduct my own investigation that evaluates the experimental design providing evidence that objects exert forces on other objects even though the objects are not in direct contact.
7. I can explain solutions to problems involving the motion of two colliding objects using Newton's 3rd Law.

Essential Question(s):

1. Stop, Go, and Change Direction, how did it happen?
2. How do balanced and unbalanced forces affect various objects?
3. What will happen to an object if balanced forces are applied to the object? What will happen to an object if unbalanced forces are applied to the object?
4. How does the speed and direction affect two colliding objects?
5. What is speed? How is speed affected by energy?
6. How can energy be converted from one form to another?
7. What happens to an object when forces are applied to the object, and what effect does the mass of the object have on the motion?
8. Do objects exert force on other objects even when the objects are not in direct contact? What experiments can be conducted that provides evidence of the forces based on those effects?
9. What are the relationships of kinetic energy and the mass and speed of an object?
10. What is Newton's 3rd law?

Key Vocabulary: Precession, Balanced Forces, Unbalanced Forces, Speed, Sir Isaac Newton, Kinetic Energy, Potential Energy, Mass.

Prerequisite Terms: Apply, Collide, Convert, Energy, Evidence, Evaluate, Exert, Explanation, Interact, Observation, Pattern, Prediction, Problem, Quantitative, Solution, State of Matter