Curriculum Units and Learning Outcomes

Content Area: Science	**Grade Level: 7**
Unit Title: Forces at a Distance	

Unit Summary:

Students will demonstrate their understanding of how forces impact the motion of objects without two objects ever actually touching. Students will design a Rube Goldberg machine that uses the forces of magnetism, electricity and gravity to "catch a mouse". Students will understand the following concepts:

- To change an object's motion, either the forces on the object an/or the mass of the object must change.
- Fields exist between objects and exert forces on each other even when the objects are not touching.
- Electric, magnetic and gravitational forces all act at a distance between objects.

Massachusetts Standards:

7MS-PS2-3: Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

7MS-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.

Enduring Understandings: Students will understand that:

- All objects that collide exert equal and opposite forces on one another.
- The motion of an object is determined by the sum of the forces acting on it.
- To change an object's motion, either the forces on the object and/or the mass of the object must change.

- Fields exist between objects and exert forces on each other even when the objects are not touching.
- Electric, magnetic, and gravitational forces all act at a distance between objects.

Essential Questions:

- What is force?
- How do forces change an object's motion?
- What types of forces exist in our world?
- How can forces impact objects without directly touching them?

Students will demonstrate KNOWLEDGE of:	**Students will be SKILLED at**:
● I know what a **force** is. ● I know that forces can change an object's **motion.** ● I know that forces can act on an object without touching it. ● I know that **magnetic**, **gravitational** and **electric** forces all act on an object. ● I know the difference between **mass** and **weight.** ● I know that weight is affected by the **mass** of the object, the **gravitational force** of an object (i.e. a planet), and the **distance** from that object. ● I know the difference between **attractive** and **repulsive** forces.	● I can classify examples as magnetic force . ● I can classify examples as gravitational force. ● I can classify examples as electric force. ● I can design of a "mouse trap" that incorporates the use of **magnetic force, gravitational force and electric force** and explains how each force works in the system.

Estimated Duration: 5 weeks