Motion, Forces and Energy (Middle School)

A Museum of Science Traveling Program
Motion, Forces & Energy is a 60-minute presentation about the eponymous content. It is designed to build on NGSS-based curricula.

NGSS: Next Generation Science Standards
Needs

We bring all materials and equipment, including a camera, video projector, and screen. Access to 110-volt electricity is required.
Space Requirements

The program can be presented in assembly-suitable spaces like gyms, multipurpose rooms, cafeterias, and auditoriums.
Goals: Forces

We illustrate that forces are pushes and pulls that can cause changes in motion.
Goals: Newton’s Laws

These changes are described by Newton’s Laws of Motion, demonstrated by a pencil-firing cannon and more!
Goals: Energy

Forces applied over distances give energy, which can change forms to light, heat, and more.
The fact that gravity is a **constant force** is demonstrated with either a four-meter-tall Platedropper or the famous “Shoot the Monkey” demonstration.
Goals: Other Concepts

In addition to these core goals, other concepts are taught with a variety of additional demonstrations.
Finale

In the finale, student ideas help to engineer changes in a Trebuchet in order to strike a target.
Program Details

• Can only be booked for school groups during the school year.
• Can only be booked for grade(s) studying program content:
  – In Massachusetts, optimal for 7th grade
  – Varies in other New England states based on individual district adaptations of NGSS
Program Details

• Capacity is up to eight classes (200 students) of a single grade per session.
• Up to two consecutive sessions can be taught per day.
NGSS Connections

• 6.MS-PS2-4. Use evidence to support the claim that gravitational forces between objects are attractive and are only noticeable when one or both of the objects have a very large mass.

• 7.MS-PS2-5. Use scientific evidence to argue that fields exist between objects with mass, between magnetic objects, and between electrically charged objects that exert force on each other even though the objects are not in contact.

• 7.MS-PS3-1. Construct and interpret data and graphs to describe the relationships among kinetic energy, mass, and speed of an object.

• 7.MS-PS3-2. Develop a model to describe the relationship between the relative positions of objects interacting at a distance and their relative potential energy in the system.

• 7.MS-PS3-5. Present evidence to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
NGSS Connections

- **7.MS-PS3-7.** Use informational text to describe the relationship between kinetic and potential energy and illustrate conversions from one form to another.
- **7.MS-ETS1-4.** Generate and analyze data from iterative testing and modification of a proposed object, tool, or process to optimize the object, tool, or process for its intended purpose.
- **8.MS-PS2-1.** Develop a model that demonstrates Newton’s third law involving the motion of two colliding objects.
- **8.MS-PS2-2.** Provide evidence that the change in an object’s speed depends on the sum of the forces on the object (the net force) and the mass of the object.
NGSS Scientific and Engineering Practices

• Asking questions and defining problems.
• Planning and carrying out investigations.
• Using mathematics and computational thinking.
• Developing and using models.
• Analyzing and interpreting data.
• Constructing explanations and designing solutions.
## 2019 – 2020 Prices

<table>
<thead>
<tr>
<th>Sessions per Day</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Session</td>
<td>$575</td>
</tr>
<tr>
<td>2 Sessions</td>
<td>$950</td>
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</tbody>
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No mileage fees charged in New England in 2019-20 School Year.
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For information/reservations:
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