

Educational Resources from *Phenomenon Science Education*

Student Proficiency Goals for **NGSS MS-PS2-1**



Information about MS-PS2-1

NGSS Performance Expectation MS-PS2-1.

Apply **Newton's Third Law** to design a solution to a problem involving the motion of two colliding objects.*

Clarification Statement.

Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.

Assessment Limits.

Assessment is limited to vertical or horizontal interactions in one dimension.

Science and Engineering Practice (Constructing Explanations and Designing Solutions)

- Apply scientific ideas or principles to design an object, tool, process or system.

Disciplinary Core Idea (PS2.A: Forces and Motion)

- For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law).

Crosscutting Concept (Systems and System Models)

- Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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Student Proficiency Goals

SEP (Constructing Explanations and Designing Solutions):

- Students identify problems involving the motion of two colliding objects.
- Students identify or are given a problem to which they can design a solution.
- Students identify the components of the system involved in an identified problem.
- Students identify the forces the objects in a system will exert on each other.
- Students identify other forces in a system that can affect the motion of the objects in the system.
- Students use knowledge of the forces that objects exert on each other and Newton's third law to design an object, tool, process, or system as a solution to their identified problem.

DCI (PS2.A Forces and Motion):

- Students know that when two objects interact, the forces exerted on each object by the other object are equal in strength.
- Students know that the forces exerted by two objects on each other are in opposite directions.
- Students know that a description of this system of interactions is called Newton's third law.

CCC (Systems and System Models):

- Students consider the systems of objects involved in collisions.
- Students use models to represent a system of objects involved in a collision.
- Students consider the forces involved in a collision and use models to represent these forces.