

NGSS Performance Expectation		In this unit, students:
3-PS2-1	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.	Discover that the door opens when the repulsive force between the magnets on the dog collar and the door is stronger than the attractive magnetic force holding the door closed.
3-PS2-3	Ask questions to determine cause and effect relationships of electrical or magnetic interactions between two objects not in contact with each other.	Explore the magnetic forces of attraction and repulsion, investigating the relationship between the number and size of magnets and their strength.
3-PS2-4	Define a simple design problem that can be solved by applying scientific ideas about magnets.	Identify the problem of creating a dog door system that must stay closed and open using magnetic forces.
3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	Imagine multiple ways to solve the dog door problem, then negotiate a group plan they test and evaluate against criteria and constraints. Students share their solutions and results as they work to improve their designs.

Crosscutting Concepts

Systems and System Models

The dog door students design is a system involving multiple components that need to work together—the dog collar, the door, and the latch—to open and close a door. Student design a magnetic latch that keeps a door closed. Then they consider how to open the door, which requires consideration of magnet alignment and strength across multiple components. For the technology to function, the system parts must work together.