Unit 7 - Magnetic Fields

Content Area: **Science**
Course(s):
Time Period: **Full Year**
Length: **Full Year**
Status: **Published**

Unit Overview

Students use a digital model, plan and conduct investigations with physical materials, and gather evidence from articles to learn about magnetic force and its relationship to kinetic and potential energy in systems of objects (systems and system models, energy and matter). They apply their understanding to analyze and interpret evidence and construct scientific explanations for the results of tests of a model magnetic spacecraft launcher.

Enduring Understandings

A magnetic force can attract or repel an object at a distance.
In a system of magnets, there is a repelling force between like poles and an attracting force between opposite poles.
A magnetic force can convert potential energy stored in a magnetic field to kinetic energy.
The energy used to move a magnet against a magnetic force is stored as potential energy in the magnetic field.
Creating a model of a magnetic system and defining its parts helps scientists test and explain the relationship between force and energy.
Moving a magnet against a stronger magnetic force transfers more energy to the magnetic field.
A magnetic force is stronger closer to a magnet.

Essential Questions

Why do magnets move objects in different ways?
How do magnets move objects?
How can you tell whether two magnets will attract each other, repel each other, or both?
How can magnets cause objects to have kinetic energy?
How does a system of magnets store potential energy in the magnetic field?
What affects the amount of potential energy stored in the magnetic field when a magnet is moved against a magnetic force?

Learning Objectives

A magnetic force can attract or repel an object at a distance.
In a system of magnets, there is a repelling force between like poles and an attracting force between opposite poles.
The pattern of magnetic field lines around attracting magnets is different from the pattern of magnetic field lines around repelling magnets.

A magnetic force can convert potential energy stored in a magnetic field to kinetic energy.
The energy used to move a magnet against a magnetic force is stored as potential energy in the magnetic field.
Creating a model of a magnetic system and defining its parts helps scientists test and explain the relationship between force and energy.
Moving a magnet against a stronger magnetic force transfers more energy to the magnetic field.
A magnetic force is stronger closer to a magnet.
Explore attracting and repelling forces with magnets and with the Simulation.
Read about the Earth's magnetic field and how it affects compasses.
Analyze field line data from the spacecraft launches.
Read about potential energy and kinetic energy in extreme sports and investigate how potential energy in elastic, gravitational, and magnetic systems can be converted to kinetic energy.
With real magnets and in the Sim, they test which movements of magnets increase potential energy.
Plan and conduct experiments with real magnets and in the Sim to test differences in the strength of magnetic forces.
Test both different strengths of magnets and different distances from magnets.
Science Innovators Scrapbook Project. (Lessons satisfy the following legislative requirements: DEI, LGBTQIA+ & People w/ Disabilities, AAPI, Climate Change, and Amistad.

Standards: Content

MS-PS2-2	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
MS-PS2-3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
MS-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.
MS-PS3-2	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

Standards: Interdisciplinary

Assessment Evidence

Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Warm Ups, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research
Summative	In correlation with the NJSLS, students must demonstrate the following as summative assessments: MS-PS2-3: Ask questions about data to determine the factors that affect the strength of

	electric and magnetic forces. MS-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. MS-PS3-2: Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. Other summative assessments will include but are not limited to: projects, summative tests, lab skills demonstrations, vocabulary quizzes, and Science Fair projects.
Alternative & Benchmark	Alternative assessments as required by student IEP/504/I&RS- Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, orally administered assessments, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments
Assessment Evidence Resource	

Instructional Resources

Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Amplify Digital Curriculum, Generation Genius, BrainPop, Microsoft 365, Primary and Secondary Source Documents, Lab Materials as needed, Amplify Readings, Labs, Simulations

Instructional Resource List

Curricular Mandates

Below are the curricular requirements as defined in NJ Administrative Code and Statute

X	Amistad	X	Diversity, Equity, and Inclusion
X	Holocaust	X	LGBT and Disabilities (Grades 6-12)
X	Climate Change	X	Asian American & Pacific Islander

Social Emotional Learning (SEL) Competencies

	Self-Awareness		Relationship Skills
X	Responsible Decision-Making		Social Awareness
	Self-Management		

21st Century Skills & Themes

X	Global and Cultural Awareness	X	Technology Literacy		Planning and Budgeting
X	Creativity and Innovation		Financial Institutions		Risk Management and Insurance
X	Information and Media Literacy		Digital Citizenship		Economic and Government Influences
X	Critical Thinking and Problem Solving		Credit Profile		Career Awareness and Planning
	Civic Financial Responsibility		Financial Psychology		