

Curriculum Development  
In the Fairfield Public Schools

**FAIRFIELD PUBLIC SCHOOLS**  
FAIRFIELD, CONNECTICUT

**GRADE 8 SCIENCE**

APPROVED 09/12/2006

## **GRADE 8 SCIENCE**

### **Statement of Purpose**

Grade 8 science focuses on improving science inquiry process skills through physical science. The interactions of matter and energy will be explored at both the microscopic and macroscopic levels. An understanding of these concepts is essential for individuals to make informed choices with regard to their environment and advancing scientific technology.

### **Audience**

Grade 8 students

### **Prerequisites**

None

### **Design and Description**

Grade 8 science is a heterogeneous class that meets one period per day. The major topics are properties of matter, energy, and motion.

### **Course Objectives**

Students will be able to:

- compare and contrast mass and weight.
- use appropriate tools and metric units to measure and calculate various physical properties including mass, volume, density, temperature, length, boiling point, melting point, and solubility.
- differentiate between the properties of simple compounds and the elements that compose them.
- differentiate between mixtures and pure substances.
- separate the components of a mixture using physical properties such as size, density, solubility, magnetism, and boiling point.
- select and use appropriate tools and metric units to measure, calculate and manipulate distance, displacement, speed, velocity, force and acceleration.
- illustrate the motion of objects in graphs of distance over time.
- identify centripetal force as the force acting on an object moving in a circular path.
- identify gravity as the centripetal force holding planets in their orbits.
- explain how regular motion and relative position of the sun, Earth, and moon affect the seasons, phases of the moon, tides, and eclipses.
- use a variety of simple machines including inclined planes, pulleys, and levers to change the forces needed to move objects.
- apply appropriate tools and metric units to measure, calculate, and manipulate distance, force, and work.
- describe how energy can be used to make objects move.
- construct bridges and explain how they are designed to withstand certain loads and potentially destructive forces.

- explore physical science concepts through design and/or construction of structures such as: a catapult, launcher, egg drop, bridge, racer, flyer, Rube Goldberg device, etc.

### **Science Standards**

#### ***Properties of Matter***

**Materials can be classified as pure substances or mixtures, depending on their physical and chemical properties.**

Students will describe the properties of common elements, such as oxygen, hydrogen, carbon, iron, and aluminum.

Students will describe how the properties of simple compounds, such as water and table salt, are different from the properties of the elements of which they are made.

Students will explain how mixtures can be separated by using the properties of the substances of which they are made, such as particle size, density, solubility, and boiling point.

#### ***Energy Transfer and Transformations***

**Energy provides the ability to do work and can exist in many forms.**

Students will explain the relationship among force, distance, and work, and use the relationship ( $W = F \times D$ ) to calculate work done in lifting heavy objects.

Students will explain how simple machines, such as inclined planes, pulleys, and levers, are used to create mechanical advantage.

Students will describe how different types of stored (potential) energy can be used to make objects move.

#### ***Forces and Motion***

**An object's inertia causes it to continue moving the way it is unless it is acted upon by a force to change its motion.**

Students will calculate the average speed of a moving object and illustrate the motion of objects in graphs of distance over time.

Students will describe the qualitative relationships among force, mass, and changes in motion using Newton's laws of motion.

Students will describe the forces acting on an object moving in a circular path.

#### ***Earth in the Solar System***

**The solar system is composed of planets and other objects that orbit the sun.**

Students will explain the effect of gravity on the orbital movement of planets and other objects in the solar system.

Students will explain how the regular motion and relative position of the sun, Earth, and moon affect the seasons, phases of the moon, and eclipses.

### ***Science and Technology in Society***

**In the design of structures there is a need to consider factors such as function, materials, safety, cost, and appearance.**

Students will explain how beam, truss, and suspension bridges are designed to withstand the forces that act on them.

### **Information and Technology Standards (to be added)**

#### **Essential Questions**

- How does the structure of matter affect the properties and uses of materials?
- What is the role of energy in our world?
- What makes objects move the way they do?
- How does the position of Earth in the solar system affect conditions on our planet?
- How do science and technology affect the quality of our lives?

#### **Focus Questions**

- What is matter?
- What are properties of matter?
- How is matter classified and measured?
- How can the periodic table be used to identify elements?
- Are the properties of elements related to the properties of the compounds they form?
- How can properties of matter be used to separate mixtures?
- How can distance and time be used to calculate the average speed of a moving object?
- How can the motion of an object be described and quantified?
- What affects the motion of matter?
- What is the effect of gravity on the orbital movement of planets in the solar system?
- How does the orbital relationship among the Earth, the moon and the sun affect conditions on our planet?
- How is energy used to move matter?
- What is the relationship among force, distance, and work?
- How can simple machines be used to simplify work?
- How is knowledge of matter and energy used to construct functional and safe structures?
- What are some practical applications of simple machines, forces and motion, elements, compounds, and mixtures?

# **UNITS of STUDY**

## **Unit 1: Classification and Measurement of Matter**

### **Science Standards**

#### ***Properties of Matter***

**Materials can be classified as pure substances or mixtures, depending on their physical and chemical properties.**

Students will describe the properties of common elements, such as oxygen, hydrogen, carbon, iron, and aluminum.

Students will describe how the properties of simple compounds, such as water and table salt, are different from the properties of the elements of which they are made.

Students will explain how mixtures can be separated by using the properties of the substances of which they are made, such as particle size, density, solubility, and boiling point.

### **Essential Question**

- How do the properties of matter affect its behavior and uses?

### **Focus Questions**

- What is matter?
- What are properties of matter?
- How is matter classified and measured?
- How can the periodic table be used to identify elements?
- Are the properties of elements related to the properties of the compounds they form?
- How can properties of matter be used to separate mixtures?

### **Core Topics**

- Correct use of laboratory equipment
- Lab safety
- Observations
- Metric measurement
- Inquiry lab skills and format
- Mass, volume, and density
- Elements, compounds, and mixtures

### **Unit Objectives**

Students will be able to:

- compare and contrast mass and weight.

- use appropriate tools and metric units to measure and calculate various physical properties including mass, volume, density, temperature, length, boiling point, melting point, and solubility.
- differentiate between the properties of simple compounds and the elements that compose them.
- differentiate between mixtures and pure substances.
- separate the components of a mixture using physical properties such as size, density, solubility, magnetism, and boiling point.

### **Sample Assessment**

Separating a Mixture Lab

### **Pacing**

9 weeks

## **Unit 2: Motion of Matter**

### **Science Standards**

#### ***Forces and Motions***

**An object's inertia causes it to continue moving the way it is unless it is acted upon by a force to change its motion.**

Students will calculate the average speed of a moving object and illustrate the motion of objects in graphs of distance over time.

Students will describe the qualitative relationships among force, mass, and changes in motion.

Students will describe the forces acting on an object moving in a circular path.

### **Essential Question**

- What makes objects move the way they do?

### **Focus Questions**

- How can distance and time be used to calculate the average speed of a moving object?
- How can the motion of an object be described and quantified?
- What affects the motion of matter?

### **Core Topics**

- Speed, velocity, and acceleration
- Forces
- Projectile motion
- Newton's 3 Laws

### **Unit Objectives**

Students will be able to:

- select and use appropriate tools and metric units to measure, calculate and manipulate distance, displacement, speed, velocity, force, and acceleration.
- identify centripetal force as the force acting on an object moving in a circular path.
- illustrate the motion of objects in graphs of distance over time.

### **Sample Assessment**

Super Ball Bounce Lab

### **Pacing**

8 weeks

## Unit 3: Physics of Orbital Cycles

### Science Standards

#### *Earth in the Solar System*

**The solar system is composed of planets and other objects that orbit the sun.**

Students will explain the effect of gravity on the orbital movement of planets in the solar system.

Students will explain how the regular motion and relative position of the sun, Earth, and moon affect the seasons, phases of the moon, and eclipses.

### Essential Question

- How does orbital motion create cycles?

### Focus Questions

- What is the effect of gravity on the orbital movement of planets in the solar system?
- How does the orbital relationship among the Earth, the moon and the sun affect conditions on our planet?

### Core Topics

- Gravity
- Solar system
- Seasons
- Phases of the moon
- Tides
- Eclipses

### Unit Objectives

Students will be able to:

- identify gravity as the force holding planets in their orbits.
- explain how regular motion and relative position of the sun, Earth, and moon affect the seasons, phases of the moon, tides, and eclipses.

### Sample Assessment

Make a children's book

### Pacing

1 week

## **Unit 4: The Use of Energy to Move Matter**

### **Science Standards**

#### ***Energy Transfer and Transformations***

**Energy provides the ability to do work and can exist in many forms.**

Students will explain the relationship among force, distance, and work, and use the relationship ( $W = F \times D$ ) to calculate work done in lifting heavy objects.

Students will explain how simple machines, such as inclined planes, pulleys, and levers, are used to create mechanical advantage.

Students will describe how different types of stored (potential) energy can be used to make objects move.

### **Essential Question**

- What is the role of energy in our world?

### **Focus Questions**

- How is energy used to move matter?
- What is the relationship among force, distance, and work?
- How can simple machines be used to help us?

### **Core Topics**

- Simple machines
- Force
- Work
- Potential energy/ kinetic energy

### **Unit Objectives**

Students will be able to:

- use a variety of simple machines including inclined planes, pulleys, and levers to change the forces needed to move objects.
- apply appropriate tools and metric units to measure, calculate, and manipulate distance, force, and work.
- describe how energy can be used to make objects move.

### **Sample Assessment**

Shipping and Sliding Performance Task

### **Pacing**

5 weeks

## **Unit 5: Structural Analysis**

### **Science Standards**

#### *Science and Technology in Society*

**In the design of structures there is a need to consider factors such as function, materials, safety, cost and appearance.**

Students will explain how beam, truss, and suspension bridges are designed to withstand the forces that act on them.

### **Essential Question**

- How are matter and energy used in the design and construction of bridges?

### **Focus Question**

- How is knowledge of matter and energy used to construct functional and safe structures?

### **Core Topic**

- Bridge design and construction

### **Unit Objective**

Students will be able to:

- construct bridges and analyze how they are designed to withstand certain loads and potentially destructive forces.

### **Sample Assessment**

Bridge Construction

### **Pacing**

2 weeks

## **Unit 6: Practical Applications of Physical Science Concepts**

### **Science Standards**

- Materials can be classified as pure substances or mixtures, depending on their physical and chemical properties.
- An object's inertia causes it to continue moving the way it is unless it is acted upon by a force to change its motion.
- The solar system is composed of planets and other objects that orbit the sun.
- Energy provides the ability to do work and can exist in many forms.
- In the design of structures there is a need to consider factors such as function, materials, safety, cost and appearance.

### **Essential Question**

- What are some practical applications of physical science concepts?

### **Focus Questions**

- What are some practical applications of simple machines, forces, and motion, elements, compounds, and mixtures.

### **Core Topics**

- catapults
- launchers
- egg drop
- bridges
- racers
- flyers
- Rube Goldberg devices
- robotics
- sports
- park rides

### **Unit Objectives**

Students will be able to:

- explore physical science concepts through design and/or construction of structures such as: a catapult, launcher, egg drop, bridge, racer, flyer, Rube Goldberg device, etc.

### **Sample Assessment**

Egg Drop

### **Pacing**

10 weeks