

# Unit #3: Earth and Space Science- Earth and Sun

Content Area: **Science**  
Course(s): **Grade 5**  
Time Period: **First Trimester**  
Length: **12 Week**  
Status: **Published**

## Unit Overview

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Earth is the third planet from the Sun. It travels around the Sun in a nearly circular orbit at a distance of about 150 million kilometers. Earth is water rich, with 71% of the planet's surface covered with water. It is surrounded by a shallow atmosphere of nitrogen (78%) and oxygen (21%), and small amounts of a lot of other gases. The atmosphere extends about 500 kilometers (km) above Earth's surface, but most of the mass of the atmosphere is concentrated in the closest 9-20 km, the troposphere.

The constant renewal of water on Earth's land surfaces by the activities in the atmosphere is one of the defining characteristics of Earth, the water planet. This unit provides students with experiences to explore the properties of the atmosphere, energy transfer from the Sun to Earth, and the dynamics of weather and water cycling in Earth's atmosphere. Other experiences help students to develop and use models to understand Earth's place in the solar system, and the interactions of Earth, the Sun, and the Moon to reveal predictable patterns-daily length and direction of shadows, day and night, and the seasonal appearance of stars in the night sky. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; and energy and matter.

## STAGE 1- DESIRED RESULTS

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## Educational Standards

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## 2020 New Jersey Student Learning Standards- Science

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## Performance Expectations

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## Physical Sciences

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SCI.5-PS1	Matter and Its Interactions
SCI.5-PS1-1	Develop a model to describe that matter is made of particles too small to be seen.
SCI.5-PS1-4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
SCI.5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down.
SCI.5-PS1-3	Make observations and measurements to identify materials based on their properties.
SCI.5-PS1-2	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
SCI.5-PS2	Motion and Stability: Forces and Interactions
SCI.5-PS3	Energy
SCI.5-PS3-1	Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

## Life Sciences

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SCI.5-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.5-LS1	From Molecules to Organisms: Structures and Processes
SCI.5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water.
SCI.5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

## Earth and Space Sciences

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SCI.5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
SCI.5-ESS1-1	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
SCI.5-ESS2-2	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
SCI.5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
SCI.5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
SCI.5-ESS1	Earth's Place in the Universe
SCI.5-ESS3	Earth and Human Activity
SCI.5-ESS2	Earth's Systems

## Engineering Design

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SCI.3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
SCI.3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
SCI.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.

## Science and Engineering Practices

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- Practice 1: Asking Questions and Defining Problems
- Practice 2: Developing and Using Models
- Practice 3: Planning and Carrying Out Investigations
- Practice 4: Analyzing and Interpreting Data
- Practice 5: Using Mathematics and Computational Thinking
- Practice 6: Constructing Explanations and Designing Solutions
- Practice 7: Engaging in Argument from Evidence
- Practice 8: Obtaining, Evaluating, and Communicating Information

## Cross Cutting Concepts

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- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Functions
- Stability and Change

## Disciplinary Core Ideas

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## Physical Sciences

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- PS1. Matter and Its Interaction

- PS1.A: Structure and Properties of Matter
- PS1.B: Chemical Reactions
- PS1.C: Nuclear Processes
- PS2. Motion and Stability: Forces of Interaction
- PS2.A: Forces and Motion
- PS2.B: Types of Interactions
- PS2.C: Stability and Instability in Physical Systems
- PS3. Energy
- PS3.A: Definitions of Energy
- PS3.B: Conservation of Energy and Energy Transfer
- PS3.C: Relationship Between Energy and Forces
- PS3.D: Energy and Chemical Processes in Everyday Life
- PS4. Waves and Their Applications in Technologies for Information Transfer
- PS4.A: Wave Properties
- PS4.B: Electromagnetic Radiation
- PS4.C: Information Technologies and Instrumentation

## Life Sciences

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- LS1. From Molecules to Organisms: Structure and Processes
- LS1.A: Structure and function
- LS1.B: Growth and development of organisms
- LS1.C: Growth and development of organisms
- LS1.D: Information Processing
- LS2. Ecosystems: Interactions, Energy, and Dynamics
- LS2.A: Interdependent relationships in ecosystems
- LS2.B: Cycles of matter and energy transfer in ecosystems
- LS2.C: Ecosystem dynamics, functioning, and resilience
- LS2.D: Social interactions and group behavior
- LS3. Heredity: Inheritance and Variation of Traits
- LS3.A: Inheritance of traits
- LS3.B: Variation of traits
- LS4. Biological Evolution: Unity and Diversity
- LS4.A: Evidence of common ancestry and diversity
- LS4.B: Natural selection
- LS4.C: Adaptation
- LS4.D: Biodiversity and humans

## Earth and Space Sciences

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- ESS1. Earth's Place in the Universe
  - ESS1.A: The universe and its stars
  - ESS1.B: Earth and the solar system
  - ESS1.C: The history of planet Earth
- ESS2. Earth's System
  - ESS2.A: Earth materials and systems
  - ESS2.B: Plate tectonics and large-scale system interactions
  - ESS2.C: The roles of water in Earth's surface processes
  - ESS2.D: Weather and climate
  - ESS2.E: Biogeology
- ESS3. Earth and Human Activity
  - ESS3.A: Natural resources
  - ESS3.B: Natural hazards
  - ESS3.C: Human impacts on Earth systems
  - ESS3.D: Global climate change

## Essential Questions

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### Investigation 1: The Sun

**Part 1:** How and why does your shadow change during the day?

**Part 2:** What can be learned by studying the length and direction of shadows?

**Part 3:** What causes day and night?

### Investigation 2: Planetary Systems

**Part 1:** How can you explain why we see some natural objects only in the night sky, some only in the day sky, and some at both times?

**Part 2:** How would you describe the size of and distance between Earth, the Moon, and the Sun?

**Part 3:** How does the shape of the Moon change over 4 weeks?

**Part 4:** How do the parts of the solar system interact?

**Part 5:** Why do stars appear to move across the night sky?

### Investigation 3: Earth's Atmosphere

**Part 1:** What is air?

**Part 2:** What is Earth's atmosphere?

**Part 3:** How do meteorologists measure and record weather variables?

#### **Investigation 4: Heating Earth**

**Part 1:** What happens to earth materials when they are exposed to sunlight?

**Part 2:** How does energy transfer to the air?

**Part 3:** What happens when a volume of fluid is warmed at the bottom?

**Part 4:** What is the best design for a solar water heater?

#### **Investigation 5: Water Planet**

**Part 1:** What causes condensation to form?

**Part 2:** How does water vapor get into the air?

**Part 3:** What is the water cycle?

**Part 4:** What is the difference between weather and climate?

### **Enduring Understanding**

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This earth and space unit develops students' understanding of: 1) What the universe is and Earth's place in it; 2) How and why Earth is constantly changing; 3) How Earth's processes and human activities affect each other; 4) How to explain the structure, properties, and interactions of matter; and 5) How to explain and predict interactions between objects and within systems of objects.

### **Students will know...**

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#### **Investigation 1: The Sun**

axis, compass, day, night, North Pole, North Star, orbit, orientation, revolution, rotation, shadow, Sun, sunrise, sunset

## Investigation 2: Planetary Systems

asteroid, asteroid belt, comet, constellation, dwarf planet, force, gas giant planet, gravity, Kuiper Belt, Moon, night sky, phase, planet, solar system, star, terrestrial planet, lunar cycle, crescent moon, first-quarter moon, full moon, gibbous moon, new moon, third-quarter moon, waning moon, waxing moon

## Investigation 3: Earth's Atmosphere

air, air pressure, atmosphere, barometer, compress, forecast, humidity, hygrometer, mass, matter, meteorologist, precipitation, pressure, temperature, thermometer, troposphere, visibility, weather, weather variable, wind, wind direction, wind speed, wind vane

## Investigation 4: Heating Earth

absorb, conduction, contract, convection current, earth material, energy transfer, expand, experiment, fluid, geosphere, hydrosphere, less dense, more dense, radiant energy, radiation, ray, reflect, reradiation, solar collector, solar energy, solar energy exposure, solar water heater, uneven heating, variable

## Investigation 5: Water Planet

climate, climatologist, condensation, condense, dew, drought, evaporate, evaporation, fog, fresh water, frost, glacier, ground water, hurricane, ice cap, lake, ocean, recycle, river, salt water, severe weather, thunderstorm, tornado, water cycle, water vapor

## Students will be able to...

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### Investigation 1: The Sun

- Ask questions about patterns of daylight in one location on Earth over a year.
- Develop and use models to understand how shadows change in length and direction over a day, what causes day and night, and seasonal changes in daylight.
- Plan and carry out investigations of shadows and the movement of the Sun across the sky.
- Analyze and interpret data to make sense of the phenomena of day and night.
- Use mathematics and computational thinking to measure and compare the length of shadows at different times of the day.
- Construct explanations using evidence, such as the relationship of the length of the shadow and position of the Sun in the sky.
- Obtain, evaluate, and communicate information from books and media and integrate that with firsthand experiences to construct explanations about the relationship between Earth and the Sun.

### Investigation 2: Planetary Systems

- Develop and use models for the interactions of objects in the solar system, including phases of the Moon,

apparent movement of the stars in the sky, and the force of gravity.

- Plan and carry out investigations dealing with night-sky observations over time.
- Analyze and interpret data to make sense of the apparent movement of objects in the sky, including the Moon, stars, and planets.
- Use mathematics and computational thinking to develop scale models of Earth, the Moon, and the Sun, and the solar system.
- Construct explanations using evidence, such as the relationships between objects in our solar system, phases of the Moon, movement of the stars, and the orbits of planets around stars and moons around planets.
- Engage in argument from evidence to support the explanation of what keeps planets orbiting stars and moons orbiting planets.
- Obtain, evaluate, and communicate information from books and media and integrate that with firsthand experiences to construct explanations about our solar system and galaxy.

### **Investigation 3: Earth's Atmosphere**

- Ask questions to understand the behavior of air particles in closed spaces.
- Develop and use models to understand the properties of air as interacting particles.
- Plan and carry out investigations of air and weather variables.
- Analyze and interpret data to make sense of the phenomena of air as particles interacting in space.
- Use mathematics and computational thinking to analyze data that provide evidence that air has mass.
- Construct explanations using evidence, such as the interaction of particles in a gas and the fact that gas is matter and takes up space.
- Obtain, evaluate, and communicate information from books and media and integrate that with firsthand experiences to construct explanations about air, atmosphere, and weather.

### **Investigation 4: Heating Earth**

- Develop and use models to understand how convection currents transfer heat in fluids.
- Plan and carry out investigations of energy transfer through radiation, conduction, and convection.
- Analyze and interpret data to make sense of the phenomena of energy transfer involving the Sun, atmosphere, geosphere, and hydrosphere.
- Use mathematics and computational thinking to measure temperature to follow the energy transfer between solids, liquids, and gases.
- Construct explanations using evidence of the energy transfer in radiation, conduction, and convection. Design solutions to improve solar water heaters.
- Engage in argument from evidence that supports claims about energy transfer to water and soil.
- Obtain, evaluate, and communicate information from books and media and integrate that with firsthand experiences to construct explanations about energy transfer in the atmosphere, hydrosphere, and geosphere.

### **Investigation 5: Water Planet**

- Develop and use models to understand the water cycle.
- Plan and carry out investigations of evaporation and condensation.
- Analyze and interpret data to make sense of the phenomena of evaporation and condensation.
- Use mathematics and computational thinking to compare the distribution of fresh and salt water on the globe.
- Construct explanations using evidence about the interactions of the hydrosphere, atmosphere, and geosphere in the process of the water cycle and the distribution of water on Earth.



- Engage in argument from evidence involving the process of condensation.

Obtain, evaluate, and communicate information from books and media and integrate that with firsthand experiences to construct explanations about the variables involved in the water cycle and climate.

## **STAGE 2- EVIDENCE OF LEARNING**

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### **Formative Assessment Suggestions**

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- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

### **Authentic Assessments Suggestions**

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#### **Investigation 1: The Sun**

- Survey
- Science notebook entries
- Response sheet
- Investigation 1 I-Check

### **Investigation 2: Planetary Systems**

- Science notebook entries
- Performance Assessment
- Response sheet
- Investigation 2 I-Check

### **Investigation 3: Earth's Atmosphere**

- Performance assessment
- Science notebook entries
- Investigation 3 I-Check

### **Investigation 4: Heating Earth**

- Science notebook entries
- Response sheet
- Performance assessment
- Investigation 4 I-Check

### **Investigation 5: Water Planet**

- Performance assessment
- Response sheet

Science notebook entries

## **Benchmark Assessments**

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Unit Posttest

## **STAGE 3- LEARNING PLAN**

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## **Instructional Map**

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Investigation 1: The Sun

Investigation 2: Planetary Systems

Investigation 3: Earth's Atmosphere

Investigation 4: Heating Earth

Investigation 5: Water Planet

### **Investigation 1: The Sun**

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#### **Investigation 1: Part 1- Shadow Shifting**

Students trace their shadows in the morning and afternoon, and compare the tracings. They use this information to determine the position of the Sun as it appears to move throughout the day.

Content:

- Shadows are the dark areas that result when light is blocked.
- Shadows change during the day because the position of the Sun changes in the sky.

#### **Investigation 1: Part 2- Sun Tracking**

Pairs of students construct Sun trackers. After using a compass to orient the Sun tracker north-south, students make hourly records of the position of the tip of the shadow cast by a golf tee. Back in the classroom, students use flashlights to reproduce the movement of the Sun throughout the day.

Content:

- Shadows change during the day because the position of the Sun changes in the sky.
- The length and direction of a shadow depends on the Sun's position in the sky.

### **Investigation 1: Part 3- Day and Night**

Students imagine one of their eyes as an observer on Earth and position themselves around a lamp to observe day and night. They discover that rotation of Earth results in day and night and, in the process, figure out which direction Earth rotates on its axis.

Content:

- Day is half of Earth's surface being illuminated by sunlight; night is half of Earth's surface in its own shadow.
- The cyclical change between day and night is the result of Earth's rotating around the stationary Sun.

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### **Investigation 2: Planetary Systems**

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#### **Investigation 2: Part 1- Night-Sky Observations**

Students take a mini-field trip to the schoolyard to look for the Moon. After recording the Moon's appearance, the class starts a Moon calendar, on which they will record the Moon's appearance every day for a month. Students observe the night sky for 4 days at home.

Content:

- The solar system includes a star, the Sun, and the objects that orbit it, including Earth, the Moon, seven other planets, their satellites, and smaller objects.

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#### **Investigation 2: Part 2- How Big and How Far?**

Students grapple with the size and distance relationships among Earth, the Moon, and the Sun. They work together to build a model of the Earth/Moon/Sun system.

Content:

- The Moon is much smaller than Earth and orbits at a distance equal to about 30 Earth diameters.
- The Sun is 12,000 Earth diameters away from Earth and is more than 100 times larger than Earth.

#### **Investigation 2: Part 3- Phases of the Moon**

Students analyze the Moon observations to discover the sequence of changes. They learn the names for the four specific phases and the intermediate phases. Students use a light source and sphere to simulate an Earth-Moon-Sun system and explore the cause of Moon phases.

Content:

- The Moon changes its appearance, or phase, in a regular pattern over 4 weeks.
- Moon phase is the portion of the illuminated half of the Moon that is visible from Earth.

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### **Investigation 2: Part 4- The Solar System**

Students work in pairs with a set of solar system cards. Based on previous knowledge, information on the cards, and information provided by the teacher, students organize the objects into a model of the solar system. Students observe a ball swinging in a circle on the end of a string as a model of gravity's effect. Gravity is introduced as the force that changes planets' direction of travel and produces circular orbits.

Content:

- The solar system includes a star, the Sun, and the objects that orbit it, including Earth, the Moon, seven other planets, their satellites, and smaller objects.
- The pulling force of gravity keeps the planets and other objects in orbit by continuously changing their direction of travel.

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### **Investigation 2: Part 5- Stars**

Students are introduced to constellations as traditional stars patterns. They identify images in patterns of stars and give them names. Students simulate Earth's rotation. While rotating, they observe the appearance of stars rising in the east, traveling across the sky, and setting in the west. Students observe a demonstration of the relationships and orientations of Earth, the Sun, and the Milky Way to explain why different stars are visible in different seasons. Students watch a video that shows how star brightness, distance, and alignment converge to produce constellations.

Content:

- Stars are at different distances from Earth. Stars are different sizes and have different brightnesses.
- A great deal of light travels through space to Earth from the Sun and from distant stars.
- Groups of stars form patterns called constellations.
- Stars (constellations) appear to move together across the night sky because of Earth's rotation.
- Different constellations are observed in the night sky during different seasons because Earth revolves around

the Sun.

### **Investigation 3: Earth's Atmosphere**

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#### **Investigation 3: Part 1- The Air Around Us**

Students take a close look at the air surrounding us. They explore the properties of air by working with syringes and tubes to discover that air takes up space and is compressible. Students discuss evidence that air is matter and has mass.

Content:

- Air is a mixture of gases held by gravity near Earth's surface.
- Air has mass, takes up space, and is compressible.

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#### **Investigation 3: Part 2- The Atmosphere**

Students study Earth's atmosphere, using diagrams, photos from space, and a reading. They are introduced to the atmosphere as a mixture of gases with properties that change with distance above Earth's surface.

Content:

- Most of Earth's air resides in the troposphere, the layer of the atmosphere closest to Earth's surface.
- Weather happens in the troposphere.

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#### **Investigation 3: Part 3- Local Weather**

Students review local weather reports and determine the variables that combine to produce the weather. They are introduced to weather instruments-a thermometer, barometer, hygrometer, compass, and wind vane. They use a digital weather station with a receiver outdoors to gather weather data, and develop a plan for acquiring daily data and sharing them with the class.

Content:

- Weather is the condition of Earth's atmosphere at a given time in a given place.

- Meteorology is the science of weather, and meteorologists are the scientists who study Earth's weather.
- Weather is described in terms of several variables: temperature, humidity, precipitation, wind, and air pressure.

#### **Investigation 4: Heating Earth**

##### **Investigation 4: Part 1- Heating Earth Materials**

Students set up an investigation to monitor temperature changes when solar energy is transferred to two earth materials: water and dry soil. Students record the temperature of the two materials in sunshine and in shade. They graph the data to discover that the temperature of the dry soil goes higher than water and cools to a lower temperature than that of water. The concept of uneven heating is introduced.

Content:

- The Sun is the major source of energy that heats Earth.
- The different energy-transferring properties of earth materials (soil and water) can lead to uneven heating of Earth's surface.

##### **Investigation 4: Part 2- Conduction**

Students observe two examples of heat transfer by conduction: from hot water to a container of cold water, and from one end of a metal strip to the other. Students discuss the mechanisms by which energy transfers to and from the air: radiation and reradiation from Earth's surface, and conduction between Earth's surface and air particles.

Content:

- The atmosphere is heated by conduction between Earth's surfaces and air particles as a result of contact.
- The atmosphere is heated by absorption of energy radiated directly from the Sun and reradiated from Earth's surfaces.

##### **Investigation 4: Part 3- Convection**

Students use a fluid, water, at different temperatures to discover the relationship between temperature and density. They put a layer of cold blue water on the bottom of a vial of room-temperature water. They put a bag of hot water against the vial and watch the blue water rise as it warms, cools, and descends, creating a convection current. Students

discuss how the same process results in wind on Earth.

Content:

- Convection is the circulation of fluid (liquid or gas) that results in energy transfer; cool masses sink, lifting warm masses.
- Convection currents are driven by uneven heating of Earth's surface.

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#### **Investigation 4: Part 4- Color and Energy Transfer**

Students set up solar water heaters using black and white collectors to see if color affects temperature change in water. They also set up open and covered solar water heaters to find out if exposure to air affects temperature change in water.

Content:

- A solar water heater is a system that uses solar energy to heat water.

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#### **Investigation 5: Water Planet**

##### **Investigation 5: Part 1- Condensation**

Students set up cups of ice water and room-temperature water and observe condensation on the ice-water cup. They investigate other systems to observe condensation on cold surfaces. They learn that water vapor in the air condenses into liquid dew (or frost) on cold surfaces.

Content:

- Condensation is the process by which gas (water vapor) changes into liquid (water).

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##### **Investigation 5: Part 2- Evaporation**

Students observe a demonstration in which two cups with equal amounts of water are placed on a balance. Both cups are open to the air, but one cup is under a lamp. Water temperatures are monitored over time. One day later, students find that more water evaporated from the cup that was heated by the lamp.



Content:

- Evaporation is the process by which liquid changes into gas.
- As temperature increases, the rate of evaporation increases.

### **Investigation 5: Part 3- Water Cycle**

Students consider why Earth is called that water planet. They toss an inflatable globe, keeping track of how often their fingers end up on water. They take part in a demonstration that shows the relative amounts of fresh water and salt water, and their distribution on Earth. They simulate the travels of a water drop through the water cycle.

Content:

- Most of Earth's water (97%) is salt water in the ocean; Earth's fresh water is found in many locations including the atmosphere, lakes and rivers, soil, ground ice, groundwater, and glaciers.
- Evaporation and condensation contribute to the movement of water through the water cycle, redistributing water over Earth's surface.
- The Sun's energy drives weather.

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### **Investigation 5: Part 4- Climate**

Students are introduced to climate and suggest schemes for describing world climate regions, based on their understanding of weather variables. They view a video to gather information on climate and compare their climate-region scheme to those of climatologists. Students develop an awareness about global climate change.

Content:

- Climate is the average or typical weather that can be expected to occur in a region of Earth's surface, based on long-term observation and data analysis.

## **Modifications/Differentiation of Instruction**

### Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion

- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

### Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

### Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

### Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary

- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

## 504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

## Modification Strategies

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- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook

- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-Direct
- Repeated Drill / Practice
- Shortened Assignments
- Teacher Notes
- Tutorials
- Use of Additional Reference Material
- Use of Audio Resources

## **High Preparation Differentiation**

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- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Menu Assignments
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

## **Low Preparation Differentiation**

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- Choice of Book / Activity
- Cubing Activities

- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Extend Skills
- Mini Workshops to Re-teach
- Open-ended Activities
- Think-Pair-Share by Interest
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Readiness
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

## **Horizontal Integration- Interdisciplinary Connections**

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### New Jersey Student Learning Standards for Mathematics

N-Q.A.Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
2. Define appropriate quantities for the purpose of descriptive modeling.
3. Choose the level of accuracy appropriate to limitations on measurement when reporting quantities.

N-CN.A. Perform arithmetic operations with complex numbers.

1. Know there is a complex number.
2. Use the commutative, associative, and distributive properties.

A-SSE.A. Interpret the structure of expressions

1. Interpret expressions that represent a quantity in terms of its context.

A-SSE.B. Write expressions in equivalent forms to solve problems.

1. Choose and produce an equivalent form of an expression to reveal and explain properties of the

quantity represented by the expression.

F-IF.A. Understand the concept of a function and use functional notation.

1. Understand that a function from one set to another set.

F-IF.B Interpret functions that arise in applications in terms of the context.

F-IF.C. Analyze functions using different representations

S-ID.A. Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on a real number line.

S-ID.B. Summarize, represent, and interpret data on two categorical and quantitative variables.

S-ID.C. Interpret linear models.

S-IC.A. Understand and evaluate random processes underlying statistical experiments.

S-IC.B. Make inferences and justify conclusions from surveys, experiments, and observational studies.

## English Language Arts Standards – Grade 5

RF 4: Read text with purpose and understanding.

RI 1: Ask and answer questions about key details.

RI 2: Identify main topic and retell key details.

RI 3: Describe the connection between two ideas.

RI 4: Ask and answer questions about unknown words.

RI 5: Identify the front cover, back cover, and title page of a book.

RI 6: Distinguish their own point of view from that of the author of the text.

RI 7: Describe the relationship between illustrations and the text.

RI 8: Identify the reasons an author gives to support points.

RI 9: Identify similarities in and differences between text on the same topic.

RI 10: Actively engage in group reading activities with purpose and understanding.

W 2: Write informative /explanatory text.

W 4: Produce clear and coherent writing.

W 5: Strengthen writing by revising and editing.

W 7: Conduct short research projects.

W 8: Gather information to answer a question.

W 9: Draw evidence from informational text to support reflection.

## 2020 New Jersey Student Learning Standards- Computer Science and Design Thinking

### Computer Science and Design Thinking Practices

CSDT.K-12.CSDTP1	Fostering an Inclusive Computing and Design Culture
CSDT.K-12.CSDTP2	Collaborating Around Computing and Design
CSDT.K-12.CSDTP3	Recognizing and Defining Computational Problems
CSDT.K-12.CSDTP4	Developing and Using Abstractions
CSDT.K-12.CSDTP5	Creating Computational Artifacts
CSDT.K-12.CSDTP6	Testing and Refining Computational Artifacts
CSDT.K-12.CSDTP7	Communicating About Computing and Design

### 8.2 Design Thinking

8.2.5.ED.1: Explain the functions of a system and its subsystems.

8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.

8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.

8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).

8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process.

8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process.

8.2.5.ITH.1: Explain how societal needs and wants influence the development and function of a product and a system.

8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have.

8.2.5.ITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use.



8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career.
<p>8.2.5.NT.1: Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem.</p> <p>8.2.5.NT.2: Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies.</p> <p>8.2.5.NT.3: Redesign an existing product for a different purpose in a collaborative team.</p> <p>8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies.</p>
<p>8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.</p> <p>8.2.5.ETW.2: Describe ways that various technologies are used to reduce improper use of resources.</p> <p>8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.</p> <p>8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment.</p> <p>8.2.5.ETW.5: Identify the impact of a specific technology on the environment and determine what can be done to increase positive effects and to reduce any negative effects, such as climate change.</p>
8.2.5.EC.1: Analyze how technology has contributed to or reduced inequities in local and global communities and determine its short- and long-term effects.

## **2020 New Jersey Student Learning Standards- Career Readiness, Life Literacies, and Key Skills**

### **Career Readiness, Life Literacies, and Key Skills Practices**

CRP.K-12.CRP1	Act as responsible and contributing community members and employee.
CRP.K-12.CRP2	Attend to financial well-being.
CRP.K-12.CRP3	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP4	Demonstrate creativity and innovation.
CRP.K-12.CRP5	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP6	Model integrity, ethical leadership and effective management.

CRP.K-12.CRP7	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP8	Use technology to enhance productivity, increase collaboration and communicate effectively.
CRP.K-12.CRP9	Work productively in teams while using cultural/global competence.

## 9.2 Career Awareness and Planning

9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.

9.2.5.CAP.2: Identify how you might like to earn an income.

9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.

9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

## 9.4 Life Literacies and Key Skills

9.4.5.Cl.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3, 7.1.NM.IPERS.6).

9.4.5.Cl.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).

9.4.5.Cl.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).

9.4.5.Cl.4: Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).

9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).

9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem (e.g., 2.1.5.CHSS.1, 4-ESS3-1).

9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).

9.4.5.DC.1: Explain the need for and use of copyrights.

9.4.5.DC.2: Provide attribution according to intellectual property rights guidelines using public domain or creative commons media.

9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have copyright restrictions.

9.4.5.DC.4: Model safe, legal, and ethical behavior when using online or offline technology (e.g., 8.1.5.NI.2).

9.4.5.DC.5: Identify the characteristics of a positive and negative online identity and the lasting implications of online activity.

9.4.5.DC.6: Compare and contrast how digital tools have changed social interactions (e.g., 8.1.5.IC.1).

9.4.5.DC.7: Explain how posting and commenting in social spaces can have positive or negative consequences.

9.4.5.DC.8: Propose ways local and global communities can engage digitally to participate in and promote climate action (e.g., 6.3.5.GeoHE.1).

9.4.5.IML.1: Evaluate digital sources for accuracy, perspective, credibility and relevance (e.g., *Social Studies Practice* - Gathering and Evaluating Sources).

9.4.5.IML.2: Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3).

9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data.

9.4.5.IML.4: Determine the impact of implicit and explicit media messages on individuals, groups, and society as a whole.

9.4.5.IML.5: Distinguish how media are used by individuals, groups, and organizations for varying purposes. (e.g., 1.3A.5.R1a).

9.4.5.IML.6: Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions (e.g., RI.5.7, 6.1.5.HistoryCC.7, 7.1.NM. IPRET.5).

9.4.5.IML.7: Evaluate the degree to which information meets a need including social emotional learning, academic, and social (e.g., 2.2.5. PF.5).

9.4.5.TL.1: Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each.

9.4.5.TL.2: Sort and filter data in a spreadsheet to analyze findings.

9.4.5.TL.3: Format a document using a word processing application to enhance text, change page formatting, and include appropriate images graphics, or symbols.

9.4.5.TL.4: Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).

9.4.5.TL.5: Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).

## **Vertical Integration- Discipline Mapping**

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ESS1- Grade 1: Air and Weather

Grade 2: Pebbles, Sand, and Silt

Grade 4: Soils, Rocks, and Landforms

Grade 6: Weather and Water

Grade 7: Planetary Science

ESS2-Kindergarten: Trees and Weather; Animals Two by Two

Grade 1: Air and Weather

Grade 2: Pebbles, Sand, and Silt

Grade 3: Water and Climate

Grade 4: Soils, Rocks, and Landforms

Grade 6: Weather and Water

Grade 7: Planetary Science

Grade 8: Earth's History

ESS3-Kindergarten: Trees and Weather; Animals Two by Two

Grade 3: Water and Climate

Grade 4: Environments

Grade 6: Weather and Water

Grade 8: Earth's History

PS1- Grade 1: Sound and Light

Grade 2: Solids and Liquids; Pebbles, Sand, and Silt

Grade 3: Water and Climate

PS2-Kindergarten: Materials and Motion

Grade 3: Motion and Matter

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## **Additional Materials**

Visit [Fossweb.com](http://Fossweb.com) for websites and additional readings.