Englewood Public School District
Science
Grade 6
Second Marking Period

Unit 2: Earth Systems – Rocks and Minerals

Overview: Students use practices to understand the significant and complex issues surrounding human uses of rock and mineral resources and the resulting impacts on the development of these resources. Students also understand that the distribution of these resources is uneven due to past and current geosciences processes or removal by humans. The crosscutting concepts of *patterns, cause and effect*, and *stability and change* are called out as organizing concepts for these disciplinary core ideas. In this unit of study students are expected to demonstrate proficiency in *asking questions, analyzing and interpreting data, constructing explanations, and designing solutions.* Students are also expected to use these practices to demonstrate understanding of the core ideas.

Time Frame: 10 to 15 Days

Enduring Understandings:
Rocks and minerals are unevenly distributed resources due to past and current geologic processes

Essential Questions:
Why aren't rocks and minerals distributed evenly across the world?
How might we treat resources if we thought about the Earth as a spaceship on an extended survey of the solar system? (How would astronauts manage their resources?)

Standards	Topics and Objectives	Activities	Resources	Assessments
(MS-ESS2-1) Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. **(MS-ESS3-1) Construct a scientific explanation based on**	**Topics** Mineral Properties Mineral Distribution Uses of Minerals Twenty-First Century Themes and Skills include: • The Four C's • Life and Career Skills	Students will complete the text activities: 1. Classifying Minerals activity (p120) 2. Finding the Density of Minerals Lab (p123) 3. Crystal Hands Lab (p125) 4. Mouthful of Minerals Lab (p136) Students will explore the National Mineral Information Center and	**Text:** Prentice Hall Science Explorer: Inside Earth **Materials:** For Classifying Minerals: • Penny • Samples of talc, calcite, and quartz For Finding the Density of Minerals Lab	**Formative Assessments**: Do Now/Ticket to Leave Class Discussion Journal Entries **Benchmark Assessments**: Exact Path **Summative Assessments:**

evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. **(MS-ESS3-4)** **Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.**	• Information and Media literacy • Global Awareness • Environmental Literacy **Objectives** Students will: Identify properties of minerals Describe the process of mineral formation Cite reasons for areas of high and low mineral distribution on a map List uses of minerals	Satellite Images of Environmental Change websites to explore mineral distribution and usage (MS-ESS3-1, 8.1.8.A.3) Students will summarize the issue of ocean mineral rights and propose possible solutions to the issue during the Who Own the Ocean's Minerals? Activity (p129) ((MS-ESS3-4) Students will view the videos Mineral Song and Mineral Rock Anthem (MS-ESS2-1,RST.6-8.9) **Enrichment Activities:** Student will explore the economics of environmentally friendly mining by completing the Chocolate Chip Cookie Mining Activity. Student's will calculate the total amount of minerals they consume in a lifetime and use the information to think critically about mineral supply and demand during the Personal Mineral Consumption Activity. (9.2.8.A.4, RST.6-8.1)	• Graduated cylinder, 100mL, • 3 mineral samples; pyrite, quartz, galena • Water • Balance For Crystal Hands: • Table salt solution • Epson salt solution • 2 shallow pans • Large sheet of black construction paper For Mouthful of Minerals: • Samples of three different kinds of toothpaste • Worn-out toothbrush • Tap water • A ceramic tile stained on the unglazed side with a felt-tip marker or pen For Chocolate Chip Cookie Mining Enrichment Activity: • Play money • Large square graph paper • 3 different brands of chocolate chip cookies • Flat toothpicks • Round toothpicks • Paper clips • Pencils **Websites:** • National Minerals Information Center • USGS Satellite Images of Environmental Change • Minerals in Our Environment Poster	Students will be evaluated on their ability to describe the different properties of minerals in the Classifying Minerals activity. Students will complete the assessments in the *Density of Minerals Lab* and explain how the density of a mineral is related to its other properties. Students will be evaluated on their ability to describe the process of mineral formation and compare and contrast the crystal structures of minerals after completing the Crystal Hands Lab. Students will complete the assessments in the *Mouth Full Of Minerals Lab* and write a lab report demonstrating their understanding of the uses of different minerals. Students will identify reasons for areas of high and low mineral distribution on a map after exploring National Mineral Information Center and Satellite Images of Environmental Change websites. Students will be evaluated based on their summarization of the issue of ocean mineral rights and feasibility of

			• USGS Educational Resources for Secondary Grades (7–12): **Videos:** • Mineral Song • Mineral Rock Anthem **Enrichment Lesson Plans:** Chocolate Chip Cookie Mining Activity Personal Mineral Consumption Activity	proposed solutions. **Alternative Assessments**: Simulations Graphic Organizers Journal Writing Learning/Response Logs
	Topics Rock Formation Twenty-First Century Themes and Skills include: • The Four C's • Life and Career Skills • Environmental Literacy **Objectives** Students will: Identify the three main types of rocks Explain how the rock cycle demonstrates the cycling of Earth's materials	Students will complete the text activities: 1. Discover Activity (p144) How do rocks compare? 2. Discover Activity (p148) How do Igneous Rocks Form? 3. Discover Activity (p152) How does pressure affect particles of rocks? 4. Mystery Rocks Lab (p163) 5. Testing Rock Flooring Lab (p167) ((MS-ESS3-4, 9.2.8.A.4) Students will simulate the rock cycle with the Crayon Rock Cycle Lab after watching the process demonstrated in the Crayon Rock Cycle Lab Video (8.1.8.A.3) Students will view the Rock Cycle Song video to review concepts **Enrichment Activities**	**Text:** Prentice Hall Science Explorer: Inside Earth **Materials:** For Discover Activity (p144) How do rocks compare? • Samples of marble and conglomerate • Hand lens • Penny For Discover Activity (p148) How do Igneous Rocks Form? • Samples of granite and obsidian • Hand lens For Discover Activity (p152) How does pressure affect particles of rocks? • Paper • Slice of bread • Stack of heavy books For Mystery Rocks Lab (p163)	**Formative Assessments:** Do Now/Ticket to Leave Class Discussion Journal Entries **Summative Assessments:** Students' progress will be identified based on responses to Discover Activity "Think It Over" conclusions. Students will be evaluated on Reponses to Mystery Rocks Lab (p163) and Testing Rock Flooring Lab (p167) to assess knowledge of different rock types. Students will receive a grade for accurate completion of the Crayon Rock Cycle Lab and questions. Student will create a diagram

		Students will create a classroom rock collection (p143)	• 1 mystery rock • 2 unknown igneous rocks • 2 unknown sedimentary rocks • 2 unknown metamorphic rocks • Hand lens For Testing Rock Flooring Lab (p167): • Steel nail • Wire brush • Water • Plastic dropper • Hand lens • Sample of igneous, sedimentary and metamorphic rocks with a flat surface • Greasy matter like butter and crayons • Materials that will stain like ink and paint For Crayon Rock Cycle: • 3 crayons • Coin or plastic knife • Hot plate • Paper towels • Aluminum foil • Water **Websites:** • http://www.scilinks.org/ • http://www.phschool.com/ • http://www.digintomining.com/teacher-resources • https://miningmatters.ca/resources/education/activities-and-lesson-plans	of the rock cycle to demonstrate their understanding of the cyclical nature of the process. **Alternative Assessments**: Students will support an argument with evidence, data, or a model. Checklists Journals Peer Reviews Graphic organizers Self-Assessments Visual Representations

Video:

- Crayon Rock Cycle Lab Video
- https://www.youtube.com/watch?v=39BFPtCQgwE

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

ELL/ESL students: Students will be supported according to the recommendations for "can do's" as outlined by WIDA – https://www.wida.us/standards/CAN_DOs/
This particular unit has limited language barriers due to the physical nature of the curriculum.

Students at risk of school failure: Formative and summative data will be used to monitor student success at first signs of failure student work will be Reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time and will be made available with a certified instructor to aid students in reaching the standards.

Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges related to the complexity In planning and carrying out investigations and analyzing and interpreting data.

English Language Learners	Special Education	At-Risk	Gifted and Talented
● Speak and display terminology ● Teacher modeling ● Peer modeling ● Provide ELL students with multiple literacy strategies. ● Word walls ● Use peer readers ● Give page numbers to	● Utilize modifications & accommodations delineated in the student's IEP ● Work with paraprofessional ● Use multi-sensory teaching approaches. ● Work with a partner ● Provide concrete	● Using visual demonstrations, illustrations, and models ● Give directions/instructions verbally and in simple written format. Oral prompts can be given. ● Peer Support ● Increase one on one time ● Teachers may modify instructions by modeling what the student is expected	● Curriculum compacting ● Inquiry-based instruction ● Independent study ● Higher order thinking skills ● Adjusting the pace of lessons ● Interest based content ● Real world scenarios ● Student Driven Instruction ● Engage students with a variety of Science and Engineering practices to

help the students find answers ● Provide a computer for written work ● Provide two sets of textbooks, one for home and one for school ● Provide visual aides ● Provide additional time to complete a task ● Use graphic organizers	examples ● Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA). ● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).	to do ● Instructions may be printed out in large print and hung up for the student to see during the time of the lesson. ● Review behavior expectations and make adjustments for personal space or other behaviors as needed. ● Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).	provide students with multiple entry points and multiple ways to demonstrate their understandings. ● Use project-based science learning to connect science with observable phenomena. ● Structure the learning around explaining or solving a social or community-based issue. ● Collaborate with after-school programs or clubs to extend learning opportunities.

Interdisciplinary Connections:

ELA-NJSLS/ELA:

RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-4),(MS-ESS2-2)

WHST.6-8.7: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS1-4)**,**(MS-ESS2-2)

RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a

flowchart, diagram, model, graph, or table). (MS-ESS2-3)

RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3)

Mathematics:

6.EE.6: Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

Career Ready Practices:
CRP4: Communicate clearly and effectively and with reason.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.

Integration of 21st century Standards NJSLS 9:
9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Integration of Technology Standards NJSLS 8:
8.1.8.A.3: Use and/or develop a simulation that provides an environment to solve a real-world problem or theory.

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-ESS2-1),(MS-ESS2-6)
- Develop a model to describe unobservable mechanisms. (MS-ESS2-4)

Planning and Carrying Out Investigations

Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth

- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. *(HS.ESS1.C GBE),(secondary to MS-ESS2-3)*

ESS2.A: Earth's Materials and Systems

- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)

Crosscutting Concepts

Patterns

- Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3)

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)

Scale Proportion and Quantity

- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS2-2)

support explanations or solutions. • Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5) **Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2)	• The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** • Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)	**Systems and System Models** • Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6) **Energy and Matter** • Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4) **Stability and Change** • Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)

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Unit 3: Earth's Waters

Overview: This unit is broken down into two sub-ideas: Earth's large-scale systems interactions and the roles of water in Earth's surface processes. Students make sense of how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. A systems approach is also important here, examining the feedbacks between systems as energy from the Sun is transferred between systems and circulates though the ocean and atmosphere. The crosscutting concepts of cause and effect, systems and system models, and energy and matter are called out as frameworks for understanding the disciplinary core ideas. In this unit, students are expected to demonstrate proficiency in developing and using models and planning and carrying out investigations as they make sense of the disciplinary core ideas. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Time Frame: 25 to 30 Days

Enduring Understandings:
The cyclical flow of water is driven by energy from the sun and gravity.

Essential Questions:
What are the processes involved in the cycling of water through Earth's systems?
How to people use Earth's water supply?
How do ocean currents form and affect climate?

Standards	Topics and Objectives	Activities	Resources	Assessments
(MS-ESS2-4) Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.	**Topics** Properties of Water Water Cycle Twenty-First Century Themes and Skills include: • The Four C's • Life and Career Skills • Global Awareness	Students will complete the text activities: 1. Discover Activity (p6) What are some properties of water? 2. Follow That String Lab (p9) 3. Calculating How Earth's Water is Distributed Lab (p15) 4. Water from Trees Lab (p18)	**Text:** Prentice Hall Science Explorer: Earth's Waters **Materials:** For Discover Activity (p6) What are some properties of water? • Plastic cups • Water • Vegetable oil	**Formative Assessments:** Do Now/Ticket to Leave Class Discussion Journal Entries **Benchmark Assessment:** Exact Path **Summative Assessments:** Students' understanding of

- Environmental Literacy

Objectives

Students will:

Explain how a water molecule's structure is related to its properties.

Locate water sources on Earth.

Explain and model how water moves through the water cycle.

5. Discover Activity (p 28) Wet or dry?
6. Natural Filter Lab (p32)
7. An Artesian Well (p38) PBL Art class

Students will watch and discuss How Polarity Makes Water Behave Strangely. (CRP.8)

Students will interact with the water cycle by visiting the Interactive Water Cycle and Study Jams! Water Cycle websites. (8.1.8.A.3)

Enrichment Activities:
Students will participate in the Water Cycle Boogie Song and dance – during the song chorus student raise both hands to represent evaporation, bring hands together above their head to represent condensation and cloud formation, and wiggle fingers while bringing hands down to represent precipitation).

Project – Every Drop Counts - Calculate Water Usage (p 5)

- Paper towels
- Plastic droppers

For Follow That String Lab (p9):
- String
- Plastic cups
- Plastic pitcher
- Tap water

For Calculating How Earth's Water is Distributed Lab (p15)
- 1-liter plastic bottle
- Water
- Graduated cylinder
- 5 plastic cups
- Plastic dropper
- Textbook

For Water from Trees Lab (p18):
- 3 plastic sandwich bags
- Balance
- 3 small pebbles
- 3 twist ties

For Discover Activity (p 28) Wet or Dry?:
- 2 kitchen sponges
- Pan
- Water
- Paper cups

For Natural Filter Lab (p32):
- Newspaper
- Loaf size pan
- Soil
- Sponge

For An Artesian Well (p38) PBL Art class:
- Loaf pan
- Clay
- Sand
- Funnel
- Straws

the properties of water will be gauged on responses to conclusion questions for *Discover Activity (p6) What are some properties of water?* and *Follow That String Lab (p9)*.

Students will demonstrate understanding of water distribution on Earth by completing *Calculating How Earth's Water is Distributed Lab (p15)* and *Water from Trees Lab (p18.)*

Student will model ways that water travels through the water cycle by completing *Discover Activity (p 28) Wet or dry?*, *Natural Filter Lab (p32)*, and *An Artesian Well (p38) PBL Art class.*

Student's responses to the Study Jams! Water Cycle assessment will demonstrate their knowledge of the water cycle.

Alternative Assessments:

Students will support an argument with evidence, data, or a model.

Checklists

Journals

Peer Reviews

			Websites: • Interactive Water Cycle • Study Jams! Water Cycle • USGS Educational Resources for Secondary Grades (7–12): **Videos:** • How Polarity Makes Water Behave Strangely • Water Cycle Boogie Song **Enrichment Lesson Plans:** Project – Every Drop Counts - Calculate Water Usage (p 5)	Graphic organizers Self-Assessments Visual Representations
(MS-ESS3-3) **Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.** **(MS-ESS3-4)** **Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** **(MS-ETS1-1)** **Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural**	**Topics** Freshwater resources Twenty-First Century Themes and Skills include: • The Four C's • Life and Career Skills • Environmental Literacy • Global Awareness **Objectives** Students will: Analyze water supply and demand. Evaluate water conservation strategies. Identify factors that affect water quality. Identify sources of water. pollution and propose	Students will complete the text activities: 1. Discover Activity (p48) Can you find a balance? 2. Getting the Salt Out Lab (p56) 3. Moving Water Uphill Lab (p62) 4. Testing Water Lab (p66) 5. Discover Activity (p68) Will Pollution Reach Your Wells? 6. How Do Algae Grow? Lab (p74) 7. Discover Activity (p78) How Does Dryness Affect Soil? 8. Inferring (p81) 9. Discover Activity (p84) Can Water Do Work? (MS-ESS3-3, (MS-ETS1-1) Students will make observations and develop hypotheses about the amount of water available for human use	**Text:** Prentice Hall Science Explorer: Earth's Waters **Materials:** For Discover Activity (p48) Can you find a balance?: • Large measuring cup • Water • Plastic dropper • 2 small bowls • Stopwatch • Spoon For Getting the Salt Out Lab (p56) • Hot plate • Aluminum foil • 250-mL beaker • Plastic spoon • Water, 100mL • Shallow pan • Ice • Plastic tube • 500mL flask • Stirring rod	**Formative Assessments**: Do Now/Ticket to Leave Class Discussion Journal Entries **Summative Assessments**: Students' understanding of water supply and demand will be assessed based on responses to conclusion questions for the *Discover Activity (p48) Can you find a balance?*, *Getting the Salt Out Lab (p56), and* Water Conservation Activity. Students will demonstrate understanding of water quality in responses to the *Testing Water Lab (p66).* Students will be able to identify sources of pollution and propose solutions during

environment that may limit possible solutions. **(MS-ETS1-2)** **Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.** **(MS-ETS1-3)** **Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.** **(MS-ETS1-4)** **Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**	solutions. Model solutions for meeting the demand for fresh water.	during the Water Conservation Activity. (MS-ETS1-2, WHST.6-8.2) Students will interact with the Where is Earth's Water? website. (MS-ESS3-4, RST.6-8.7) Students will design a water delivery system to aid developing communities in the Gravity-Fed Water System Activity. (MS-ETS1-3,CRP4) **Enrichment Activities** Students will model the amount of "greywater" generated in a home and propose solutions to reduce water waste in the Shades of Grey(water) activity. (MS-ETS1-4, 6.EE.6)	• Rubber stopper • Salt • Rubber tubing, 50cm For Moving Water Uphill Lab (p62) • Stack of books • 2 bowls • Plastic tubing For Testing Water Lab (p66): • Hot plate • Liquid soap • Ruler • Wax pencil • Tap, distilled, spring and mineral water (200mL each), • 4 250mL beakers, • 4 test tubes w/stoppers • 4 pieces pH paper • Test tube rack • 25mL graduated cylinder • PH indicator chart • 4 paper cups/person For Discover Activity (p68) Will Pollution Reach Your Wells?: • Coffee filters • Permanent markers • Paper plates • Sponge • Food coloring • Water For How Do Algae Grow? Lab (p74) • Two jars • Tap water • Pond or aquarium water • Graduated cylinder • Liquid fertilizer	the *Discover Activity (p68) Will Pollution Reach Your Wells?* and *How Do Algae Grow? Lab (p74)*. Students will be evaluated on their design for the Gravity-Fed Water System. Activity. **Alternative Assessments**: Students will support an argument with evidence, data, or a model. Checklists Journals Peer Reviews

For Discover Activity (p78)
How Does Dryness Affect Soil?

- Soil
- Pan
- Water
- Lamp

For Inferring (p81):

- Basin
- Plastic cups
- Water
- Funnel

For Discover Activity (p84)
Can Water Do Work?:

- Large plastic trash bags
- Cylinder shaped objects
- Corks
- Spools
- Marbles
- Balls
- Empty cans
- Plant sprayer or spray bottle with spray and stream settings
- Water

For Water Conservation Activity:

- Two 2-liter bottles full of water
- Food coloring (dark color preferable)
- Measuring cups (for measuring amounts ranging from 50 ml to 14.5 ml)
- Five clear containers (to hold water ranging in volume from 1,950 ml to 0.5 ml)
- Markers and tape for making labels
- Map of your local

watershed (See Surf Your Watershed for maps)
- Water Use Worksheet PDF Document
- Notebooks for student work

For Gravity-Fed Water System Activity:

For introductory teacher presentation:

- Gravity-Fed Water Systems Presentation (a PowerPoint® file)
- Computer and LCD projector to show a PowerPoint presentation
- Drill with ½" bit to start holes in tubs
- Utility or Exacto® knife to further widen holes

Each group needs:

- Access to water or, if necessary, a 5-gallon bucket filled with water
- Safety glasses/goggles, one per student
- Gravity-Fed System Design Worksheet, one per student
- Turbidity chart (to measure cloudiness), on the last slide of the presentation
- 2 calculators, for two students to check calculations
- 2 6-ft long 0.25" or 0.5" clear polymer tubing (or 1 of each; available at hardware stores)
- 1 3-ft long 0.5" clear polymer tubing to represent the tap (available at hardware stores)

- 5 0.25-in and 5 0.5-in threaded hose barbs (thread on one end and barbed on the other), with o-ring that goes over the threaded section, along with a metal or plastic nut that threads on to the threaded section (available at hardware stores)
- 3 clear 5-gallon tubs, holes drilled for the following; for more information, see the Procedures section and Figure 1 (tubs available at hardware/discount stores): pipe adaptors for exit of spring catchment basin or dam (tub 1), entrance and exit for sedimentation tank (tub 2), entrance only for "community" tank (tub 3)
- 2 cups of dirt (sediment)
- 2 stopwatches to measure flow rate
- (5) 2' x 2' cardboard boxes, or larger cardboard boxes (to place tanks on)
- 1 clear plastic cup (end user) (note: this is the cup of water that students fill with tub 3 water to insinuate drinking)

To share with the entire class:

- 12 6-ft long 0.25" clear polymer tubing (available at hardware stores)
- 12 6-ft long 0.5" clear polymer tubing (available at hardware stores)
- 3 hoses connected to

			classroom taps to fill tub 1 (dam/catchment) **Website:** Where is Earth's Water? https://www.epa.gov/greeningepa/water-conservation-epa http://www.thewaterpage.com/water-conservation.htm https://www.watercalculator.org/education/recommended-water-websites/ **Video:** See Water Conservation Activity https://www.youtube.com/watch?v=B4ZR53n0D8I **Enrichment Lesson Plans and Materials:** See Shades of Grey (water)	
(MS-ESS2-6) **Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.**	**Topics** Ocean Salinity Ocean Currents Twenty-First Century Themes and Skills include: • The Four C's • Life and Career Skills • Environmental Literacy • Global Awareness **Objectives** Students will: Model how differences in ocean salinity and temperature affect ocean currents.	Students will complete the text activities: 1. Discover Activity (p108) 2. Investigating Changes In Density Lab (p114) 3. Discover Activity (p116) Which is more dense? 4. Modeling Ocean Currents Lab (p122) (also see 5E Ocean Currents Lab) **Enrichment Activity:** Students will explore ocean current models on the Ocean Currents Explorer website (MS-ESS2-6, 8.1.8.A.3)	**Text:** Prentice Hall Science Explorer: Earth's Waters **Materials:** For Discover Activity (p108) Will the egg sink or float?: • Two beakers or jars • Measuring spoons • Salt • 2 uncooked eggs For Investigating Changes In Density Lab (p114): • Thumbtacks • 250mL graduated cylinder • Unsharpened pencil with an eraser • Metric ruler • Fine-point permanent	**Formative Assessments:** Do Now/Ticket to Leave Class Discussion Journal Entries **Summative Assessment:** Students will receive a grade for their *Modeling Ocean Currents Lab* conclusion questions. **Alternative Assessments**: Students will support an argument with evidence, data, or a model. Checklists

		marker • Ice • Balance • Spoon • Salt For Discover Activity (p116) Which is more dense? • Plastic container • Water • Food coloring For Modeling Ocean Currents Lab (p122): • Rectangular baking tray, • Chalk • Modeling clay, 3 sticks, • Ruler • Permanent marker • Hole puncher • Newspaper • Blue & red construction paper • Light reflecting rheoscopic fluid, 400mL, or water and food coloring **Websites:** • Ocean Currents Explorer • 5E Ocean Currents Lab **Video:** See Ocean Currents Explorer or 5E Ocean Currents Lab	Journals Peer Reviews Graphic organizers Self-Assessments Visual Representations

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning.
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Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges related to the complexity In planning and carrying out investigations and analyzing and interpreting data.

English Language Learners	**Special Education**	**At-Risk**	**Gifted and Talented**
● Speak and display terminology ● Teacher modeling ● Peer modeling ● Provide ELL students with multiple literacy strategies. ● Word walls ● Use peer readers ● Give page numbers to help the students find answers ● Provide a computer for written work ● Provide two sets of textbooks, one for home and one for school ● Provide visual aides ● Provide additional time to complete a task ● Use graphic organizers	● Utilize modifications & accommodations delineated in the student's IEP ● Work with paraprofessional ● Use multi-sensory teaching approaches. ● Work with a partner ● Provide concrete examples ● Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA). ● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia,	● Using visual demonstrations, illustrations, and models ● Give directions/instructions verbally and in simple written format. Oral prompts can be given. ● Peer Support ● Increase one on one time ● Teachers may modify instructions by modeling what the student is expected to do ● Instructions may be printed out in large print and hung up for the student to see during the time of the lesson. ● Review behavior expectations and make adjustments for personal space or other behaviors as needed. ● Structure lessons around questions that are authentic, relate to students' interests, social/family background	● Curriculum compacting ● Inquiry-based instruction ● Independent study ● Higher order thinking skills ● Adjusting the pace of lessons ● Interest based content ● Real world scenarios ● Student Driven Instruction ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. ● Use project-based science learning to connect science with observable phenomena. ● Structure the learning around explaining or solving a social or community-based issue. ● Collaborate with after-school programs or clubs to extend learning opportunities.

	modeling).	and knowledge of their community. • Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).	

Interdisciplinary Connections:

ELA-NJSLS/ELA:

RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-4),(MS-ESS2-2)

WHST.6-8.7: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS1-4)**,**(MS-ESS2-2)

RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS2-3)

RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3)

Mathematics:

6.EE.6: Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

Career Ready Practices:
CRP4: Communicate clearly and effectively and with reason.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.

Integration of 21st century Standards NJSLS 9:

9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Integration of Technology Standards NJSLS 8:

8.1.8.A.3: Use and/or develop a simulation that provides an environment to solve a real-world problem or theory.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Develop and use a model to describe phenomena. (MS-ESS2-6) • Develop a model to describe unobservable mechanisms. (MS-ESS2-4) **Planning and Carrying Out Investigations** • Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5)	**ESS2.C: The Roles of Water in Earth's Surface Processes** • Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4) • The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5) • Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) • Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) **ESS2.D: Weather and Climate** • Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living	**Cause and Effect** • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5) **Systems and System Models** • Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6) **Energy and Matter** • Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)

	things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6) • Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5) • The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)	