Unit 04: Watery Planet

Content Area: **Template**
Course(s):
Time Period: **Full Year**
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Standards Alignment

New Jersey Student Learning Standards

Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.

Ask questions about what would happen if a variable is changed.

Identify scientific (testable) and non-scientific (non-testable) questions.

Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.

Use prior knowledge to describe problems that can be solved.

Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.

Practice 2. Developing and using models
Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

Identify limitations of models.

Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.

Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.

Develop and/or use models to describe and/or predict phenomena.

Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.

Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.

Practice 3. Planning and carrying out investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

Evaluate appropriate methods and/or tools for collecting data.

Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

Make predictions about what would happen if a variable changes.

Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.

Practice 4. Analyzing and interpreting data
Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.

Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.

Analyze data to refine a problem statement or the design of a proposed object, tool, or process.

Use data to evaluate and refine design solutions.

Practice 5. Using mathematics and computational thinking
Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success.

Organize simple data sets to reveal patterns that suggest relationships.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard).

Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.

Identify the evidence that supports particular points in an explanation.

Apply scientific ideas to solve design problems.

Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

Practice 7. Engaging in argument from evidence
Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

Compare and refine arguments based on an evaluation of the evidence presented.

Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.

Construct and/or support an argument with evidence, data, and/or a model.

Use data to evaluate claims about cause and effect.

Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Practice 8. Obtaining, evaluating, and communicating information
Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.

Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.

Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.

Connections to the Nature of Science: Most Closely Associated with Practices
Scientific Investigations Use a Variety of Methods

Science investigations use a variety of methods, tools, and techniques.

Scientific Knowledge is Based on Empirical Evidence

Science findings are based on recognizing patterns.

Science uses tools and technologies to make accurate measurements and observations.

Scientific Knowledge is Open to Revision in Light of New Evidence

Science explanations can change based on new evidence.

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Science theories are based on a body of evidence and many tests.

Science explanations describe the mechanisms for natural events.

Crosscutting Statements
1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.

Patterns of change can be used to make predictions.

Patterns can be used as evidence to support an explanation.

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

Cause and effect relationships are routinely identified, tested, and used to explain change.

Events that occur together with regularity might or might not be a cause and effect relationship.

3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.

4. Systems and System Models – A system is an organized group of related objects or components; models can

be used for understanding and predicting the behavior of systems.

A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.

A system can be described in terms of its components and their interactions.

Connections to Engineering, Technology and Applications of Science
Interdependence of Science, Engineering, and Technology

Science and technology support each other.

Tools and instruments are used to answer scientific questions, while scientific discoveries lead to the development of new technologies.

Influence of Engineering, Technology, and Science and the Natural World

Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

When new technologies become available, they can bring about changes in the way people live and interact with one another.

Connections to the Nature of Science: Most Closely Associated with Crosscutting Concepts
Science is a Way of Knowing

Science is both a body of knowledge and processes that add new knowledge.

Science is a way of knowing that is used by many people.

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

Science assumes consistent patterns in natural systems.

Basic laws of nature are the same everywhere in the universe.

Science is a Human Endeavor

Most scientists and engineers work in teams.

Science affects everyday life.

Creativity and imagination are important to science.

ESS2: Earth's Systems
ESS2.C: The Roles of Water in Earth's Surface Processes

Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)

ESS3: Earth and Human Activity
ESS3.C: Human Impacts on Earth Systems

Human activities in agriculture, industry,and everyday life have had major effects on the land, vegetation, streams, ocean, air,and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

ETS1: Engineering Design
ETS1.A: Defining and Delimiting an Engineering Problem

Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria).Different proposals for

solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1) (secondary to 4-PS3-4)

ETS1.B: Developing Possible Solutions

Research on a problem should be carried out before beginning to design a solution.Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)

At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.(3-5-ETS1-2)

ETS1.C: Optimizing the Design Solution

Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3) (secondary to 4-PS4-3)

SCI.4.ETS1.A	Defining Engineering Problems
SCI.2.ETS1.B	Developing Possible Solutions
SCI.2-ESS2	Earth's Systems
SCI.2.ETS1.C	Optimizing the Design Solution
SCI.2.ESS2.C	The Roles of Water in Earth's Surface Processes
SCI.5-ESS3	Earth and Human Activity
SCI.5.ESS3.C	Human Impacts on Earth Systems
3-5-ETS1	Engineering Design

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.1.5	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

TECH.8.1.5.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
TECH.8.2.5	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.5.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.5.B. 6	Compare and discuss how technologies have influenced history in the past century.
TECH.8.2.5.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
TECH.8.2.5.D.3	Follow step by step directions to assemble a product or solve a problem.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

LA.K-12.NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
	Craft and Structure
LA.K-12.NJSLSA.R4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
LA.K-12.NJSLSA.R6	Assess how point of view or purpose shapes the content and style of a text.
LA.RI.5.3	Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
LA.RI.5.4	Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.
LA.RI.5.6	Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.
LA.K-12.NJSLSA.SL	Speaking and Listening
	Comprehension and Collaboration
LA.K-12.NJSLSA.SL1	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
LA.K-12.NJSLSA.SL2	Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
LA.K-12.NJSLSA.L	Language
	Vocabulary Acquisition and Use
LA.K-12.NJSLSA.L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
LA.SL.5.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and

	teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.
LA.SL.5.1.A	Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
LA.SL.5.1.B	Follow agreed-upon rules for discussions and carry out assigned roles.
LA.SL.5.1.C	Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
LA.SL.5.1.D	Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
LA.SL.5.2	Summarize a written text read aloud or information presented in diverse media and formats (e.g., visually, quantitatively, and orally).
LA.L.5.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit…

This unit helps students develop the idea that water is a profoundly important natural resource, but one which requires surprising ingenuity to find and maintain.

Meaning

Essential Questions

Essential Questions

• How much of our planet's water is freshwater and where is it located?

• What is an aquifer?

• Why does it rain?

• How does a hurricane form?

• What do engineers do?

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

• Although the Earth is a "watery planet," only a very small amount of water is freshwater.

• The water we use comes often comes from an aquifer deep under ground.

• Evaporation of ocean water is the ultimate source for rain, and the source of most of our easily accessible freshwater.

• Hurricanes form over warm water and can be dangerous for oceanfront communities.

• Engineers work to design solutions to protect towns from natural disasters.

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

• Only a small percent of the water on the Earth is accessible freshwater.

• Underground aquifers provide much of the water that people use.

• Evaporation, Condensation, and Precipitation comprise the water cycle.

• A hurricane is a storm that forms over warm water, gathers in strength and can be very dangerous.

• An engineer is a person who tries to design solutions for problems

Skills

Skills

Student will be skilled at …

• Utilize standardized units to quantify the amounts of fresh and salt water on Earth.

• Evaluate correlations between elevation, water depth, plant and soil patterns with available drinkable water.

• Model how the hydrosphere and atmosphere interact to produce rain.

• Analyze how Earth's systems interact to cause hurricanes.

• Explain how engineers help solve problems.

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

Mystery Science Spaceship Earth Videos

MS WP1: How much water is in the world?

MS WP2: When you turn on the faucet, where does the water come from?

MS WP3: Can we make it rain?

MS WP4: How can you save a town from a hurricane?

Mystery 1 Assessment: How much water is in the world?

Summative: Written Test

MS WP1 Assessment Revised (Schwartz)

Mystery 2 Assessment: When you turn on the faucet, where does the water come from?

Summative: Written Test

MS WP2 Assessment Revised (Schwartz)

Mystery 3 Assessment: Can we make it rain?

Summative: Written Test

MS WP3 Assessment Revised (Schwartz)

Science Guided Reading List (Collingswood): *Water From Air: Water Harvesting Machines* by Cherese Cartlidge

Cross-content Non-fiction NGSS Recommended Reading List:

• *Strauss, R. (2007). One well: The story of water on earth.*

Looking at all the water on Earth—in the atmosphere, the oceans, lakes, ponds, rivers, and rain as "One Well" into which all life dips to survive—Strauss presents a timely discussion of the use and abuse of a not-so-limitless resource.

• *Bang, M. (2014) Common ground: The water, earth and air we share.*

A simple story of our planet's natural resources with jewel-like paintings by Caldecott Honor author Molly Bang. Through the example of a shared village green and the growing needs of the townspeople who share it, Molly Bang presents the challenge of handling our planet's natural resources.

• *Mulder, M. (2014). Every last drop: Bringing clean water home.*

Looks at why the world’s water resources are at risk and how communities around the world are finding innovative ways to quench their thirst and water their crops.

MS WP1: How much water is in the world?
MS WP2: When you turn on the faucet, where does the water come from?
MS WP3: Can we make it rain?
MS WP4: How can you save a town from a hurricane?

MS WP1 assessment revised.docx
MS WP2 Assessment revised.pdf
MS WP3 assessment revised.docx

Formative Assessment Strategies

Formative Assessment Strategies

- Answering questions posted within Mystery Science videos
- Working with small groups to discuss observations during lab work
- Analysis of student-side pages of Interactive Notebooks

Learning Activities/Unit of Study

Learning Activities/Unit of Study

- Mystery Science Spaceship Earth videos
- Hands-on lab activities for each lesson from Mystery Science
- Note-taking in teacher-led pages of Interactive Notebooks
- Non-fiction read-alouds and discussions
- Lecture

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read

instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.