Grade 7

STEM Learning Garden Unit: Water

Grade 7 MS-LS2 **Ecosystems: Interactions, Energy, and Dynamics**

Massachusetts State Standards:

MS-ESS2-4. Develop a model to explain how the energy of the sun and Earth's gravity drive the cycling of water, including changes of state, as it moves through multiple pathways in Earth's hydrosphere.

MS-LS2-6(MA). Explain how changes to the biodiversity of an ecosystem—the variety of species found in the ecosystem—may limit the availability of resources humans use. [Clarification Statement: Examples of resources can include food, energy, medicine, and clean water.]

Essential Question(s): Why is water quality so important?

Performance Expectation: *(What will the students know and be able to do after this unit? Matching the student task or question directly with the practices.)* Once students become familiar with water and where it comes from, they will research the importance and preservation of clean water for human health. Students will design and develop a model to purify water in small groups. Students will present their models to the class and combine the best design solutions to create one design to be used in the school learning garden.

Science and Engineering Practices

Developing and Using Models

- Develop a model to describe phenomena.

Analyzing and Interpreting Data

- Analyze and interpret data to provide evidence for phenomena.

Constructing Explanations and Designing Solutions

- Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.

Engaging in Argument from Evidence

- Analyze and interpret data to provide evidence for phenomena.
- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

Standards for Mathematical Practices

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for an express regularity in repeated reasoning.

Disciplinary Core Ideas

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

Global movements of water and its changes in form are propelled by sunlight and gravity.

MS-ESS3-1. Interpret data to explain that the Earth's mineral, fossil fuel, and groundwater resources are unevenly distributed as a result of geologic processes.

MS-ESS3-4. Construct an argument supported by evidence that human activities and technologies can be engineered to mitigate the negative impact of increases in human population and per capita consumption of natural resources on the environment.

MS-LS2-6(MA). Explain how changes to the biodiversity of an ecosystem—the variety of species found in the ecosystem—may limit the availability of resources humans use.

Resources:

Resources:
Teacher: Lesson Examples:
Water Cycle and Watersheds
http://thewaterproject.org/community/student-resources/water-related-education-materials-for-grades-7-8/

https://www.ucar.edu/learn/1_1_2_4t.htm

http://sciencenetlinks.com/lessons/the-water-cycle/

Think Garden: The Importance of Water
http://www.pbslearningmedia.org/resource/thnkgard.sci.ess.water/think-garden-the-importance-of-water/
Informational Articles (NEWSELA leveled) PDF format
Clean Water (Leveled 760-1240)
https://newsela.com/articles/clean-water/id/55/
Link to articles regarding water:
http://www.chem.duke.edu/~jds/cruise_chem/water/watpur.html
Online Video
https://www.brainpop.com/search/search.weml?keyword=clean+water
Online examples of Water Filters:
http://pbskids.org/zoom/activities/sci/waterfilter.html
Video: Engineering Design Process:
https://www.youtube.com/watch?v=5Dp2qHz8r2U
Online: Animated Water Purification Powerpoint:
http://www.epa.gov/ogwdw/kids/flash/flash_filtration.html
Water purification project support
http://www.ciese.org/curriculum/purification/lp_lesson3.html
http://www.safewaterscience.org/Downloads/Lesson2.pdf

Math Standards

7.RP Ratios and Proportional Relationships
7. NS Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
7.G Draw, construct, and describe geometrical figures and describe the relationships between them.

ELA Standards

RST: 1. Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
WHST: **2**. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
9. Draw evidence from informational texts to support analysis, reflection, and research.

Discussion Questions

- How does water contribute to plant growth and health?
- What is the relationship between gardening practices such as using pesticides or fertilizers and water quality?
- What are some ways to conserve water in the garden?

Assessment:

Science Notebook
Science Notebook Rubric
Group Project Rubric
Model of water cycle
Working Model of water purification system

Careers:

- **Middlesex Community College;** **http://catalog.middlesex.mass.edu/preview_program.php?catoid=4&poid=275&returnto=317**
- **http://water.epa.gov/aboutow/careers/**
- **http://biotech-careers.org/job/water-quality-technician**

Related Standards
Grade 7 MS-ETS1 Engineering Design

MS-ETS1-2. Evaluate competing solutions to a given design problem using a systematic process to determine how well each meets the criteria and constraints of the problem. Use a model of each solution to evaluate how variations in one or more design features, including size, shape, weight, or cost, may affect the function or effectiveness of the solution.*

MS-ETS1-4. Generate and analyze data from iterative testing and modification of a proposed object, tool, or process to optimize the object, tool, or process for its intended purpose.*
MS-ETS1-7(MA). Construct a prototype of a solution to a given design problem.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

- Construct an explanation using models or representations.

Developing and Using Models

- Develop and/or revise a model to show the relationships among variables.
- Develop and/or use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales.

Obtaining, Evaluating, and Communicating Information

- Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s).
- Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.

Standards for Mathematical Practices

- Make sense of problems and persevere in solving them.
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- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
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Disciplinary Core Ideas

ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.

Models of all kinds are important for testing solutions.

ETS1.C: Optimizing the Design Solution

The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.