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| **Lesson Title:** Wondering Through the Water Cycle |  |
| **Grade Level:** 4th  | **Quarter:**1st  |
| **Standards:** S4E3. Students will differentiate between the states of water and how they relate to the water cycle and weather. d. Explain the water cycle (evaporation, condensation, and precipitation). S4CS5. Students will communicate scientific ideas and activities clearly. a. Write instructions that others can follow in carrying out a scientific procedure. b. Make sketches to aid in explaining scientific procedures or ideas. d. Locate scientific information in reference books, back issues of newspapers and magazines, CD-ROMs, and computer databases. S4CS3. Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities utilizing safe laboratory procedures. a. Choose appropriate common materials for making simple mechanical constructions and repairing things. |
| **Lesson Essential Question:** **EQ: How can I design a game that teaches children about the water cycle?**  | **Vocabulary:**Water cycle, evaporation, condensation, precipitation  |
| * card stock
* cardboard
* construction paper
* paint
* plastic wrap
* popsicle sticks
* bulletin board paper
 | * file folders
* boxes
* colored clay
* toothpicks
* scissors
* glue
* black marker
 | **Lesson Assessment:** * Student journal
* Created game
* Teacher observation
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| **STEM Challenge Overview:**The water on Earth today is all the water we will ever have, And Earth's water is in endless motion, on the planet's surface, in its depths and in the atmosphere above. Lakes, rivers, and oceans lose water to the air through evaporation. Plants draw water from the soil and return it to the air. Volcanoes release water once locked in rocks deep within the Earth. All that water rises and falls back to Earth as rain or snow. Eventually, it all finds its way back underground and to lakes, rivers, and the sea. The whole cycle, or hydrologic cycle, then repeats itself. |
| **Teacher Background:**Students have been learning all about how the water cycle works. Students should be able to explain the water cycle independently prior to completing this challenge. Example of water cycle game: You could play these games prior to doing this challenge in class.<https://ir.library.oregonstate.edu/xmlui/handle/1957/25496> <http://www.planetbonehead.com/teachers/h-2-oh-no/water-cycle-race>  |
| **INSTRUCTION** |
| 1. **Ask/Engage (Day 1, 30 minutes)**
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| * Begin by playing the Water Cycle Rap, <https://www.youtube.com/watch?v=i3NeMVBcXXU>
* After the song is over have students explain the water cycle with an elbow partner.
* Introduce the STEM challenge.

The Hasbro Game Company has contacted you, a hydrologist for the US Forestry Service, to develop a new board game that takes 2-4 players through the water cycle. The game must provide participants with opportunities to use and explain their knowledge regarding the water cycle. Finally, your game must be contained within a uniquely designed container with compartments for storing game pieces and rules. * Pass out student journals and have them complete the ask portion of their journal.
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| 1. **Imagine/Brainstorm (Day 2, 30-45 minutes)**
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| * Introduce the constraints of the design plan.
* You only have 3 to 4 days of STEM time to complete.
* You must use the materials provided by your teacher.
* Define the criteria for success.

Your water cycle game must:* Illustrate all parts of the water cycle (precipitation, condensation, and evaporation)
* Include areas where water is stored on Earth
* Reflect changes in elevation
* Have 2 pop-up or 3-D features
* Be packaged in a container with compartments no larger than 18” X 18”
* Have a catchy title
* Include “Rules of the Game” and game pieces for 2-4 players
* Require players to explain key information about the water cycle
* Be attractive and neatly made

 Ask each student to work independently to come up with 1-2 possible design solutions. Students should draw/label their designs*.*  |
| 1. **Plan/Design (Day 2 continued)**
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| * Have students get into teams of 3-4 students.
* Each student presents their ideas to their team.
* Student teams collaborate to come up with final design plan.
* Students draw final design plan and make a list of needed supplies.
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| 1. **Create / Test (Day 3-5, you may need more time to complete)**
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| * Student teams build their design according to their design plan. Students test their design plan and record data*.*
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| 1. **Evaluate/Improve –** and repeat Steps 1-5
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| * Students evaluate their design for success. Did it meet the established criteria? Did their final design match their planned design? How would students improve their design?
* Let students play one another’s board games or trade them with another 4th grade class.
* You could also have a 3rd grade class play it to preview what they will learn in 4th grade.
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Wondering through the Water Cycle

 4th Grade

**Challenge**: The Hasbro Game Company has contacted you, a hydrologist for the US Forestry Service, to develop a new board game that takes 2-4 players through the water cycle. The game must provide participants with opportunities to use and explain their knowledge regarding the water cycle. Finally, your game must be contained within a uniquely designed container with compartments for storing game pieces and rules.

**Criteria:**

* Illustrate all parts of the water cycle (precipitation, condensation, and evaporation)
* Include areas where water is stored on Earth
* Reflect changes in elevation
* Have 2 pop-up or 3-D features
* Be packaged in a container with compartments no larger than 18” X 18”
* Have a catchy title
* Include “Rules of the Game” and game pieces for 2-4 players
* Require players to explain key information about the water cycle
* Be attractive and neatly made

**Constraints:**

* You only have 3 to 4 days of STEM time to complete.
* You must use the materials provided by your teacher.

**Materials:** card stock, construction paper, boxes, cardboard, plastic wrap, paint, popsicle sticks, scrap paper, file folders, clay, toothpicks, scissors, glue, drawing materials

1. **ASK / ENGAGE:** What is the problem you are being asked to solve?

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1. **IMAGINE/BRAINSTORM:** What are some possible solutions to the problem that you are trying to solve? After you brainstorm, draw and label your ideas below.

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| **Idea #1** | **Idea #2** |

1. **PLAN/DESIGN:** Share your ideas with your group and collaborate to decide on a final design plan. Draw your team’s design below and make a list of the materials that you will need to complete your design.

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| **Team Design Plan** | **Materials List** |

1. **CREATE/TEST**: Use your Final Design Plan to create and build your solution. Test your design. Did it work? Why or Why not?

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1. **EVAULATE/IMPROVE:**  How well did your design work? Did your solution solve the problem within the given constraints?

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How can you improve your design? How can you make it better? Draw and label your improved design below.

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| **Improved Design Plan** |