

INCORPORATING INTERACTIVE OUTDOOR LEARNING INTO EVERYDAY
CURRICULA

by

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A capstone project submitted in partial fulfillment of the requirements for the degree of Master
of Arts in Education: Natural Science and Environmental Education

Hamline University

Saint Paul, Minnesota

December 2021

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Project Summary

Place-based education is defined as “learning that is rooted in what is local – the unique history, environment, culture, economy, literature, and art of a particular place” (Smith, G., & Sobel, D. 2010, p.23). This style of education relies on interactive experiences to engage students, foster a deeper connection with their local community, and inspire positive change. The goal of this capstone project is to better understand *how educational materials can be used to integrate interactive, outdoor experiences into everyday classroom curricula?* Through the creation of these educational materials I can better ensure that a student’s spark of curiosity does not simply become a “flash in the pan” but instead grows into a steady flame.

The curriculum designed for this capstone project encourages environmental literacy through the use of prompts and activities that incorporate interactive outdoor experiences. Appropriately named, H₂O on the Go, this unit of curriculum provides students with an overview of the hydrosphere. Incorporating aspects of backwards curriculum design, place-based education, and developmentally appropriate practice, this curriculum is designed for high school students enrolled in environmental science classes. This project will be implemented at Spring Hill High School with students in grades tenth through twelfth. Serving as an introduction to the hydrosphere, the H₂O on the Go curriculum includes fifteen lesson plans that are divided into three major sections:

Intro to H₂O: students are introduced to the chemical composition of water. This section features seven lesson plans that center around water’s unique properties and the impact that they have on their surrounding environment. During an interactive lab, students will discover more about these unique properties (surface tension, high specific heat, adhesion/cohesion, and solubility). Alternative to their typical lab experiences occurring

in the “field”, this Intro to H₂O lab provides students with additional practice perfecting lab techniques and data analysis.

The Incredible Journey: students learn about where water comes from. A series of three lesson plans re-familiarize students to the water cycle and provides more detailed information regarding the overall process. When students are first introduced to the water cycle they are often taught the most basic steps such as evaporation and precipitation. Within this curriculum, students will learn about the water cycle in more detail focusing on other steps of the water cycle such as evapotranspiration and surface water absorption. Along with covering the water cycle in deeper detail, students will also be introduced to watersheds and learn more about the effects that human actions can have on an entire water source.

Humans and H₂O: after learning about water’s structure, properties, and cycle, students will analyze the impact that humans have on water quality. Featuring five lessons, this section will cover personal water usage, what happens to water after it has been used, sources of pollution and potential pollution solutions. Student’s will have the opportunity to visit a local wastewater treatment plant and see the process of water treatment in real time as part of a unique field trip opportunity.

Meant to serve as an introduction to the hydrosphere, the H₂O on the Go curriculum engages students through the use of outdoor activities, interactive labs, and a field trip. This curriculum is not intended to be the only coverage of the hydrosphere, instead it should be used as a thorough introduction. Following units can be designed to investigate other aspects of the hydrosphere such as aquatic habitats, water scarcity and the distribution of pollution. This unit of curriculum was designed using the Understanding by Design template and backwards research design

outlined by Wiggins and McTighe. The basic tenet of backwards research design is that long-term desired effects occur when educators start with their final goal in mind and work backwards. Backward design is best organized into three stages: identification of desired results, determination of acceptable evidence and planned instruction and learning experiences. By following Wiggins and McTighe's curriculum guidelines, educators can produce a better curriculum that serves the students while also working to avoid unnecessary activities or distractions.

Intro to H₂O

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- **PD.1.ES.1** Describe the structure, origin, and evolution of the Earth's components: atmosphere, biosphere, hydrosphere and lithosphere
- **PD.1.ES.11** Describe the physical and chemical properties of water

Understanding (s)

Students will understand that:

- Water is a molecule composed of hydrogen and oxygen.
- Water's chemical formula contributes to the development of unique properties.

Essential Question(s):

- What is water?
- What about water's chemical composition makes it unique?

Student objectives (outcomes):

Students will be able to:

- Describe how the chemical properties of water (hydrogen bonds) correlate to its unique characteristics.
- Assess their pre-existing knowledge about water, its properties, cycle and forms.

Stage 2 – Assessment Evidence

Performance Task(s):



- Students will create models of water molecules demonstrating an understanding of the compound's structure.

Other Evidence:

- Unit Pre-Assessment
- Lesson Pre-Assessment

Stage 3 – Learning Plan

Learning Activities:

- **Unit Introduction (15 minutes)**
 - Ask students to take out a piece of paper and write down what they know about water: characteristics, chemical make-up, water cycle stages, etc.
 - Call on students to hear their answers. These answers will provide a window into their current working knowledge of water.
 - Inform students that we are officially entering the hydrosphere and will begin our study of water. Provide students with a brief overview of the unit and future activities to look forward to.
- **Unit Pre-assessment (15 - 20 minutes)**
 - Have students complete the unit pre-assessment. This assessment will evaluate student's existing knowledge of water's chemical make-up, unique properties, forms (solid, liquid, gas) and cycle.
 -  H2O on the Go Pre-Assessment
- **Water's Structure (Pre-assessment) (20 minutes)**
 - Provide students with scissors, blank paper and tape.
 - Working together in groups of two, ask the students to create a water molecule (don't provide any templates).
 - Ask guiding questions to assist students with the creation of their own water molecules.
 - What two elements is water composed of?
 - Which of those elements is larger? How do you know? What makes it larger?
 - What do the connecting bonds look like? What kind of bond does it form? How many are there?
 - Provide the students with the  Build a Water Molecule template and review the proper structure with students.

Diving Deeper Into Water's Structure

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- PD.1.ES.11 Describe the physical and chemical properties of water
- NS.4.ES.1 Collect and analyze scientific data using appropriate mathematical calculations, figures and tables
- NS.4.ES.2 Use appropriate equipment and technology as tools for solving problems (e.g., microscopes, centrifuges, flexible arm cameras, computer software and hardware)

Understanding (s)

Students will understand that:

- Water is composed of hydrogen and oxygen.
- Water's chemical formula contributes to the development of unique properties.
- Hydrogen bonds formed between water molecules allow it to easily bond to other water molecules.
- Students will understand how to use lab equipment to complete an inquiry based activity.

Essential Question(s):

- What about water's chemical composition makes it unique?
- How does water interact with other water molecules?

Student objectives (outcomes):

Students will be able to:

- Describe how the chemical properties of water (hydrogen bonds) correlate to its unique characteristics.
- Describe how water molecules interact with one another (hydrogen bonding).

Stage 2 – Assessment Evidence

Performance Task(s):	Other Evidence:
<ul style="list-style-type: none">• Students will create models of water molecules interacting with one another, demonstrating an understanding of the compound's structure.	<ul style="list-style-type: none">• Bell Ringer Responses

Stage 3 – Learning Plan

Learning Activities:
<ul style="list-style-type: none">• Bell Ringer (10 minutes)<ul style="list-style-type: none">○ What two elements is a water molecule composed of? Which atom is larger in size?○ Review answers with students• Water Molecule Interactions (25 minutes)<ul style="list-style-type: none">○ Have students take out the water molecules that they assembled the day before.○ Ask them to work together in their group to determine how their water molecules would attach/bond to one another.○ Review the process of hydrogen bonding and its importance to water's functions.• Properties of Water Lab Introduction (20 minutes)<ul style="list-style-type: none">○ Provide each student with a Properties of Water Lab WKSHT.<ul style="list-style-type: none">■ Students will record their answers and observations on this worksheet.■ Students will turn their worksheets into the class bin at the end of class each day to ensure that they have it for the following day.○ Briefly introduce each Properties of Water Lab Stations : more thorough instructions will be given when in the lab.○ Remind students to come prepared to work in the lab (appropriate clothing) for the next ~5 days.

Water Properties Lab: Surface Tension

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- PD.1.ES.11 Describe the physical and chemical properties of water
- NS.4.ES.1 Collect and analyze scientific data using appropriate mathematical calculations, figures and tables
- NS.4.ES.2 Use appropriate equipment and technology as tools for solving problems (e.g., microscopes, centrifuges, flexible arm cameras, computer software and hardware)

Understanding (s)

Students will understand that:

- Water is a molecule composed of hydrogen and oxygen.
- Water's chemical formula contributes to the development of unique properties.
- Students will understand how to use lab equipment to complete an inquiry based activity.

Essential Question(s):

- What about water's chemical composition makes it unique?
- What is surface tension?

Student objectives (outcomes):

Students will be able to:

- Use lab equipment correctly to make new discoveries regarding the properties of water.
- Describe how the chemical properties of water (hydrogen bonds) correlate to its unique characteristics.
- Describe surface tension in regards to water molecules.

Stage 2 – Assessment Evidence

Performance Task(s): <ul style="list-style-type: none">• Completion of Station 1 of the Properties of Water Lab.	Other Evidence: <ul style="list-style-type: none">• Completion of Station 1 questions in their Water Properties Packet.
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Stage 3 – Learning Plan

Learning Activities:

Pre-Lab Reminders (10 minutes)

- Remind students about lab safety (highlight specific safety concerns for the day) and rules. **Students who don't behave will be removed from the lab and given a zero!**
- After ensuring that all students are dressed appropriately, bring them into the science lab and assign them into groups of three.

Station 1: Surface Tension (40 minutes)

- Have students read through the station instructions.
- Students will run a “practice round” where everyone uses a dropper to see how many drops of water their penny can hold.
- Have students compare their number with their fellow group members (**these numbers will most likely vary!**)
- Initiate a classroom discussion on the importance of consistency within scientific experiments.
 - What are the characteristics of a good scientific experiment?
 - Why do you think your number of drops varied from your group members?
 - What are some ways that we can ensure our data is consistent?
 - What are some ways that we can ensure that our data is accurate?
- Following this review of experimental design, have students complete station 1.

Clean-Up (5 minutes)

- Students should reset their lab stations for the next class period.
- Turn in lab packets!

Water Properties Lab: Adhesion and Cohesion

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- PD.1.ES.11 Describe the physical and chemical properties of water
- NS.4.ES.1 Collect and analyze scientific data using appropriate mathematical calculations, figures and tables
- NS.4.ES.2 Use appropriate equipment and technology as tools for solving problems (e.g., microscopes, centrifuges, flexible arm cameras, computer software and hardware)

Understanding (s)

Students will understand that:

- Water's chemical formula contributes to the development of unique properties.
- Students will understand how to use lab equipment to complete an inquiry based activity.

Essential Question(s):

- What is adhesion?
- What is cohesion?
- How does water's structure facilitate adhesion and cohesion?
- How is adhesion and cohesion utilized in our environment?

Student objectives (outcomes):

Students will be able to:

- Use lab equipment correctly to make new discoveries regarding the properties of water.
- Describe how the chemical properties of water facilitate adhesion and cohesion.
- Describe why adhesion and cohesion is crucial for our environment.

Stage 2 – Assessment Evidence

Performance Task(s): <ul style="list-style-type: none">• Completion of Station 2 of the Properties of Water Lab.	Other Evidence: <ul style="list-style-type: none">• Completion of Station 2 questions in their Water Properties Packet.
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Stage 3 – Learning Plan

Learning Activities: Pre-Lab Reminders (10 minutes) <ul style="list-style-type: none">• Remind students about lab safety (highlight specific safety concerns for the day) and rules. Students who don't behave will be removed from the lab and given a zero!• After ensuring that all students are dressed appropriately, bring them into the science lab and assign them into groups. Station 2: Adhesion and Cohesion (40 minutes) <ul style="list-style-type: none">• Have students read through the station instructions and complete Station 2.<ul style="list-style-type: none">○ Students will be running the experiment twice to ensure better experimental accuracy.• Instructor should be assisting students with any questions they might have as well as supervising the lab for safety. Clean-Up (5 minutes) <ul style="list-style-type: none">• Students should reset their lab stations for the next class period.• Turn in lab packets!

Water Properties Lab: Beat the Heat

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- PD.1.ES.11 Describe the physical and chemical properties of water
- NS.4.ES.1 Collect and analyze scientific data using appropriate mathematical calculations, figures and tables
- NS.4.ES.2 Use appropriate equipment and technology as tools for solving problems (e.g., microscopes, centrifuges, flexible arm cameras, computer software and hardware)

Understanding (s)

Students will understand that:

- Water's chemical formula contributes to the development of unique properties.
- Students will understand how to use lab equipment to complete an inquiry based activity.

Essential Question(s):

- What is specific heat?
- How does water's specific heat compare to other liquids?
- How does water's specific heat affect our environment?

Student objectives (outcomes):

Students will be able to:

- Use lab equipment correctly to make new discoveries regarding the properties of water.
- Describe how the chemical properties of water affect its specific heat.
- Identify both negatives and positives for water's high specific heat in our environment.

Stage 2 – Assessment Evidence

Performance Task(s): <ul style="list-style-type: none">• Completion of Station 3 of the Properties of Water Lab.	Other Evidence: <ul style="list-style-type: none">• Completion of Station 3 questions in their Water Properties Packet.
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Stage 3 – Learning Plan

Learning Activities: Pre-Lab Reminders (10 minutes) <ul style="list-style-type: none">• Remind students about lab safety (highlight specific safety concerns for the day) and rules. Students who don't behave will be removed from the lab and given a zero!• After ensuring that all students are dressed appropriately, bring them into the science lab and assign them into groups. Station 2: Specific Heat (40 minutes) <ul style="list-style-type: none">• Have students read through the station instructions and complete Station 3.<ul style="list-style-type: none">○ Students will be running the experiment twice to ensure better experimental accuracy.• Instructor should be assisting students with any questions they might have as well as supervising the lab for safety. Clean-Up (5 minutes) <ul style="list-style-type: none">• Students should reset their lab stations for the next class period.• Turn in lab packets!

Water Properties Lab: Universal Solvent

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- PD.1.ES.11 Describe the physical and chemical properties of water
- NS.4.ES.1 Collect and analyze scientific data using appropriate mathematical calculations, figures and tables
- NS.4.ES.2 Use appropriate equipment and technology as tools for solving problems (e.g., microscopes, centrifuges, flexible arm cameras, computer software and hardware)

Understanding (s)

Students will understand that:

- Water's chemical formula contributes to the development of unique properties.

Essential Question(s):

- What are the four
- Why is water considered to be a universal solvent?

Student objectives (outcomes):

Students will be able to:

- Use lab equipment correctly to make new discoveries regarding the properties of water.
- Explain how the chemical properties of water make it a universal solvent.

Stage 2 – Assessment Evidence

Performance Task(s):

- Completion of Station 4 of the Properties of Water Lab.

Other Evidence:

- Completion of Station 4 questions in their Water Properties Packet.

Stage 3 – Learning Plan

Learning Activities:

Pre-Lab Reminders (10 minutes)

- Remind students about lab safety (highlight specific safety concerns for the day) and rules. **Students who don't behave will be removed from the lab and given a zero!**
- After ensuring that all students are dressed appropriately, bring them into the science lab and assign them into groups.

Station 2: Universal Solvent (40 minutes)

- Have students read through the station instructions and complete Station 4.
 - Students will be running the experiment twice to ensure better experimental accuracy.
- Instructor should be assisting students with any questions they might have as well as supervising the lab for safety.

Clean-Up (5 minutes)

- Students should reset their lab stations for the next class period.
- Turn in lab packets!

Water Properties Lab Review

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- PD.1.ES.11 Describe the physical and chemical properties of water
- NS.4.ES.1 Collect and analyze scientific data using appropriate mathematical calculations, figures and tables
- NS.4.ES.2 Use appropriate equipment and technology as tools for solving problems (e.g., microscopes, centrifuges, flexible arm cameras, computer software and hardware)

Understanding (s)

Students will understand that:

- Water's chemical formula contributes to the development of unique properties.

Essential Question(s):

- What are the four unique properties of water reviewed in our labs?
- What effect do these unique properties have within our environment?

Student objectives (outcomes):


Students will be able to:

- Draw connections between water's chemical composition and its various unique properties (surface tension, high specific heat, universal solvent and adhesion and cohesion).

Stage 2 – Assessment Evidence

Performance Task(s): <ul style="list-style-type: none">• Bell Ringer• Completion of Properties of Water Lab Packet.	Other Evidence: <ul style="list-style-type: none">• Post Lab Discussion
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Stage 3 – Learning Plan

<p>Learning Activities:</p> <p>Bell Ringer (10 minutes)</p> <ul style="list-style-type: none">• What are the four unique properties of water that you learned about during the past several days of labs? What is the driving force behind these unique properties? <p>Lab Make-Up Time (~20 - 30 minutes)</p> <ul style="list-style-type: none">• Use this time to complete any lab activities that ran long or were not completed earlier in the week. <p>Post Lab Discussion (15 minutes)</p> <ul style="list-style-type: none">• Lead a discussion with students using the following questions as jumping off points.<ul style="list-style-type: none">○ What were your thoughts on this lab? Was it fun, hard, easy, etc.○ What were you most surprised to learn during this lab?○ Can you think of any “real world” applications of water’s unique properties? <p>Intro to H₂O (10 minutes)</p> <ul style="list-style-type: none">• Play the  Properties of Water video to act as a final lab recap.

The Incredible Journey

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- PD.1.ES.11 Describe the physical and chemical properties of water

Understanding (s)

Students will understand that:

- Water is a finite resource.
- While traveling through the water cycle, water takes on many forms.

Essential Question(s):

- What are the different forms water takes as it travels throughout the water cycle?
- Is a water molecule's path through the water cycle random or uniform?

Student objectives (outcomes):

Students will be able to:

- Effectively define the different stages of the water cycle (evaporation, condensation, precipitation, evapotranspiration, etc).

Stage 2 – Assessment Evidence

Performance Task(s):

- Students will follow the path that a water molecule takes as it travels through the water cycle. Learning more about each stage as they go along.
- Completion of an Incredible Journey Tracking Log WKSHT.

Other Evidence:

- Bell Ringer Responses
- Post-Activity Discussion



Stage 3 – Learning Plan

Learning Activities:

Bell Ringer (10 minutes)

- What are the different forms water takes as it moves through the water cycle?
- Do you think that a water molecule's path through the water cycle is uniform or random?

The Incredible Journey Activity

- Students will embody a water molecule as it travels through the water cycle. Stations will be set up within the classroom representing the different stages each complete with a unique rolling die. Students will roll 30 times and track their progress as they move throughout the activity.
-  The Incredible Journey
-  **The Incredible Journey Activity Log**
- Once students have completed the activity and their worksheet, they will turn their worksheet into the bin.

Water Cycle Introduction

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- PD.1.ES.1 Describe the structure, origin, and evolution of the Earth's components: atmosphere, biosphere, hydrosphere and lithosphere
- PD.1.ES.11 Describe the physical and chemical properties of water
- SP.3.ES.3 Explain common problems related to water quality: conservation, usage, supply, treatment and pollutants (point and nonpoint sources)

Understanding (s)

Students will understand that:

- Water is a finite resource.
- While traveling through the water cycle, water takes on many forms.
- Freshwater is the least available form of our water supply.

Essential Question(s):

- What are the different forms water takes as it travels throughout the water cycle?
- Knowing that water is a finite resource, what can we do to help preserve the quality of our water supply?

Student objectives (outcomes):


Students will be able to:

- Effectively define the different stages of the water cycle (evaporation, condensation, precipitation, evapotranspiration, etc).
- Predict potential problems relating to pollution and future water use.
- Breakdown the availability of water in regards to saline, fresh and ice-locked.

Stage 2 – Assessment Evidence

Performance Task(s): <ul style="list-style-type: none">• Students will follow along with the Google Slides Presentation, taking notes along the way.	Other Evidence: <ul style="list-style-type: none">• Bell Ringer Responses• Discussion responses (throughout the presentation and at its conclusion)
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Stage 3 – Learning Plan

Learning Activities: Bell Ringer (10 minutes) <ul style="list-style-type: none">• To the best of your ability, write down and define as many stages of the water cycle that you know. Water Cycle Presentation (45 minutes) <ul style="list-style-type: none">• Students will take notes and follow along to learn about the water cycle.•  Water Cycle Notes

Watershed Discovery

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- PD.1.ES.1 Describe the structure, origin, and evolution of the Earth's components: atmosphere, biosphere, hydrosphere and lithosphere
- PD.1.ES.11 Describe the physical and chemical properties of water
- SP.3.ES.3 Explain common problems related to water quality: conservation, usage, supply, treatment and pollutants (point and nonpoint sources)

Understanding (s)

Students will understand that:

- Everyone occupies a watershed.
- Watersheds are land areas that funnel all the water in the area into outflow points.
- Pollutants that occur within a watershed affect the entire watershed.

Essential Question(s):

- Where does our local water come from?
- How does water travel through a watershed?
- Is pollution ever an isolated incident?

Student objectives (outcomes):

Students will be able to:

- Define the term watershed.
- Determine what watershed they live in and identify the quality of their local water sources.
- Identify potential sources of pollution within their watershed.

Stage 2 – Assessment Evidence

Performance Task(s): <ul style="list-style-type: none">• Watershed Discovery Worksheet	Other Evidence: <ul style="list-style-type: none">• Engagement in the watershed demonstration.
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Stage 3 – Learning Plan

Learning Activities:

Watershed Introduction (30 minutes)

- Provide students with the definition of a watershed.
 - Watershed Demonstration
 - Provide every group with a piece of waxed paper, a plastic tub, food coloring and a spray bottle.
 - Step 1: Instruct students to crumple up their piece of waxed paper.
 - Step 2: Open the paper up enough that it fills a good portion of the plastic tub. *There should still be wrinkles in the paper*
 - Step 3: Inform students that this represents a watershed.
 - Discuss where the water would flow within the watershed.
 - What do the higher “wrinkles” represent within the watershed?
 - Step 4: Have students place drops of food dye around their watershed. Different colors could represent different forms of pollution.
 - Step 5: Instruct students to spray their watershed with water from their spray bottle (simulate rain) and observe what happens.

Watershed Discovery Worksheet (25 minutes)

- Students will research their local watershed while completing the attached worksheet.
-  Watershed Discovery
- Worksheet will be turned in at the end of class or at the beginning of class the next day if it becomes homework.

Humans and H₂O

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- SP.3.ES.3 Explain common problems related to water quality: conservation, usage, supply, treatment and pollutants (point and nonpoint sources)

Understanding (s)

Students will understand that:

- Water is essential to their everyday lives.
- Water exists in two forms: direct and virtual.
- They can take steps to reduce their personal water use.

Essential Question(s):

- How do humans use water?
- Is all of our water use direct (we interact with it physically)?
- How can we reduce water use?

Student objectives (outcomes):

Students will be able to:

- Distinguish the difference between direct and virtual water use.
- Better explain how they utilize water on a daily basis.
- Identify areas where they can reduce their personal water use.

Stage 2 – Assessment Evidence

Performance Task(s):

- Bell Ringer
- Watershed Calculator Tool

Other Evidence:

- In class discussion responses.

Stage 3 – Learning Plan

Learning Activities:

Bell Ringer (10 minutes)

- What are five ways that you use water on a daily basis?
- Discuss responses with students (a large number of these responses will most likely reference direct water use).

Direct vs. Virtual Water (20 minutes)

- Show students a jar of pasta sauce, a chocolate bar, and a steak.
- Ask students to think about how water is related to each of these items.
- Define direct and virtual water.
- Ask students to guess which item from earlier uses the most virtual water.
- Ask students for some other examples of virtual water use in their everyday lives.

Water Footprint Calculator (15-20 minutes)

- Have students take out their chromebooks and navigate to <https://www.watercalculator.org/footprint/what-is-virtual-water/>
- Have students take the quiz to calculate their household water usage.

Discussion (5-10 minutes)

- What was your average daily water usage?
- What did you spend the most water on? The least?
- What are some ways that you can reduce your water use? Use the suggested tips in the summary for help.

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Where Does it All Go?

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- SP.3.ES.3 Explain common problems related to water quality: conservation, usage, supply, treatment and pollutants (point and nonpoint sources)

Understanding (s)

Students will understand that:

- Water continues to exist once it goes down their drains.
- There are systems in place to treat water before returning it back into the environment.

Essential Question(s):

- Once the water goes down the drain, what happens to it?
- Is our water contaminated after we use it?
- What do we remove from water before returning it back into the environment?

Student objectives (outcomes):

Students will be able to:

- Identify some common pollutants that must be removed from their water post use.
- Describe the basics of the water treatment process.
- Identify potential problems that exist with our water treatment methods.

Stage 2 – Assessment Evidence

Performance Task(s):

- Bell Ringer
- Sparkling Water Activity

Other Evidence:

- In class discussion responses.


Stage 3 – Learning Plan

Learning Activities:

Bell Ringer (10 minutes)

- Draw a map of the journey that water takes to get into your house and where it goes after you have used it?
- Discuss responses with students. How many of them mentioned water treatment?

Sparkling Water Activity (35 minutes)

-  Sparkling Water Activity

Clean-Up (10 minutes)

- Have students reset their stations for the next period.

Waste Water Treatment Field Trip

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- SP.3.ES.3 Explain common problems related to water quality: conservation, usage, supply, treatment and pollutants (point and nonpoint sources)

Understanding (s)

Students will understand that:

- Water continues to exist once it goes down their drains.
- There are systems in place to treat water before returning it back into the environment.

Essential Question(s):

- Once the water goes down the drain, what happens to it?
- Is our water contaminated after we use it?
- What do we remove from water before returning it back into the environment?

Student objectives (outcomes):

Students will be able to:

- Identify some common pollutants that must be removed from their water post use.
- Describe the basics of the water treatment process.
- Identify potential problems that exist with our water treatment methods.

Stage 2 – Assessment Evidence

Performance Task(s):

- Participation throughout field trip

Other Evidence:

- None

Stage 3 – Learning Plan

Learning Activities:

Field Trip to the Hope Wastewater Department

- Students will get to observe the process of wastewater treatment up close and personal!
- Staff will guide students through the water treatment process and provide additional information regarding the use, management, and “disposal” of municipal water.

What-are We Doing to Our Water?

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- SP.3.ES.2 Investigate the relationships between human consumption of natural resources and the stewardship responsibility for reclamations including disposal of hazardous and non-hazardous waste
- SP.3.ES.3 Explain common problems related to water quality: conservation, usage, supply, treatment and pollutants (point and nonpoint sources)

Understanding (s)

Students will understand that:

- Human actions directly affect the quality of their water.
- Water pollution can be divided into two categories: point sources and nonpoint sources.

Essential Question(s):

- What causes water shortages?
- What is the difference between point and nonpoint water pollutants?
- What are some examples of nonpoint source water pollutants?
- What are some examples of point source water pollutants?

Student objectives (outcomes):

Students will be able to:

- Define the two categories of water pollution: point and nonpoint.
- Identify sources of point and nonpoint pollution.
- Begin brainstorming potential solutions to these sources of pollution.

Stage 2 – Assessment Evidence

Performance Task(s):

- Bell Ringer
- Pollutant research project

Other Evidence:

- Group participation

Stage 3 – Learning Plan

Learning Activities:

Bell Ringer (10 minutes)

- Although a majority of our planet is made up of water, many places around the globe don't have access to drinkable water. Why do you think this is?

Water Pollutants PBL (45 minutes)

- Ask students to list examples of water pollutants (encourage them to draw on examples they have learned over the past few weeks).
- Using this list of pollutants, have students divide them into point and nonpoint sources (to the best of their ability).
- Review the divisions and formally define point and nonpoint sources.
- Assign students into pairs and assign a form of water pollution:
 - Students will research their form of pollution and create a short presentation defining the form of pollution, explaining how it occurs, and providing potential solutions.
 - Students will present their form of pollution to their classmates tomorrow!

Water Pollutant Presentations

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):

- SP.3.ES.2 Investigate the relationships between human consumption of natural resources and the stewardship responsibility for reclamations including disposal of hazardous and non-hazardous waste
- SP.3.ES.3 Explain common problems related to water quality: conservation, usage, supply, treatment and pollutants (point and nonpoint sources)

Understanding (s)

Students will understand that:

- Human actions directly affect the quality of their water.
- Water pollution can be divided into two categories: point sources and nonpoint sources.

Essential Question(s):

- What is the difference between point and nonpoint water pollutants?
- What are some examples of nonpoint source water pollutants?
- What are some examples of point source water pollutants?

Student objectives (outcomes):

Students will be able to:

- Define the two categories of water pollution: point and nonpoint.
- Identify sources of point and nonpoint pollution.
- Begin brainstorming potential solutions to these sources of pollution.

Stage 2 – Assessment Evidence

Performance Task(s):

- Pollutant PBL Presentation
- Unit Post Assessment

Other Evidence:

- Peer Presentation Notes


Stage 3 – Learning Plan

Learning Activities:

Water Pollutants PBL Presentations (35 minutes)

- Student pairs will present their pollutants to their classmates.
- Classmates not actively presenting will take notes about their classmates' pollutant examples.
- Once presentations are complete, inform students that the following unit will work to analyze water pollution in greater detail:
 - Macroinvertebrates as bioindicators
 - Water testing with scientific equipment
 - Ecosystem services

Unit Post Assessment (20 minutes)

- Students will take the Unit Post Assessment (same as the initial assessment) to track their growth.
-  H2O on the Go Pre-Assessment

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