

Environmental Health in the Classroom

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Abstract

This unit on environmental health was designed for elementary students, specifically in grades three through five, to help them understand the important role water has in our lives and the environment. Water is essential for all life on earth, but can also cause major problems for humans and the environment if it becomes contaminated. This unit will briefly touch on the water cycle to provide background information for students, but the main focus will be on how to ensure adequate access to safe drinking water and how students can impact water contamination and the environment in general.

In this unit, students will learn about some major devastating examples of water contamination, like the Exxon Valdez Oil Spill, the Flint Water Crisis, and the BP Oil Spill. Based on what they learn about these incidents, students will experiment with various materials to determine which ones are most absorbent to clean up the oil spill. The ultimate goal of this unit is to make students more aware of the impact they have on the environment and help them see they can make a difference.

Key Words

water pollution, contamination, water cycle, conservation, plastic pollution

Unit Content

Objectives

Environmental Health is a topic that affects everyone. People are exposed to a variety of environmental hazards on a daily basis, often unknowingly. Some hazards include air pollution, chemicals or water contamination. According to the NEHA, or the National Environmental Health Association, environmental health is the science and practice of preventing injury and illness. It also promotes well-being by identifying environmental hazards so humans can limit exposure that could adversely affect their health. (Hughes, 2019).

Water is one of our most valuable resources so it's important that we have access to a safe and abundant water supply. According to the Centers for Disease Control and Prevention, the United States has one of the safest water supplies in the world. Unfortunately, water contamination still occurs. Some factors that lead to contamination include sewer releases or malfunctioning on-site wastewater treatment systems, naturally

occurring chemicals and minerals and land use practices that contaminate the water supply. This unit will solely focus on the water supply in the United States, but access to clean water is a global issue that impacts millions of people around the world.. There are over 785 million people on the planet that do not have access to clean water. The United Nations' Sustainable Development Goals address this issue and aim to provide universal access to clear water and sanitation by 2030.

This unit will include information on the water cycle, the history of the EPA, the quality of water and the impact students can have on our environment. We will also look at the quality of water in our city and homes, the cost and impact of using plastic water bottles, and the effectiveness of water filters.

The Water Cycle

Water covers about 75% of our planet and is essential to our lives so it's important to understand where water comes from. Most of the water found on the planet is saltwater and people need freshwater so students also need to know how we get our drinking water. The water cycle as a topic is not presented as a standard until the 6th grade according to the Next Generation Science Standards. However, students in much younger grades are introduced to the other standards involving water. One topic covered in younger grades is the different forms of water, such as solid, liquid, and gas.

[\(https://www.nextgenscience.org/\)](https://www.nextgenscience.org/)

The water cycle is also known as the hydrologic cycle. Water is in constant motion over time and takes place on, above, and below the surface of the Earth. The cycle includes the following three stages: precipitation, evaporation, and condensation.

Precipitation refers to water, sleet, snow, hail, or any liquid that comes from the clouds. Precipitation can affect the weather and creates runoff into bodies of water. Evaporation is the process where precipitation changes from a liquid to a gas or vapor. Water vapor is in the air around us even when we can't see it. Condensation is the last part of the water cycle and is the opposite of evaporation. It is the process where water vapor in the air is changed to liquid water. These droplets form clouds and eventually the water falls as a form of precipitation, depending on the temperature.

Conservation is an important topic to cover with students. They may not realize how much water is wasted every day. For example, students can impact the amount of water used while brushing their teeth, washing their hands, cleaning dishes, and even bathing. There are great resources about water sense for kids including games at the Environmental Protection Agency or EPA website at <https://www.epa.gov/watersense/watersense-kids#Why%20Save%20Water>.

History of the EPA

Since water is an essential natural resource, it's important that we take steps to protect it. People in the United States often take having access to clean drinking water for granted, even though it is a luxury in other countries, or not widely available. In the United States, the EPA, or the Environmental Protection Agency was created in 1970 by President Nixon to ensure access to clean water.

The EPA creates and enforces national standards. Some major tasks were to improve water treatment facilities, end dumping in the Great Lakes, create a plan for the treatment of oil spills and other chemical contamination in bodies of water, and address air pollution issues. The EPA is still a strong organization that works to improve environmental issues. In 2020, they released a document which outlined some major accomplishments from the past four years. (epa.gov) Some of these included: finalizing the first greenhouse gas emissions standard for aircraft, overhauling the Lead and Copper Rule for drinking water, and announcing the Newest Recycling Goal. In addition, the EPA developed a list for surface disinfectants for the use against SAR-CoV-2 in response to the COVID-19 health emergency.

The first major law in the U.S. to address water pollution was the Federal Water Pollution Control Act of 1948. In the 1970's public awareness increased and the Environmental Protection Agency amended the original act and passed the Clean Water Act of 1972 or simply the Clean Water Act, CWA. The 1972 amendments gave the EPA the authority to set minimum standards to protect tap water and regulated pollutant discharges into water in the U.S. Many additional amendments have been made over the years. In 1982, the municipal construction grants process was streamlined. In 1987, the construction grant program was replaced with the Clean Water State Revolving Fund.
(<https://www.epa.gov/history>)

Water Contamination

Although there are rules and regulations in place to protect the quality of water, major accidents can still cause catastrophic results. When major water contamination occurs, it usually makes major headlines because it impacts so many and costs so much money to clean up. Some major cases that have drawn international attention include the Exxon Valdez Oil Spill in 1989, the BP oil spill in 2010 and the Flint Michigan Water Crisis of 2014.

Exxon Valdez

The Exxon Valdez Oil Spill occurred in 1989. The Exxon Valdez was an oil tanker that ran aground in Alaska's Prince William Sound, which caused one fifth of the 1.26 million barrels of oil to spill. The spill took four years and \$2 billion dollars to clean up. It was

one of the worst oil spills in U.S. history. The disaster killed hundreds of thousands of seabirds, otters, and other sea animals due to the oil-covered water. The oil spread and ended up covering over 1,300 miles of the coastline.

(<https://www.history.com/topics/1980s/exxon-valdez-oil-spill>) It was determined that the captain and third mate were both intoxicated during the collision.

BP Oil Spill

The BP oil spill is also referred to as the Deepwater Horizon oil spill or the Gulf of Mexico oil spill. It occurred in 2010 on an oil rig in the Gulf of Mexico, about 40 miles off the coast of Louisiana. The oil rig was leased by BP oil company. A natural gas explosion killed 11 workers and injured many more. The rig eventually capsized and sank. The oil continuously leaked from the well nearly 5,000 feet below the surface of the water until they were able to put a cap on it, but that was after over 7 million gallons of crude oil had already spilled into the water. Over 1,100 miles of the coastline of Mississippi, Alabama, and Florida were polluted.

(<https://www.britannica.com/event/Deepwater-Horizon-oil-spill>)

The Flint Michigan Water Crisis

The EPA estimates that there are between 6 and 10 million pipes carrying water around the country that are lead or have lead solder or lead fixtures. Lead can pass from pipes into drinking water when the chemistry encourages it or water sits without moving for an extended period of time in contact with the pipes. A well-known lead water case occurred in 2014 in Flint Michigan. The city changed their water supply from Lake Huron to the Flint River. This was supposed to save money, but residents quickly began experiencing issues with the water's taste and smell and had other health issues like skin rashes. The Flint River had high chloride, high chloride-to-sulfate mass ratio. This was different than the Lake Huron water and would have required the municipal water authority to add corrosion inhibitor to keep the lead from leaching out of the pipes. (American Journal of Public Health, 2016). The municipal water authority did not add corrosion inhibitors. Lead leaked into water and had negatively impacted many families, but especially children. According to the AJPH, children absorb 40% to 50% of an oral dose of water-soluble lead compared to 3% to 10% for adults. Lead causes lowered IQ, behavior problems and also is responsible for high fetal death rates and lower birth weights.

The actions of the municipal water authority were found to be criminal because they knowingly did not follow EPA required procedures to protect the public. Officials in government in the state of Michigan were found responsible for the outcome due to poor decision making. There were several lawsuits filed against local and state officials and eventually cost the state of Michigan millions of dollars, most of the money went to families with children affected by the lead in the drinking water. This is an example of why following federal standards to protect the public's health is so important and why it

would be good to eliminate all of the lead service lines to prevent this from happening again.

Water Filters

With water contamination, like the Flint Michigan water crisis making national news, many people have concerns about the safety of their drinking water. Filters offer people some level of protection against lead, chlorine and other chemicals that may affect the taste, smell and safety of drinking water.

Many homes in the United States use some type of water filter, but many people often debate whether they are necessary. If people are getting their water from a regulated water supply, the water is routinely tested for contaminants as it leaves the drinking water plant. It's a question as to whether people can trust that people responsible for ensuring safe water are making choices that are in the best interest of the residents. If not, there could be negative consequences for the environment and human health.

Besides worrying about water contamination, many people say that taste is a factor in their drinking water. In Philadelphia, the water supply comes from either the Schuylkill River or the Delaware River. Although the municipal water treatment plant make both safe to drink, there is chlorine and ammonia added to treat the water. This can negatively affect the taste. (Evans) Sometimes people complain about the taste of water because it comes from a source they are not familiar with. For example, if you live outside of Philadelphia and the water you drink on a daily basis does not come from the Schuylkill or Delaware River, you may not like the taste of the water in Philadelphia.

Another concern is lead. Families with homes built before 1960 could have lead pipes or fixtures with lead. Lead could contaminate water after it leaves the drinking water plant through pipes. The Philadelphia Water Department conducts free residential water testing for their customers. According to the Drink Philly Tap website, if residents have concerns about lead, they should run water for a few minutes before drinking it. It is also important to regularly clean the faucet aerator and use filters that are designed for lead removal.

There are many different types of water filters that can be used to improve taste and filter out contaminants. The EPA recommends an NSF international certified filter so if purchasing a filter, it's important to make sure it is NSF certified. The different types of filters include whole house filters, faucet filters and water pitcher filters.

Whole house filters are the most expensive filter option and most difficult to install, but they purify the water at the inlet valve. This means all water is filtered, in every room out of every faucet. These come in 3 stage options and often incorporate water softeners that reduce the concentration of hard metals. (Dale, 2021)

Water pitcher filters and faucet filters are less expensive options to filter water. Since kitchen faucets are the source of most water that is consumed, this option works for most people. Tap water can contain trace amounts of contaminants. They may not be harmful in small amounts, but can affect the taste. A water filter pitcher is compact and fits in the fridge so water is always cold. The major disadvantage is that the pitcher can only hold a certain amount of water and needs to be filled frequently. Faucet filters solve the problem of limited capacity. (Ortez, 2021). These filters connect directly to the sink and filter the water directly as it comes out of the faucet. The disadvantage to this kind is the water is not as cold as the pitcher and they can be bulky.

Besides installing home water filters. Home water quality tests add an additional level of protection. Home tests are available online and in most hardware stores. Home kits can test for lead, bacteria, hardness, fluoride, copper, iron and other contaminants. They are inexpensive and can give results in minutes.

Water Bottles

Although water filters provide protection at home, many people still use disposable water bottles due to the cost and convenience of it. Plastic water bottles came out in the 1970s and were considered a miracle invention. In March of 2017, the Beverage Marketing Corporation, announced that the United States sells more bottled water by volume, than any other bottled beverage (Moss, 2018). Although many people are consuming less carbonated soft drinks, it's concerning that bottled water sales are so high. Plastic bottles are a major problem for the environment. Not only are they expensive, they are also less regulated than tap water and could contain chemicals that are harmful to our health. According to the Drink Philly website, as much as 40% of bottled water in stores actually comes from municipal tap water. This is something to consider when purchasing bottled water.

Since its invention, bottled water has had mixed reviews. At one time, it was considered a miracle. Many people prefer bottled water to tap because of the taste. Tap water contains chlorine and bottled water does not and this can affect the taste. Now, bottled water is seen as an environmental issue because we are polluting the environment with plastic. The Great Pacific Garbage Patch is an important example of the accumulated plastics that have ended up in the ocean. (<https://www.nationalgeographic.org/encyclopedia/great-pacific-garbage-patch/>) The

Besides the environmental impact and regulation issues, water in plastic bottles is expensive, in comparison to tap water. According to the Drink Philly Tap website, bottled water costs about \$.89 to \$8.26 per gallon, while in Philadelphia, tap water costs less than 1 cent per gallon. The average bottled water drinker spends between \$200 and \$2,000 per person, per year on water. Tap water drinkers only spend about \$2.

Another issue with plastic water bottles is the lack of recycling that takes place. Many people don't recycle and don't see the benefit of recycling. Individuals and businesses both play a part in recycling. Individuals can recycle at home and work. Businesses could help with the recycling efforts by using plastic that contains at least 50 percent recycled plastic. (National Geographic)

The solution seems easy, use refillable bottles or water filters. The refillable bottles will save the environment from excess plastic pollution and the water filter will make tap water safe to drink. Water filters can even improve the taste of tap water.

Our Impact

There are many small things we can do that have a big impact on the environment. People can limit the amount of garbage disposed of, recycle, and use reusable water bottles. These are all simple things but require people to make the effort to consistently take action.

Recycling takes very little effort and can make a big impact. Many towns have a separate day for recycling which makes it easy to dispose of plastics, cardboard, and paper. Recycling plastics is important because it reduces the plastic pollution that ends up in bodies of water. Recycling plastic is great because you can use old bottles and containers and turn them into new containers, plastic lawn furniture, carpets, and even clothes. Shockingly, according to National Geographic, 91% of plastic is not recycled and only one out of every 6 water bottles is recycled. The rest sit in landfills. (Clarke Fox).

A quick look around a typical house, will reveal an alarming number of plastics in most rooms. From plastic cups, plates, and utensils in the kitchen to plastic containers with shampoo, conditioner, and other beauty products, plastics are everywhere and if they are not recycled, they end up in landfills. Over 40% of plastic pollution is from single use plastic items. (Shaw, National Geographic). Plastic that is not recycled takes up to 1,000 years to decompose so it's important we take steps to keep them out of landfills.

Teaching Strategies

There are seven teaching strategies included in this unit, although there are a wide range of options available to educators. The strategies included in this unit include differentiated instruction, cooperative learning, technology, graphic organizers, inquiry based learning and turn and talk.

Differentiated instruction is essential in order to meet the needs of all students and uses teaching strategies to meet the needs of all learners. Teachers can differentiate instruction based on content, process, product or learning environment. Differentiating content means changing the material the student needs to learn or how they access it. Process means they change the order or method needed to learn the content.

Differentiating products means changing the end product or project needed to show mastery. Differentiating the learning environment is creating spaces and routines for students to be successful.

Cooperative learning is a strategy to allow students to work collaboratively in small groups. This can be more challenging in younger grades, but with teacher guidance and practice, students can be given opportunities to work together. Small group work not only gives students a chance to work on more hands-on cooperative learning activities, but it gives teachers a chance to work with small groups to get a better understanding of students' strengths and weaknesses.

Technology is a great way to enhance learning. Prior to the global pandemic, some teachers were using technology while others were not. Technology was also difficult to use because not all students had access to their own laptop or tablet. Now that most schools have gone virtual or hybrid at some point, most students have learned to use technology at home, and at school. Technology plays an important role in inquiry based learning.

Inquiry based learning is successful because it involves the students in their own learning process and allows them to make some choices regarding their learning. Inquiry based learning is student centered and shifts some of the responsibility of learning to the students. Inquiry based learning can be complicated to manage and requires teachers to guide students. With this strategy, it is important to encourage student curiosity to help motivate students to learn.

Graphic organizers are often used to help students organize their work. They can provide students with a framework for taking notes or beginning the writing process. In this unit, students will use graphic organizers while taking notes on videos, t-charts, and during the writing assignment to plan their writing.

Turn and talk is used to give students an opportunity to share their thoughts and ideas with a partner before sharing with the entire class. Turn and talk is simple to implement and will be used during read-alouds to have students work with a partner to think out their answer and get other students' perspectives.

Classroom Activities

Standards:

- RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

- RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.
- RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.
- W.3.2.A Introduce a topic and group related information together; include illustrations when useful to aiding comprehension.
- W.3.2.B Develop the topic with facts, definitions, and details.
- SL.3.1.C Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.
- SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

Next Generation Standards (Second Grade)

PS1.A: Structure and Properties of Matter

- Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1)
- Different properties are suited to different purposes. (2-PS1-2),(2-PS1-3)
- A great variety of objects can be built up from a small set of pieces. (2-PS1-3)

Patterns

- Patterns in the natural and human designed world can be observed. (2-PS1-1)

Cause and Effect

- Events have causes that generate observable patterns. (2-PS1-4)
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

Energy and Matter

- Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3)

Next Generation Standards (Sixth Grade)

- Develop a model to describe the cycling of water through Earth's systems (MS)
- Driven by energy from the sun and force of gravity (ESS2-4)

Lesson 1: The Water Cycle

This lesson provides background knowledge. It includes a book and video on the water cycle.

Timeline: 2 class periods

Objectives:

Students will be able to ask and answer questions in order to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

Materials:

The Water Cycle by Torrey Maloof available on Epic at <https://www.getepic.com/app/read/42483>

The Water Cycle Video by Smile and Learn- English at <https://www.youtube.com/watch?v=B77sebHmfdk> or The Watery Cycle by Bill Nye at the Water Cycle Video by Smile and Learn- English at <https://www.youtube.com/watch?v=B77sebHmfdk>

KWL (What we Know, what we Want to know, and what we Learned) graphic organizer to track what students know, what they want to learn, and what they learned. (See appendix)

Anchor chart paper

Vocabulary: evaporation, condensation, precipitation

Steps:

Use anchor charts (or student copies in appendix) to create a KWL with students, charting what they know about the water cycle and what they want to learn.

Read the Water Cycle by Torrey Maloof on Epic with students.

Complete the L column of the anchor chart listing facts they learned.

Have students answer the comprehension questions listed below. Use turn and talk for question 4.

Watch the Water Cycle Video by Smile and Learn- English at <https://www.youtube.com/watch?v=B77sebHmfdk> or the Water Cycle by Bill Nye at the

Water Cycle Video by Smile and Learn- English at <https://www.youtube.com/watch?v=B77sebHmfdk>

Provide students with a chart to take notes during the video about the 3 parts of the water cycle. Inform students they should take notes and come up with the definition and at least one example for each part. (see chart and evaluation tool in appendix)

Comprehension Questions:

What are the 3 forms of waters and give an example of each? (pg. 8-9)

Study the diagram on pg. 10-11. Explain the 3 parts of the water cycle.

Besides drinking, what are some other uses of water? (cleaning, growing food, cooking food, and making power- pg. 18-19)

What are some ways we can save water? (pg. 20-21)

Lesson 2: Recycling Plastic

Timeline: 2 periods

Objective:

Students will be able to identify items to recycle and describe the impact of plastic pollution

Materials:

Video at <https://www.nationalgeographic.com/science/article/plastic-produced-recycling-waste-ocean-trash-debris-environment>

Empty plastic bottles

Computer

Anchor chart paper

Steps:

Discuss how many plastic items are disposed of every day at school. (cereal containers, straws, silverware, etc) and at home (milk containers, ketchup bottles, etc)

Play video which shows plastic that ends up at the bottom of the ocean.

<https://www.nationalgeographic.com/science/article/plastic-produced-recycling-waste-ocean-trash-debris-environment>

Have students research ways to reuse plastic bottles and create a list on the board or chart paper. Ideas may include storing craft supplies like beads, dry foods like rice, putting in a toilet tank to limit water used, bird feeder, planter, etc). Ideas can be found at <https://foshbottle.com/blogs/fosh/60-ways-to-reuse-plastic-bottles> and https://www.youtube.com/watch?v=ZN3tXr2_CJO

Allow students to work in groups to create something out of plastic. Encourage them to create something that would be useful. (refer to the list and website in step 3)

****Note**** Cutting plastic can be difficult. Students should be supervised with safety scissors. If an exacto knife is needed for something specific, it should only be used by an adult.

Lesson 3: How to make a Water Filter

Water filters are devices that remove impurities from water.

NOTE: Students should not drink the water in the experiment. There are many different ways to build a water filter. The NASA website can be used and contains a video for students to view at <https://www.jpl.nasa.gov/edu/learn/project/make-a-water-filter/> This water filter project. This version is from National Geographic Kids and can be accessed at <https://kids.nationalgeographic.com/books/article/water-wonders>.

Timeline: 1-2 class periods

Objectives:

Students will be able to make a filter in order to understand how filtration works

Students will be able to work collaboratively in order to create a filter

Materials:

2 - 2 liter plastic bottles

Dirty water (use soil, coffee grounds, oil, tiny pieces of foam, etc)

Utility knife or scissors, (for adult use)

Measuring cup

Spoon

Stopwatch

Pencil and paper

Coffee filter (or a bandana, napkin, or paper towel)

Rubber bands

Filter materials to test (pick 2 or 3): gravel, cotton balls, sand, activated charcoal)

Steps:

An adult should cut the 2 liter bottle in half and flip the top half over and put it in the bottom half. The top will look like a funnel where you will build your filter.

Place a coffee filter (or bandana, napkin, or paper towel) in the top part of the filter.

Put filler material in the coffee filter in layers. (gravel, cotton balls, sand or other materials) You can use one type of material or all of them. Just write down what you used and the order you placed them into the filter.

Mix soil into a cup of water and stir. Pour the dirty water into the filter.

Start timer once you start pouring the water.

Keep track of how long it took all the water to go through the filter and write it down.

Carefully scoop out the filter materials and not what each layer took out of the water.

Experiment. Clean the bottle out and use different materials or put them in the filter in a different order. Keep track of your results.

Experiment	Materials (in order)	Time to pass through filter	Notes
1			
2			
3			

Lesson 4: Plastic Pollution

Timeline: 1-2 class periods

Objectives:

Students will be able to describe examples of plastics that pollute the ocean and environment

Students will be able to explain the impact human activities make on the environment

Materials:

Plastic bottle, plastic cup with lid and straw, and any other small plastic containers that gets thrown away

Large container of water, an aquarium

Small plastic fish or other object to represent ocean life

Poster Board and markers

Steps:

Put out examples of plastics for students to examine. Have students brainstorm a list of how these items enter oceans and harm animals.

Fill a large container or aquarium with water. Add a plastic container, straw, plastic lid, and a six ring plastic can holder into the water.

Plastic small fish or toys in the aquarium.

Have students brainstorm how these plastics affect animals, like the fish.

Visit National Geographic for Kids at <https://kids.nationalgeographic.com/science/article/plastic-pollution> and read Tips to Reduce Waste

Have students in groups create a poster to promote reducing waste.

Show a video that shows how plastic straws impact the environment. There is a kid-friendly video at <https://www.youtube.com/watch?v=kCwtlzABUpY> (Note there are several videos about the most famous straw in the world that was stuck in a turtle's nostril but it may be upsetting to watch an anime in distress)

Optional writing assignment: Have students think about items they buy and the type of packages they come in. Students will write a letter trying to persuade someone to stop using the item or write a letter to the company asking them to change the packaging. For example, if you know someone that uses disposable plastic cups or plates made up paper or styrofoam, write a letter to persuade them to use glass plates or cups. (Discuss reusable shopping bags, individually wrapped items, reusable bottles, plastic baggies for food storage, etc)

Writing Rubric

Category	4 Advanced	3 Proficient	2 Basic	1 Below Basic
Focus	The paragraph is well written and stays on topic throughout.	Most of the paragraph is on topic, but there the writing goes off topic once or twice.	Some writing is not clear and often drifts away from the task causing confusion.	The writing is not focused and is confusing.
Content	The question is completely answered with plenty of evidence to support it.	The question is completely answered but there is not much evidence to support it.	The question is completely answered but there is no evidence to support it.	The question is not answered or is off topic.
Organization	Writing has a strong introduction, body and conclusion. Transitions are used as needed.	Most of the writing is in order, but transitions are missing.	Some of the writing is in order, but there is some confusion due to organization.	Writing is out of order and no transitions are used.
Style	Includes descriptive words and sentences are varied in length and structure.	Most sentences address the prompt, but very few descriptive words are used.	Very few descriptive words and little sentence variety.	No descriptive words are used and many sentences are short, begin with the same word or are incomplete.
Conventions	0-1 errors in spelling, grammar or punctuation. Writing is neat and legible.	2-3 errors in spelling, grammar or punctuation. Writing is clear and legible.	4-5 errors in spelling, grammar or punctuation. Some writing is difficult to read.	More than 5 errors in spelling, grammar or punctuation. Writing is not completely legible.

Lesson 5: Water Contamination

Oil spills have a devastating impact on wildlife and costs humans a lot of time and money to clean up.

Timeline: 1-2 class periods

Objectives:

SWBAT explore which materials are most absorbent to clean up oil spills

Materials:

2 pans

water

vegetable oil

spoons

paper towels

cotton balls

dawn dish soap

Steps:

Show the Exxon Valdez oil spill video at
<https://www.youtube.com/watch?v=J1VdQEMEju8>

Have students fill each pan halfway with water.

Measure out $\frac{1}{2}$ cup of vegetable oil.

Have students examine the other materials and predict which item will absorb the most oil.

Students will work in 2 groups and take turns trying different absorbent materials. (providing them with the dawn dish soap last. They can add other materials if they think it might work. (Ex: fabric, paper, etc)

Have students record their findings on the worksheet.

Detailed instructions can be found at <https://littlebinsforlittlehands.com/oil-spill-experiment/>

Optional:

A kid friendly cartoon video about oil spills can be found at https://www.youtube.com/watch?v=ZIJb5c_N5ME

A video demonstrating the effects of an oil spill is presented from the Georgia Aquarium and is found at <https://www.youtube.com/watch?v=CzkhAMUifTY>

(This is a similar experiment but uses some other materials, like feathers, fur, rocks, leaves, shampoo, etc.)

Resources

Center for Disease Control and Prevention (CDC)

https://www.cdc.gov/healthywater/drinking/public/water_quality.html

The CDC is a global organization that works to keep people safe from health threats.

Clark-Fox. Plastic Pollution: You can make a difference by reducing your plastic waste. National Geographic for Kids. Retrieved from <https://kids.nationalgeographic.com/science/article/plastic-pollution> on Nov. 17, 2021.

This article focuses on the negative effects of plastic on wildlife and how to reduce plastic pollution

Comfy Living website. Retrieved from the web on November 19, 2021.
<https://comfyliving.net/recycling-statistics/>

This site lists statistics on recycling.

Dale, Timothy. (2021). The Best Whole-House Water Filters for Healthier Water. Retrieved from <https://www.bobvila.com/articles/best-whole-house-water-filter/> on Nov. 18, 2021.

This article from Bob Vila's website examines various different types of filters and the pros and cons of each.

Drink Philly Tap <https://drinkphillytap.org/>

Drink Philadelphia is committed to promoting safe tap water in Philadelphia.

EPA United States Environmental Protection Agency
<https://www.epa.gov/environmental-topics/water-topics>

The Environmental Protection Agency was created in 1970 to ensure safe drinking water and to establish national standards.

Evans, Ashtyn. Is Philadelphia Tap Water Safe to Drink? Retrieved from the web on December 2, 2021. <https://waterfilterdata.org/is-philadelphia-tap-water-safe-to-drink/>

Denchak, Melissa. Flint Water Crisis: Everything You Need to Know (2018).
<https://www.nrdc.org/stories/flint-water-crisis-everything-you-need-know>

This article explains how the Flint water crisis unfolded and what impact it had on residents.

Howarth, Marilyn. Challenges to Drinking Water in the US. Retrieved from Perelman School of Medicine at the University of Pennsylvania on Oct 12, 2021.

Hughes, Joanna (February 25, 2019) Three Reasons to Study Environmental Health
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Water filter experiments

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<https://www.serious-eats.com/how-bottled-water-became-americas-most-popular-beverage> Retrieved from the web on Nov. 18, 2021.

This article looks at the history and sales of different brands of bottled water.

NASA website. Precipitation Education at NASA <https://gpm.nasa.gov/education/water-cycle> Retrieved from the web on Dec. 1, 2021.

Next Generation Science Standards <https://www.nextgenscience.org/>

The official website for science standards. for all grade levels.

<https://www.epa.gov/ground-water-and-drinking-water/home-drinking-water-filtration-fact-sheet>

Explains the pros and cons of using a water pitcher filter versus a faucet filter and how to select the right filtration system.

Pallardy, Richard. "Deepwater Horizon oil spill". *Encyclopedia Britannica*, 3 Sep. 2021, <https://www.britannica.com/event/Deepwater-Horizon-oil-spill>. Accessed 29 November 2021.

A detailed description of the BP oil spill.

Parker, Laura. The Story of Plastic: How the plastic bottle went from miracle container to hated garbage. National Geographic. Aug 23 2019

Shaw, Allison. Plastic Pollution: Kids vs. Plastic.
<https://kids.nationalgeographic.com/nature/kids-vs-plastic/article/pollution-1>
Retrieved from the web on Nov. 20, 2021.

This National Geographic article looks at the amount of single use plastic that ends up in the ocean.

The Water Cycle by Torrey Maloof available on Epic at
<https://www.getepic.com/app/read/42483>

This is a book for children from Epic on the water cycle.

World Vision Website. Global Water Crisis: Facts, FAQs, and how to help

<https://www.worldvision.org/clean-water-news-stories/global-watr-crisis-facts>

Videos to watch

Bill Nye the Science Guy video
https://www.schooltube.com/media/Bill+Nye+Water+Cycle/1_x140f0rz

How to Make a Water Filter <https://www.jpl.nasa.gov/edu/learn/project/make-a-water-filter/>

What really happens to the plastic you throw away - Emma Bryce video

<https://www.youtube.com/watch?v=6xlNyWPpB8>

National Geographic: Planet of Plastic

<https://www.nationalgeographic.com/science/article/plastic-produced-recycling-waste-ocean-trash-debris-environment>

The Water Cycle <https://www.youtube.com/watch?v=B77sebHmfdk>

<https://www.jpl.nasa.gov/edu/learn/project/make-a-water-filter/> This water filter project.

This version is from National Geographic Kids and can be accessed at

<https://kids.nationalgeographic.com/books/article/water-wonders>.

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<https://www.nationalgeographic.com/environment/article/plastic-bottles>

Appendix

Name: _____

Date: _____

KWL Chart: The Water Cycle

K What I Know	W What I Want to Learn	L What I Learned

Name: _____

Date: _____

The Water Cycle Video

Part of the Water Cycle	Notes (definitions and examples)
Evaporation	
Condensation	
Precipitation	

Evaluation Tool:

Possible Score: 12 points

Category	4 Advanced	3 Proficient	2 Basic	1 Below Basic
Definitions	Student includes definitions for all 3 words.	Student includes definitions for 2 words. .	Student includes definitions for 1 word.	Student does not include definitions for any words.
Examples	Student includes at least one example for all 3 words.	Student includes at least one example for 2 words.	Student includes at least one example 1 words.	Student does not include any examples.
Style and Organization	Work is neat and organized with the correct information in each column.	Work is either neat or organized, but not both.	Work is not neat or organized, but is eligible..	Work is not neat or organized and is difficult to read.

Water Filter Experiment

Name: _____ Date: _____

Experiment	Materials (in order)	Time to pass through filter	Notes
1			
2			
3			

Name: _____

Date: _____

Water Contamination Experiment

Hypothesis (prediction)	
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Materials Used	Results

Conclusion	
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