

Lesson Plan

Description
 This lesson weaves traditional knowledge, the relationship between water and Indigenous peoples, and western science together in order to examine the universal importance of water. By completing this lesson, students will better understand the need for water and what needs to be done to ensure clean water is accessible to all.

<p>Learning Outcomes</p> <ul style="list-style-type: none"> • Students will learn about water advisories and why water isn't always accessible • Students will explore forms of water treatment, specifically water filtration • Students will learn about the importance of water for themselves and why it is sacred to Indigenous communities 	<p>Specific Expectations</p> <p>E1.1 assess the impact of human activities on air and water, taking various perspectives into consideration, including those of First Nations, Métis, and Inuit, and plan a course of action to protect the quality of the air and/or water in the local community</p> <p>E1.3 examine the availability of fresh water and drinking water around the world, and describe the impact on communities</p> <p>E2.5 describe ways in which living things, including humans, depend on air and water</p> <p>A3.2 investigate how science and technology can be used with other subject areas to address real-world problems</p>
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Introduction

Aanii/Hello, my name is Shaylene Restoule. I am one of the Indigenous Program Interns at Science North, and I am also completing my Indigenous Studies degree at Laurentian University. I am an Anishinaabe kwe with relation to Dokis First Nation and Wikwemikong Unceded Reserve. I have gained a lot of knowledge throughout my years growing up of our Indigenous worldviews and how we can live in balance and harmony with the land and people around us. Both of my home communities have struggled with water security, and it has become my passion to learn more about the importance of water in Indigenous communities and how we can take steps towards protecting what is sacred to us.

The Importance of Water

Water (Bi) has a sacred responsibility in Indigenous peoples' lives, through ceremony and everyday life. The forces of colonization have led to a disconnect between intergenerational sharing of knowledge regarding the sacredness of water. As Indigenous peoples, we have a direct connection with water, as it is the first element we are introduced to. Water plays an important role in traditional and ceremonial practices, as it connects us to all life. Many

communities are working towards the restoration of our water and learning how to better protect it for our seventh generation to come.

Water Inequality

Unfortunately, there are many Indigenous communities in Canada that don't have the infrastructure in place to have consistent access to clean water. First Nations often rely on small water systems or individual wells for water but due to inadequate funding and lack of resources being provided, the available water is often not clean. The number of water-borne diseases in First Nations communities is 25 times higher than the national average and people living on reserves are 90 times more likely to have no access to running water compared to non-Indigenous people in Canada. (Black, 2021) This inequality has made water security a chronic challenge for many Indigenous communities. Without the proper infrastructure in place, many communities are faced with long-term water advisories such as Neskantaga First Nation in Northern Ontario that has been on a long-term boil water advisory since 1995.

Water Advisories

Water advisories are put in place when drinking water is no longer safe. There are three forms of water advisories that can impact Indigenous communities; do not consume, do not use, and boil water advisories. Do not use advisories warn that tap water should not be used for any reason because the water poses a health risk and pollutants can't be removed through boiling. Do not consume advisories are equally a result of contaminants like lead not being able to be removed from water by boiling. While the water can be used for bathing, it can't be used for any drinking or cooking. Boil water advisories are used to remove viruses, bacteria and parasites and requires water to be boiled for at least 1 minute before it's used.

Long-term water advisories are understandably challenging for Indigenous communities and have additional economic and cultural impacts due to the lack of clean water in the community.

Water Treatment

While boiling water can work to kill certain bacteria or viruses, it is only a short-term solution. It does not remove suspended particles from the water and lacks the advanced level of disinfection for certain parasites, bacteria, and viruses. To properly treat water, water treatment facilities need to be in place, infrastructure that is often missing on reserves.

The water treatment process typically involves coagulation, flocculation, sedimentation and filtration to remove the various suspended particles. This is followed by disinfection by chemicals, UV light or ozone. Finally, most water treatment plants adjust the water pH and add fluoride to improve taste. In this lesson, students will be able to observe the difference between boiling water and filtering water.

Materials

- 1L bottles cut in half
- Hot plate
- Pot
- Contents used to create filter system: Cotton balls, Sand, Charcoal (optional), gravel and pebbles
- Sample of local lake or pond water OR Coffee grounds/instant coffee (represents contamination). NOTE: Do not drink lake or pond water, even after it has been boiled or filtered
- Coffee filter

Action

Step 1 – Discussion

Begin the lesson by discussing the importance of water in our daily lives and its significance to Indigenous peoples.

- How many times a day do students use water at home or school?
- What are some things that can be found in lakes, streams, and ponds around us?
- What are sources of water pollution?
- What are boiling water advisories?
- How can students conserve water at home

Step 2 – Boiling Water

1. Before beginning, collect sample of water from a nearby lake or stream, ensuring to get enough sediment that there are observable suspended solids in the water. Using coffee grounds or soil in tap water can also work.
2. Put the water in a pot and boil it using a hotplate. Observe the water and ask students if they'd drink it?

Step 3 – Filtration

1. Cut a 1L bottle in half, and place the top half into the bottom half of the bottle
2. Give the students the various materials for the filter system (cotton balls, sand, charcoal, gravel, pebbles) and get them to layer the materials in the order they think would be best to filter the water.
3. The order is important as it will affect how efficient the system is. Letting students experiment with the order is an excellent exercise in inquiry-based learning.
4. The recommended order is for the filter is to put a layer of cotton balls on the bottom, followed by the sand, charcoal, gravel and pebbles. This order allows each layer to remove appropriately sized sediment. Reversing the order would cause all the sediment to get clogged in the cotton balls, slowing down the filtration process.
5. Use an elastic band to attach the coffee filter to the spout of the pop bottle, this is the finest filter material and will remove the smallest sediments
6. Pour the water sample through the filtration system and collect it at the bottom. Pour the water through the filter again if it still appears dirty
7. Boil the water once again and ask students to observe the difference. Would they drink this water? (Don't drink the water!)

Step 4 – Review and Assess

- Open a discussion to ask students why we used those materials in the filtration system, is there any significance? Could other materials be used?
- Is there another way students can filter water without using such materials? What is the purpose of filtering water?
- Be sure to inform students that even though they may all have access to clean water, there are some Indigenous communities who do not. Some communities don't have any access to clean water while others must walk to collect water from wells or wait for water trucks to deliver clean water to their home.

Consolidation/Extension

- While boiling and filtering water improves the water quality, it is not a perfect system and there are likely still contaminants remaining in the water samples. We wouldn't drink the water we treated today, but sometimes that's the only water that is accessible. Ask students to think about ways they can conserve the water they use and to reflect on their ability to use water in their daily lives.
- To extend the inquiry portion of the activity, provide students with different filter materials such as napkins, cheese cloth or sponges.
- If your local area has a water treatment facility, find out if it is possible to do a field trip to learn more about filtration processes.

<p>Accommodations/Modifications</p> <ul style="list-style-type: none"> • The activity can be done in groups or as a demonstration for the students • If you're unable to collect local water samples, fill a water bottle with materials such as coffee grounds, dirt, grass, glitter, salt, or other products to represent pollution. • If materials aren't available, have students design and draw their own water filter system How much would this filter cost to build? Would it be too expensive to build? What materials would they use? What are its functions? 	<p>Assessment</p> <p>This activity and the guiding questions can be used as Assessment <i>for Learning</i>. Gather information from the students throughout the activity to gauge their level of understanding and if additional time will be needed for the topic.</p>
<p>Additional Resources</p> <p>Government of Canada; Indigenous and Northern Affairs Canada. (2022, July 22). <i>Ending long-term drinking water advisories</i>. Government of Canada; Indigenous and Northern Affairs Canada. Retrieved August 31, 2022, from https://www.sac-isc.gc.ca/eng/1506514143353/1533317130660</p> <p>Black, K. (2021, 05 07). <i>The True State of Drinking water advisories in First Nations</i>. Retrieved from University of Calgary: https://ucalgary.ca/news/tip-iceberg-true-state-drinking-water-advisories-first-nations</p> <p>Water First Education & Training Inc. (2022, July 13). Retrieved August 30, 2022, from https://waterfirst.ngo/</p> <p>There's Something in the Water – 2019 Film The Water Walker – Film</p>	