

Lesson #1: Setting the Stage

Topic:	Science 14 Unit D Introduction (Focus on Water)
Science 14 Program of Studies outcome(s): Science, Technology and Society (STS) and Knowledge	<p>Students will:</p> <p>1. Describe how the flow of matter in the biosphere is cyclical along characteristic pathways and can be disrupted by human activity</p> <ul style="list-style-type: none"> • General introduction • https://education.alberta.ca/media/3069383/pos_science_14_24.pdf
Skills	<p>Initiating and Planning:</p> <p style="padding-left: 40px;">Ask questions about relationships between and among observable variables and plan investigations to address those questions</p> <ul style="list-style-type: none"> • Identify questions to investigate arising from practical problems and issues • Define questions and problems to facilitate investigation <p>Performing and Recording:</p> <p style="padding-left: 40px;">Conduct investigations into the relationships between and among observations, and gather and record qualitative and quantitative data</p> <ul style="list-style-type: none"> • Carry out procedures, controlling the major variables • Organize data, using a format that is appropriate to the task or experiment • Use tools, technology and apparatus safely <p>Communication and Teamwork</p> <p style="padding-left: 40px;">Work collaboratively on problems; and use appropriate language and formats to communicate ideas, procedures and results</p> <ul style="list-style-type: none"> • Receive, understand and act on the ideas of others • Communicate questions, ideas, intentions, plans and results, using lists, notes in point form, sentences, data tables, graphs, drawings, oral language and other means • Work cooperatively with team members to develop and carry out a plan, and troubleshoot problems as they arise
Attitudes	<p>Most of the Attitude Outcomes stated in the Program of Studies are included into each of the <i>Wading in for Water</i> lessons. This includes; Interest in Science, Mutual Respect, Scientific Inquiry, Collaboration, Stewardship, and Safety. Please refer to the specific outcomes</p>

	<p>https://education.alberta.ca/media/3069383/pos_science_14_24.pdf</p>
Planning ahead	<p>- Paper for Groundwater Activity (keep to review in Lesson #5)</p> <p style="text-align: center;">*Safety First: Refer to your school/department/district regulations*</p> <p>- Demo: Ice cubes and a glass of water -classroom with a sink for the team building activities -for <u>each</u> group:</p> <ul style="list-style-type: none"> • eye dropper • Penny • Beaker • Access to water • Flat surface • Clear glassware without a pouring lip • Large box of paperclips (have a few extra boxes for backup) • Lesson 2 eggs preparation 24 hours in advance
Type of lesson	<p>Brainstorm Discussion Team Building water activities</p>
Word Wall	<p>Listed in Appendix A</p>

Getting Started

<p>Topic opener “hooks”</p>	<p>Intro/ Hook ideas: At the beginning of the unit it is useful to gauge students’ current understanding of water and the hydrologic cycle. As an introductory activity, ask students in small groups to draw and label a diagram of the hydrologic cycle (http://www.sciencekids.co.nz/sciencefacts/weather/thewatercycle.html). An important component they may miss is groundwater. Use The Groundwater Foundation website (http://www.groundwater.org/get-informed/basics/groundwater.html) to lead a class discussion for the purpose of:</p> <ul style="list-style-type: none"> • Understanding the basics of groundwater – Misconception Alert! Students may mistakenly think that groundwater is found as puddles, reservoirs or streams underground • Recognizing the importance of groundwater within the hydrologic cycle • Identifying potential threats to groundwater and the impact to the hydrologic cycle • Determining reasons for monitoring local water conditions both above and under ground (seen and unseen)
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<p>Lesson Sketch</p>	<p>1. Brainstorm Questions:</p> <ul style="list-style-type: none"> • What do we already know about the water cycle? • What is another name for the water cycle? • How do the words that we have brainstormed about water connect to one another? • What are the terms to describe the changes from liquid/solid/gas? <p>2. Properties of water:</p> <p>Questions:</p> <ul style="list-style-type: none"> • Demo: Drop ice cubes in a glass of water. Which state of water is more/less dense, liquid or solid? What happens to the water in lakes during the winter? What is a unique property of water when water freezes? Not sure? Think about ice fishing. Ice floats, so why is that important to fish in the winter? What if they run out of oxygen? Imagine if ice was more dense than liquid water. What would happen to the lakes in the winter? How would that impact the ecosystem? Consider the plants and animals (like fish) in the lake. • Based on the last point, what temperature is water most dense (heaviest)? Least dense (lightest)? This is an unusual behaviour – other substances are usually more dense in the solid form. Why might this be an important characteristic of water? • At what temperature does water freeze/boil? What if water is not “pure”, will it freeze/boil at 0 C and 100 C? • This is a good opportunity to discuss the <i>particulate nature of matter</i> – a Big Idea of science and necessary for understanding water quality issues (https://www.scoe.org/files/ngss-particle-model.pdf) Discuss what (generally) happens to particles of matter as they gain or lose energy. What is different about water? <p>3. Team building activities:</p> <p style="color: red;">*Safety First: Refer to your school/department/district regulations*</p> <p>Divide the class into groups of 4-5 students, and assign each group member a specific role (see Appendix B)</p> <p>a. <u>Coin and dropper</u>: surface tension Which group can get the most water drops on the penny? What did the winning group do to be successful? Now do this again, and add one drop of liquid soap Teacher resource video https://www.youtube.com/watch?v=uCZ1AmoQGm8</p> <p>b. <u>Paperclip in a small glass of water</u> (a vessel without a lip such as a measuring cup or beaker is NOT recommended): surface tension, adhesion and cohesion. Teacher resource video https://www.youtube.com/watch?v=CeiZfBu7ehE</p>
<p>Closing ideas</p>	<p>Does water have memory? Dinosaur “pee” crash course video: https://www.youtube.com/watch?v=o_bbQ0m3wuM _Students are intrigued by the idea that the water we have on Earth today is the same, recycled water that was here millions of years ago). This is an opportunity to discuss <i>conservation of mass (matter) and energy</i> – necessary for understanding cycling in the environment. Video (time 4:36): http://ed.ted.com/lessons/the-law-of-conservation-of-mass-todd-ramsey</p>

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