


LESSON PLAN 1 : INTRODUCING THE PLASTIC PROBLEM

Subject: Science	Grade: 1-6	Duration: approx. 2 hours
Lesson Overview	To learn the impact plastic has on the environment and ecosystems and to begin to build engagement, interest and curiosity.	

Curriculum Ties	Core Competencies:		
			
	Grade	Subject	Objectives
	2	Science	<ul style="list-style-type: none"> ● Water sources including local watersheds: <ul style="list-style-type: none"> ○ oceans, lakes, rivers, wells, springs ● Physical Ways of changing materials <ul style="list-style-type: none"> ○ warming, cooling, cutting, bending, stirring, mixing and breaking down ● Local First People's knowledge of water: cultural significance of water (i.e., water is essential for all interconnected forms of life)

	3	Science	<ul style="list-style-type: none"> ● Living things are diverse, can be grouped, and interact in their local ecosystems <ul style="list-style-type: none"> ○ Why is biodiversity important in an ecosystem? ○ Interconnectedness means that all things are related to and interact with each other in the environment. How does local First Peoples knowledge of living things demonstrate interconnectedness? ● The knowledge of local First Peoples of ecosystems <ul style="list-style-type: none"> ○ the interconnection between living and non-living things in the local environment; our shared responsibility to care for the local environment (i.e., stewardship); information shared from the local First Peoples community and Elders.
	4	Science	<ul style="list-style-type: none"> ● Biomes as large regions with similar environmental features.
	5	Science	<ul style="list-style-type: none"> ● First People's concepts of interconnectedness in the environment <ul style="list-style-type: none"> ○ Everything in the environment is one / connected (e.g. sun, sky, plants & animals) and we have a responsibility to care for them. ● The nature of sustainable practices around BC's resources. ● First People's knowledge of sustainable practices.
	5	Social Studies	<ul style="list-style-type: none"> ● Resources and economic development in different regions of Canada <ul style="list-style-type: none"> ○ Identify significant natural resources in Canada, including: fish and marine resources. ○ What natural resources are most important to the economy of your community? ● Make ethical judgements about events, decisions, or actions that consider the conditions of a particular time and place, and assess appropriate ways to respond. <ul style="list-style-type: none"> ○ Canada's response to climate change. ○ What are the potential consequences of non-sustainable practices in resource use?

Content Objectives	<ul style="list-style-type: none"> ● Students will begin to understand the impact of plastics in our marine environments. ● They will gain a scientific knowledge of how it affects our local ecosystems.
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Materials and Equipment Needed for this Lesson
<ul style="list-style-type: none"> ● A variety of plastic items with various resin codes (it is particularly impactful if they are recognisable items from day-to-day life. Examples: <ul style="list-style-type: none"> ○ Plastic pop bottle ○ Plastic cutlery ○ Shampoo bottle ○ Condiment bottle ○ Plastic bag ○ Coffee cup lid ● Large bucket full of water

Lesson Stages	Learning Activities
Introduction	<ul style="list-style-type: none"> ● Begin to build connections with the local environment. <ul style="list-style-type: none"> ○ “What do you enjoy about the beach / lake / river?” ○ “What issues concern you the most about our environment?” ○ “How do you think the things you enjoy doing can be impacted by these issues?” ● Introduce Surfrider & the work we do <ul style="list-style-type: none"> ○ Information about Surfrider Pacific Rim’s current campaigns and programs can be found on our website: www.pacificrim.surfrider.org ○ Do you have a local Surfrider chapter? What are they currently working on? ● Talking Points for each Grade: <ul style="list-style-type: none"> ○ Grade 2:

	<ul style="list-style-type: none"> ■ What are the water sources near by? What other types of water sources could you find elsewhere? ■ Why is water important for all living things? ■ How does water cycle through the environment? ■ Water is essential for all interconnected forms of life ○ Grade 3: <ul style="list-style-type: none"> ■ What is biodiversity: the variety of different types of living things in an ecosystem. Talk about animals in the ocean and how they interact. What animals have students seen on the beach? ■ Why is biodiversity important in an ecosystem? ■ Discuss certain characteristics of local plants, animals and fungi ■ Can use this song: The Biodiversity SONG Science for Kids Grades K-2 - YouTube ○ Grade 4: <ul style="list-style-type: none"> ■ How do living things sense, respond, and adapt to stimuli in their environment? ■ Talk about aquatic/ marine biomes. Biomes are regions grouped by similar temperature and precipitation ■ Watch this video about what biomes are: Biomes - The Living Landscapes of Earth, Introduction To Biomes Of The World, Geodiode - YouTube ■ Discuss: What types of animals are in our biome? What types of trees, plants etc. What types of things do we see underwater and on the beach? ○ Grade 5 <ul style="list-style-type: none"> ■ What does interconnectedness mean? <ul style="list-style-type: none"> ● everything in the environment is one/connected (e.g., sun, sky, plants and animals) and we have a responsibility to care for them ● What are the First Peoples concepts of interconnectedness? Interconnected - YouTube ■ What are BC's natural resources? Which are renewable and non renewable? B.C.'s natural resources industry - YouTube ■ What is the nature of sustainable practices around BC's resources? <ul style="list-style-type: none"> ● How do First Peoples view sustainable practices? ● What do First People do to maintain sustainable practices? ■ Resources and economic development in different regions of Canada <ul style="list-style-type: none"> ● Identify significant natural resources in Canada, including:
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	<p>fish and marine resources.</p> <ul style="list-style-type: none"> ● What natural resources are most important to the economy of your community? <p>■ Make ethical judgements about events, decisions, or actions that consider the conditions of a particular time and place, and assess appropriate ways to respond.</p> <ul style="list-style-type: none"> ● Canada’s response to climate change. ● What are the potential consequences of non-sustainable practices in resource use? <p>***For grade 5 can also discuss local types of earth materials and rock cycle, if it makes sense.</p>																																				
<p>Activity</p>	<p>ACTIVITY #1: Plastic Science! Plastics in the Water Column</p> <p>What does plastic in the ocean do: float, hang or sink? Students make predictions and then test their theory, and see if there are similarities in types and numbers on plastics.</p> <p>1) Experiment with a variety of plastic objects in groups of 4 or 5</p> <p>a. Record the name of the item and its resin number in the chart below. b. Predict whether it will sink, hang, or float and write in the chart below. c. Now submerge the items in the water and record your results d. Leave the last column until the final activity</p> <table border="1" data-bbox="399 1266 1570 1581"> <thead> <tr> <th></th> <th>Plastic Item</th> <th>Resin No</th> <th>Prediction: Do you think this plastic sinks or floats</th> <th>Results: did it sink or float</th> <th>Marine animals affected</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p><i>*See workbook for full copies of these tables</i></p> <p>2) Have a discussion:</p> <ul style="list-style-type: none"> ● Are there similarities with the buoyancy of the plastics? ● What is the resin code number? Refer to the Resin Code Key for help! 		Plastic Item	Resin No	Prediction: Do you think this plastic sinks or floats	Results: did it sink or float	Marine animals affected	1						2						3						4						5					
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- What would you normally use these plastic objects for? Are there alternative materials this object could be made with?
- What would happen if the plastics from your experiment made it into the ocean? (photodegradation, break down into tiny pieces and impact sea life at all levels of the food chain; soak up toxins like PCBs and POPs; sink to the sea floor; float and end up on beaches)

#	Name of Plastic	Uses	Where in Water Column
1	PETE Polyethylene terephthalate	Soft drink and water bottle, peanut butter containers, salad dressing and vegetable oil containers	Sinks
2	HDPE High-density polyethylene	Milk jugs, detergents, household cleaners, motor oil containers, some garbage bags, butter and yogurt tubs	Floats
3	PVC Polyvinyl chloride	Clear food packaging, medical equipment, siding, piping, windows, shampoo bottles	Sinks
4	LDPE Low-density polyethylene	Squeezable bottles, various bags (for bread, frozen food, shopping and dry cleaning), clothing and furniture	Floats
5	PP Polypropylene	Syrup bottles, ketchup bottles, caps, straws, medicine bottles	Floats
6	PS Polystyrene	CD cases, takeout containers, food packaging	Sinks
6	EPS Expanded Polystyrene	Meat trays, egg cartons, disposable plates and cups, dock floatation	Floats
7	Other	DVD cases, iPod packaging, signs and displays, nylons	Varies

ACTIVITY #2: Impact on eco-systems

For younger grades: Cut out the animals and stick onto the zone of the ocean they feed in. What marine animals might be affected by your plastics in the experiment? Write the answers in the last column of the table above. *How does that make you feel?*

Surface: Bald Eagle, Albatross, Grey Whale, Right Whale

Pelagic: Orca, Tufted Puffin, Leatherback Turtle, Humpback Whale, Coho Salmon

Benthic: Giant Pacific Octopus, Grey Whale, Sea Otter

For older grades: research exactly where and what these animals are feeding on, and what role they play in the ecosystem.

Discuss: How does this information make you feel? How do you think this is also affecting humans? This discussion can then lead into the bio accumulation discussion.

ACTIVITY #3: Bioaccumulation

How plastic ends up in the food chain

1. Pollutants are absorbed by microplastics, and mix with plankton
2. This toxic soup is ingested by filter feeders
3. These pollutants bioaccumulate and biomagnify up the food chain

Class demonstration:

- In a class of 20, designate 8 students to be Plankton, give them each a handful of rice / pasta / poker chips / or some other token. Then they wander around the room.
- Next, designate 5 different students as Herring. The Herring run around and 'eat' and as many plankton as they can (the plankton pass over their tokens to their Herring captors) Now the herring wander around with their groups of Plankton.
- Designate 4 different students as Salmon. The Salmon run around and 'eat' as many Herring as they can (collecting their tokens as they go). Now the Salmon swim around with their groups of herring and Plankton.
- Designate 2 more students to be Sea Lions. The Sea Lions 'eat' as many salmon as they can (collecting their tokens), and they wander around in their groups of Sea lions, Salmon, Herring and Plankton.
- The final student is a Transient Orca. They eat both Sea Lions (collecting all the tokens).
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Explain that these animals are absorbing the chemicals and toxins from plastic into themselves as they feed (bioaccumulation), and that animals higher up the food chain consume a heavier load of these toxins as they inherit the load that their prey has already accumulated (biomagnification). Whilst the plankton only has a handful of tokens, a transient orca has a whole bag.

Closure	<ul style="list-style-type: none"> ● Have a final discussion on the impacts ● <i>Consider this: it isn't only marine creatures that eat seafood. Research has shown that not only are we consuming microplastic with our food, but even inhaling it in the air we breathe! Microplastics are literally everywhere, from the deepest ocean trenches to uninhabited arctic shores.</i>
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Modifications / Extensions	<ul style="list-style-type: none"> ● Adjust the level of depth depending on the grade. The goal is to begin to build an interest, engagement and curiosity. ● For non-coastal groups, discuss how rivers transport plastic to the ocean ● Make sure to discuss more specific the topic for each grade. <ul style="list-style-type: none"> ○ Science 2: Water Sources ○ Science 3: Local eco-systems ○ Science 4: Biomes ○ Science 5: Nature of sustainable practices
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Additional Teacher Info	<p>Additional Student Resources for Research:</p> <p>Plastic 101 video: https://education.nationalgeographic.org/resource/science-101-plastics/</p> <p>https://5gyres.org https://oceanlegacy.ca/ https://marinedebris.noaa.gov/ www.plasticpollutioncoalition.org https://www.plasticoceans.org/ oceana.org/</p>
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