

Environment and
Climate Change Canada

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Ocean
School

ocean WISE.



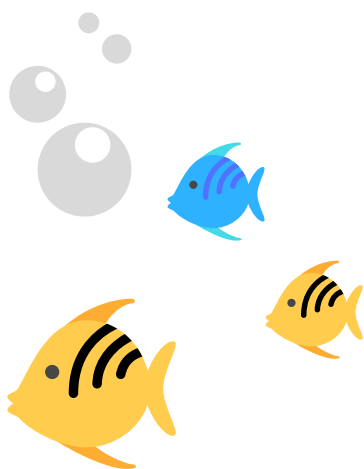
Sea Smart



STUDENTS ON ICE
FOUNDATION - FONDATION



PLASTIC EDUCATION KIT



A RESOURCE GUIDE FOR

**TEACHERS LEADING
CHANGE**

GRADES 10-11

www.plasticsedkit.ocean.org

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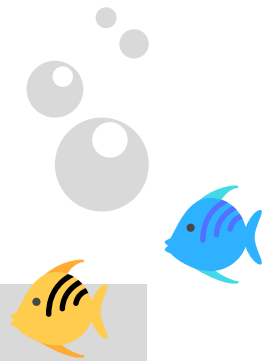
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Help us inspire our youth to break the plastic pattern...

and protect our ocean.



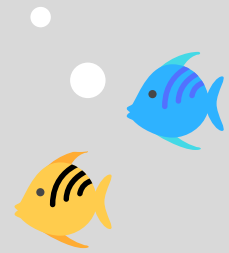
At least **8 million tonnes** of plastics leak into the ocean each year.



But why does the ocean matter?



- No oceans, no us!
- Life on Earth cannot exist without our oceans
- Our oceans produce over 50% of the oxygen we breathe
- Our oceans control weather and temperature
- 40% of carbon dioxide gets absorbed by our oceans
- 4.3 billion people rely on seafood for protein



Why is plastic pollution a problem?

- More than 500 billion kg of plastic is produced every year
- Forty percent of all plastic produced is designed for single use
- Plastic never disappears, instead it breaks up into smaller pieces, absorbing and releasing poisons along the way
- Over 90 % of marine birds have plastic pieces in their stomachs
- Plastic is killing more than 100,000 sea turtles, birds, whales, dolphins, and other animals each year from ingestion and entanglement.
- Plastic and other forms of pollution are ending up in our marine life, and it's making its way into our food chain. Fish eat plastic - we eat fish.
- Other toxins from plastic disposal are ending up in our bodies.
- Plastic is in our tap and bottled water, seafood and in the air we breathe



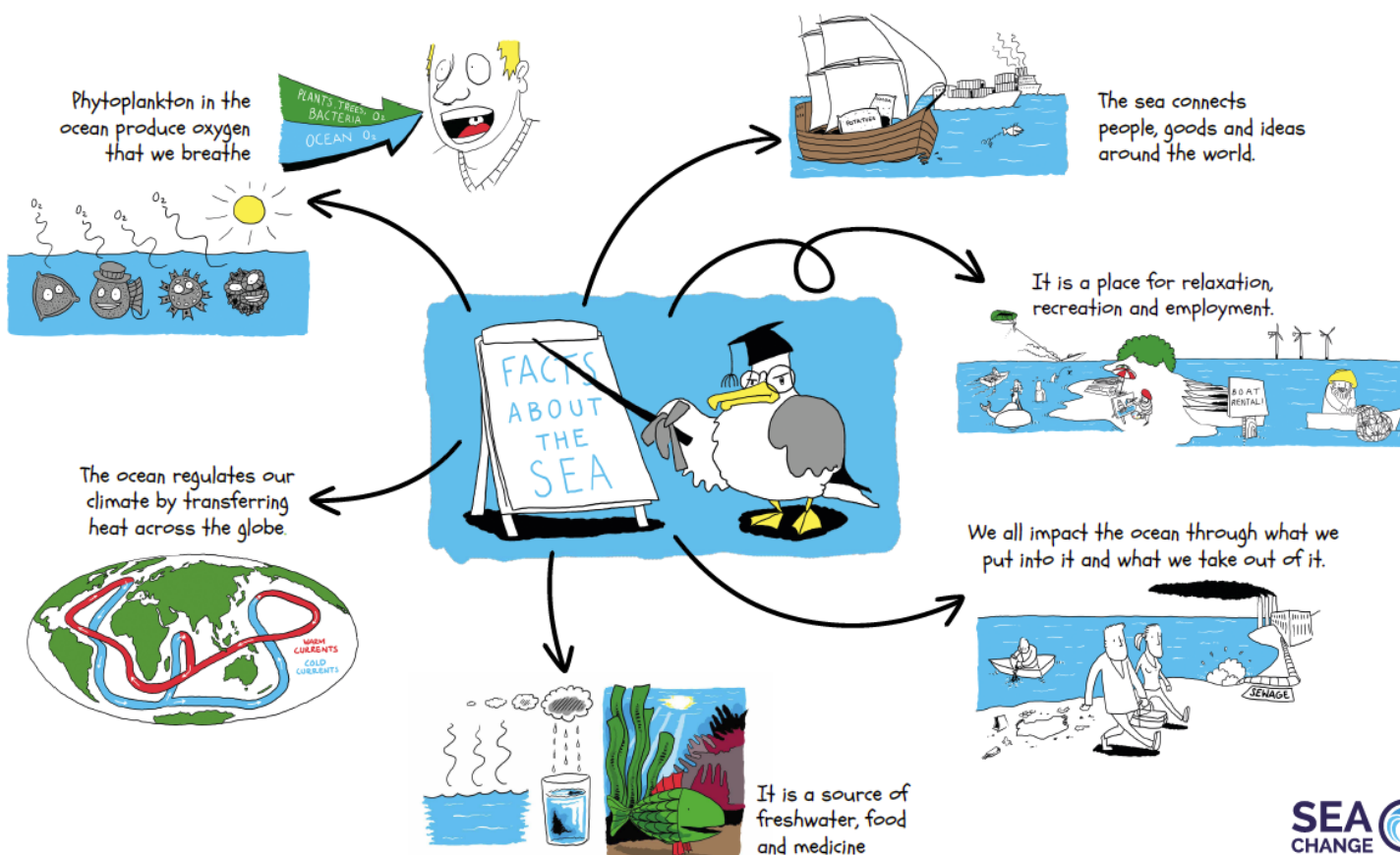
Dear Teachers...

The Earth's oceans, and the interconnected cycle of water and waterways, are utterly vital to every living thing on Earth. And yet the health of these oceans, and by extension the wellbeing of all life on Earth, is at risk due largely to the impacts of human activity. Plastic is everywhere in our oceans and it's going to take a deep, transformational change in humanity's consciousness and activities regarding the oceans to ensure healthy, sustainable life on this planet. We believe this is possible! **But we need your help.** Our youth need to be made aware of their own plastic use and how their actions will have a direct impact on the environment around them. Through these lessons we hope our youth will become leaders of change - and this all starts in your classroom. Thank you for caring and helping us break this pattern!

Why Canada?

- Canada has 243,000 km of coastline - the longest coastline in the WORLD!
- Of the five ocean basins, Canada's coast touches three of these; the Atlantic, Arctic and Pacific Oceans
- We also have more surface area covered by lakes than any other country in the world.
- Canada has North America's strongest current - located in the Discovery Passage in BC, with speeds up to 17km/hr.
- With millions of lakes, Canada has more lake area than any other in the world!

UNDERSTANDING OUR OCEAN



“I pledge to respect the ocean and appreciate what it gives me.”

LESSON
1
GRADES
10-11

Students will be able to:

- ✓ Explain ways the ocean is a unique resource.
- ✓ Understand how we are harming the ocean through the production of plastics.
- ✓ Explain what makes up a healthy ocean and aspects of the environment within it -focus on how we can advocate for this through social media.

The action of the ocean changes the shape of the land. It does this by the slow, continuous movement of seawater, erosion of land deposition of the ocean sediments across geological eras working together to create the landscape. Not only has the ocean changed our landscape, we also rely on it for our every day life. It gives us food, energy, medicine, transportation, recreation, travel, tourism and even our climate! In this lesson students will reflect on the importance of our oceans, the ways we harm the ocean and what we can do to help it. This lesson should be interactive, where students can communicate their thoughts with the class.

The ocean and life in the ocean shapes the earth.



Plastic is changing the ocean environment.

Materials

- Student Workbook
- Pen/Pencil
- Audio/visual system

 **CRITICAL QUESTIONS**

How does the ocean help us? How can we help the ocean? What happens when plastic is added to an ocean environment?

 **LESSON GUIDE**

- 1) Watch the videos **Oceans are Life** and **The Majestic Plastic Bag**
- 2) **Workbook Page 1:** Give the students 5 minutes to brainstorm each bubble and then come back as a class and share their ideas. Ensure they add the ideas of others to their own map. Ex. Water is a unique resource as it gives us a variety of benefits; food, medicine, travel, climate, etc.
- 3) **Workbook Page 2:** Discuss aspects found in the ocean; plants, animals, oxygen, sand, rocks, etc. Have the students consider what makes the ocean healthy and how plastic litter will lead to an unhealthy ocean environment. Once complete, have students draw out their healthy ocean.
- 4) Discuss the ocean promise; to respect the ocean and appreciate what it gives me. Ask the students - what does this mean? Why is this important? Have the students discuss what it means to be respectful versus disrespectful to the ocean environment.

Want to start the unit with a bang? Schedule a virtual meeting with the Vancouver Aquarium and get a tour on how plastics are harming the ocean environment. More info at onlinelearning@ocean.org.

 **RESOURCES (Click on them!)**

- OW: *Take the Pledge*
- OW: *Virtual Meeting*
- OW: *What is Plastic*
- UNESCO: *Ocean Literacy For All*
- SC: *Understanding our Ocean*
- OW: *Ocean Literacy Course*
- *Heal The Bay: The majestic plastic bag*
- OW: *6 Countries*

“I pledge to reduce the amount of plastic in my lunches.”

LESSON 2 GRADES 10-11

Scientists have theorized that life on Earth most likely originated in the sea. The ocean is not only where life is thought to originate but it has also generated much of the oxygen that is required by many of Earth’s organisms. Phytoplankton living in the ocean’s surface waters produce oxygen through photosynthesis. They are the base of the aquatic food chain as they are consumed by zoo plankton, which are consumed by fish larvae, consumed by small fish, consumed by other predators. This lesson will introduce the students to the food chain and will encourage discussion around the flow of energy from one organism to another. Students will also consider how plastic will impact this food chain – especially considering many animals will eat it, mistaking it for food.

Students will be able to:

- ✓ Explain what a simple versus a complex food chain is.
- ✓ Understand how the flow of food energy moves from one organism to another.
- ✓ Understand the environmental, ethical, economic, and health impacts of plastic pollution on the food chain.

CRITICAL QUESTIONS

The ocean made the earth habitable.

How has the ocean made the earth habitable? How does plastic impact the food chain? What happens if plastic is mistaken as food? What happens when an animal is taken out of the food chain?

LESSON GUIDE

Marine life consumes plastic every day.

1) Discuss favourite foods. What do you eat? Why? What kind of energy does this give you? Do you get the same energy from sugar as you would from meat? Relate this to simple and complex food chains.

2) **Workbook page 3:** Students will look at the food web and try to draw arrows to the animal's food. Some may have one or more arrows connected to it!

3) **Workbook page 3:** What happens when plastic is added to the food chain? Explain how this might affect the animals. *Consider bioaccumulation, trophic levels and impacts on people that rely on seafood as a resource.*

Materials

- Student Workbook
- Pen/Pencil
- Lab materials

Take it to the Lab (additional activity):

Dissect a seafood species such as squid, herring or clams. Connect anatomy, physiology and fishing practices and how they might be impacted by plastic consumption.

RESOURCES (Click on them!)

- OW: [Reusable Containers!](#)
- OW: [Article: All About Lunches](#)
- WE: [Go Green Action Campaign](#)
- OW: [Our People](#)
- C3: [Oceans are Life](#)
- OW: [Dissection Worksheets](#)
- UN: [Plastic Ocean](#)
- FNEC: [Unit 8 Ocean Connections](#)
- [Mysteries of Ancient Clam Gardens](#)

LESSON
3
GRADES
10-11

“I pledge to reduce using single use plastics.”

Water is everywhere! It covers 70% of the earth's surface. Of all that water 97% is found in the ocean. There are 5 major ocean basins around the world and all of these basins together form one big world ocean. Water in the ocean is always moving, all around the world. Waves, tides and the rotation of the earth move the water, nutrients and even animals all over the planet. This movement helps to maintain balance in the world, and keeps the planet healthy. In this lesson students will look at how the ocean moves from place to place and carries animals, plants and plastic with it. Students will consider how their own litter can end up in the ocean and take time to consider the three big R's, as well as ways to take action on reducing litter at home.

Students will be able to:

- ✓ Describe how objects in the ocean move from one place to another.
- ✓ Understand the negative impact of single use plastics.
- ✓ Find alternatives for single use plastics at home.

The earth has one big ocean with many features.



Plastic litter knows no borders.

Materials

- Student Workbook
- Pen/Pencil
- Audio visual system
- Posters - [Marine Debris](#) and [Giant Pacific Garbage Patch](#)



CRITICAL QUESTIONS

How does plastic end up in the ocean? Is plastic biodegradable?



LESSON GUIDE

- 1) Watch video; [Fish Telemetry by C3](#)
- 2) **Workbook page 4:** Answer questions on the video.
- 3) **Workbook page 5:** Think-Pair-Share - Make a list of ways you can reduce using single use plastics at home, ex. [Watch video: Here's How](#) on making body scrub at home
- 4) Optional Plastic Challenge: For 3 days, carry with you a clear plastic jar/container. Every time you use a piece of single-use plastic, put it into the jar. After the three days, empty your jar and evaluate what items you used. Write a blog about the experience.



RESOURCES (Click on them!)

- OW: [How does plastic end up in the ocean?](#)
- OW: [How does plastic end up in the Arctic?](#)
- OW: [A Year of Ocean Stories](#)
- UN Clean Seas: [Turn the Tide on Plastic](#)
- OW: [Here's How Videos](#)
- OW: [Vortex](#)
- OW: [Vortex Virtual AquaClass](#)
- CS: [Taking the Pledge](#)

LESSON
4
GRADES
10-11

“I pledge to pick up litter when I’m outside and try plogging... picking up litter while jogging!””

The ocean has a lot of diversity in its plants and animals. These adaptations are based on the ecosystem in which they are living in. In this lesson students will learn about biodiversity and ecosystems. They will consider the properties of the ocean and ocean floor and discuss how plastic will have a direct impact on this. Students will take action by organizing a shore-line clean-up in their area - whether they live near a beach or not.

Students will be able to:

- ✓ Explain the properties of the ocean and the ocean floor.
- ✓ Explain the affects the plastic pollution has on an ecosystem.
- ✓ Explore their own ideas on how to mitigate plastic pollution.

The ocean supports a great diversity of life and ecosystems.



Plastic is changing the ecosystems of marine life.

Materials

- Student Workbook
- Pen/Pencil
- Audio visual system
- Computers to plan shoreline clean-up



CRITICAL QUESTIONS

How has plastic impacted the ecosystem of the animals in the ocean? How could they adapt to this? How could it harm them?



LESSON GUIDE

1) Mind map: Write the word “Ocean Ecosystem” on the board and brainstorm aspects of this with the students; ask – what is an ecosystem? What does it require? What are the properties of and ocean ecosystem?

2) Shoreline Clean-up: Consider the shoreline and how this has a direct impact on the ocean environment. Have the students organize a shoreline clean-up in their area. (Information found below with extra lesson guides if desired) *Note: Students do not have to live near a beach to host a clean-up!*

3) **Workbook Page 6:** Down the Drain Challenge. To contextualize human impact on the environment and demonstrate how individual action can have both a negative and positive effects on ocean health. More info found [here](#).



RESOURCES (Click on them!)

- OW: [Shoreline Lesson Guides](#)
- OW: [Shoreline Clean-up](#)
- OW: [Host a Clean-up](#)
- OW: [Killer Whales](#)
- CS: [Clean Seas Education Pack](#)
- OW: [Ocean Bridge Leaders](#)
- OW: [Saving Sea Lions](#)
- SA: [Plastic Pollution May Change Cattle DNA](#)
- C3: [Oceans are Life](#)

“I pledge to use reusable water bottles at school and at home.”

LESSON
5
GRADES
10-11

The oceans are the prime regulators of climate, they absorb 90% of the planet’s heat, 30% of the planet’s carbon dioxide and give the planet 50% of the oxygen that we need. Ocean currents allow the ocean to absorb, store and transfer of heat. These abilities allow the ocean to have a major influence on climate. Most rain that falls on land originally evaporated from the ocean. As water evaporates from the ocean it transforms into water vapor that is incorporated into the atmosphere. Some of this water vapor rises and helps to form the clouds from which rain falls. In this lesson, students will learn about the hydrologic cycle and will consider the impact of plastic in the ocean on climate.

Students will be able to:

- ✓ Explain how the ocean acts as a massive water source; focus on the hydrologic cycle.
- ✓ Explain how the ocean influences climate and weather.
- ✓ Understand how the impact of plastic in the ocean climate and weather.

The ocean is a major influence on climate and weather.

CRITICAL QUESTIONS

How does the ocean influence the earth’s climate? How would plastic in the ocean change the climate and weather? How does this impact us?

LESSON GUIDE

- 1) **Workbook Page 7:** Introduce the hydrologic cycle and complete questions on this.
- 2) Set up science experiment on warm and cold currents in the ocean;
 - Temperature differences create currents – cooler water sinks and flows towards the tropics to cool the water there down and the warmer water from the Tropics flows to the poles to take its place, where it is cooled.
 - Demonstrate all this using ice cubes with blue dye, hot water that is dyed red using food colouring. Set a clear bucket/tub of water the night before your experiment (to have room temperature water the next day).
 - Place blue water with ice cubes in the room temperature water and pour hot red water in the tub. Watch where the coloured water moves.
- 3) Watch video; **How is Climate Change Affecting Arctic Communities?**
- 4) **Worksheet Page 8:** Discuss how plastic heats up the ocean and changes the climate in small groups.

RESOURCES (Click on them!)

- OW: [How is Climate Change Affecting Arctic Communities?](#)
- OW: [What happens to your plastic bottle when you recycle it?](#)
- UNESCO: [How does ocean acidification occur?](#)



Plastic in our ocean is impacting the climate and weather.

Materials

- Student Workbook
- Pen/Pencil
- Audio visual system
- Atlases or maps of Canada with waterways labelled
- 3 glasses, 3 thermometers, plastic wrap, tape (per group)
- Dark Construction paper

LESSON
6
GRADES
10-11

“I pledge to re-purpose plastic I was going to throw away.”

Our lives are connected to the ocean depths. There are challenges and opportunities in this previously hidden realm, and yet, despite the size and importance of the ocean, less than 10% of it has been explored. The global map of the ocean floor is less detailed than maps of Mars, the Moon or Venus. Still, large organisms in the depth of the ocean are being found with plastics in their stomachs. These come from plastics breaking down, from microbeads in cleaners and microfibrils from our clothes. In this lesson, students are going to look at physical and chemical ways of changing materials and how this relates to microplastics in the ocean.

Students will be able to:

- ✓ Understand that plastic pollution begins early, starting with the production process.
- ✓ Explain practical applications and implications of chemical processes to create plastics.
- ✓ Identify major differences between the seven different classifications of plastics and which are recyclable in their community.

 **CRITICAL QUESTIONS**

What aspects of the ocean have not been explored? What are microplastics? How do they end up in the depths of the ocean?

The ocean is largely unexplored.

 **LESSON GUIDE**

1) Watch video: [What happens to Microplastics in the Ocean](#)

2) Students go for a walk in small groups around the school in search of different types of litter and bring them back to the class.

3) **Workbook Page 9:** Students will decide if each piece of litter or recycling was made with plastic. Sort items into three categories: contains plastic, may contain plastic and definitely does not contain plastic. Discuss how we know that something does NOT contain plastic - what qualities to we look/feel for?

4) **Workbook Page 10:** Sort through your “contains plastic” pile and divide them into smaller groupings (i.e. purpose, strength/durability, standard classifications, recyclable in your city etc.). Discuss whether each grouping was created differently than the others. How? Have your students choose a piece of plastic and do research into the chemicals and processes required to create it.

Try it in the lab:

- Students try their hand at making Casein Plastic - a simple and natural plastic-like substance from household ingredients.
- Students research some of the current ways that we are reusing, repurposing and recycling plastics today.
- Students are divided into pairs and provided with pens, paper, building materials (i.e. cardboard, masking tape, etc.) and tasked with the creation of a contraption that would help humans or animals reuse, repurpose and recycle plastics.

 **RESOURCES (Click on them!)**

- OW: [Microplastics](#)
- OW: [Microplastics Explained](#)
- OW: [The Plastic Invasion](#)
- C3: [Microplastics](#)
- C3: [Finding Plastic](#)
- ON: [Endeavour Hydrothermal Vents](#)



Microplastics are everywhere!

Materials

- Student Workbook
- Pen/Pencil
- Audio visual system

“I pledge to spread my knowledge about using plastics with others.”

Water is not just a resource - it also has a cultural importance to Indigenous communities in Canada. For Indigenous peoples, water is a living thing and a spiritual entity with “life-giving” forces. With this there are certain duties and responsibilities to ensure that it is respected, protected, and nurtured. For Indigenous peoples, water quantity and quality are not only ecological and health issues but also parts of a much broader holistic perspective which recognizes that all aspects of creation are interrelated. Water is not only for drinking but also has traditionally and continuously been used in ceremonies, to grow medicines, and for cleansing and purification. (Excerpt taken from *The Solutions Journal: Found here*). In this lesson, students will consider how actions on plastic use impacts the indigenous communities. They will do a reflection activity and consider their own connection to the ocean. After this they will apply their learning to a poster to share with their peers.

LESSON

7

GRADES

10-11

Students will be able to:

- ✓ Understand the importance of ocean resource stewardship.
- ✓ Connect actions and decisions on plastic use to the impact on the local and global environment, including those of First Peoples.
- ✓ Understand the influence of visual culture on self-perception and identity through plastic use poster campaign.

? CRITICAL QUESTIONS

How can we respect the ocean? What can we do to help it?

The ocean and humans are connected.



We can all become wiser with our use of plastic.

Materials

- Student Workbook
- Pen/Pencil
- Audio visual system

▶ LESSON GUIDE

- 1) SEL Reflection Activity: Students visualize they are at the ocean. What do you hear and what can you see? What does it smell like to you? Describe the sensations you feel on your skin and what you feel in your heart when you think of the Ocean.
- 2) Watch Video: **It’s not me, It’s you**
- 3) **Workbook Page 11:** Love Letters to the Sea
- 4) **Workbook Page 12:** Students will build a campaign in their community for a topic related to preventing plastic in the ocean. Ex: *How we view plastics and our relationships with plastics is influenced by media, marketing, community and social media.*
- 5) **Workbook Page 13-15:** Students will create a pitch using the steps provided.

*Schedule a virtual meeting to see Douglas Coupland’s **Vortex** on Marine Plastic. More info at onlinelearning@ocean.org.*

💡 RESOURCES (Click on them!)

- OW: *Reduce, Reuse, Recycle*
- OW: *Our Ocean Needs You*
- OW: *Virtual Trip to the Vortex*
- C3: *Expedition Videos*
- OW: *Humans are turning the World into Plastic*

Rubric for Teachers: Unit Evaluation

This rubric can be used as an evaluation of the student's performance throughout this unit. You will find the same rubric in the student workbook to help them understand how they may be evaluated.

| Engagement in Activities - /20 | | | |
|---|---|--|--|
| Standard of Excellence 17-20 | Proficient 13-16 | Acceptable 10-12 | Not Acceptable 0-9 |
| Students readily engaged in activities and consistently showed leadership in each of the assigned activities. | Students willingly engaged in activities and frequently showed leadership in each of the assigned activities. | Students engaged in activities and occasionally showed leadership in each of the activities. | Students reluctantly engaged in activities and rarely showed leadership in the activities. |

| Responses / Reflections - /10 | | | |
|--|--|---|--|
| Standard of Excellence 9-10 | Proficient 7-8 | Acceptable 5-6 | Not Acceptable 0-4 |
| Responses demonstrate a thorough understanding of the complexity of the issues. Students develop a sound judgment based on solid evidence. | Responses demonstrate an understanding of the complexity of the issues and the ability to support their opinion. | Responses demonstrate an ability to summarize and restate the key issues. | Responses indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation. |

| Presentation - /10 | | | |
|---|---|---|--|
| Standard of Excellence 9-10 | Proficient 7-8 | Acceptable 5-6 | Not Acceptable 0-4 |
| Contribution demonstrates a thorough understanding of topic. Effective and competent communication of key concepts. | Contribution demonstrates an understanding of topic. Effective communication of key concepts. | Contribution demonstrates a general understanding of topic. Communication of key concepts is evident. | Contribution indicates a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation. |

Thanks to our Partners!



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Ocean School **École de l'Océan**



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