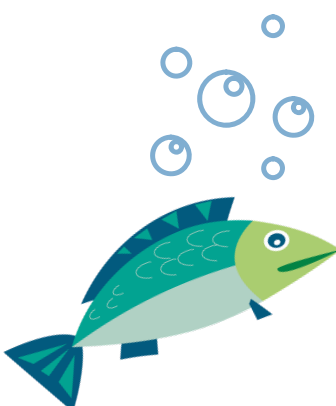




Seafood Education Kit



A RESOURCE GUIDE FOR
**TEACHERS LEADING
CHANGE**

Grades 10-11

<http://education.ocean.org>

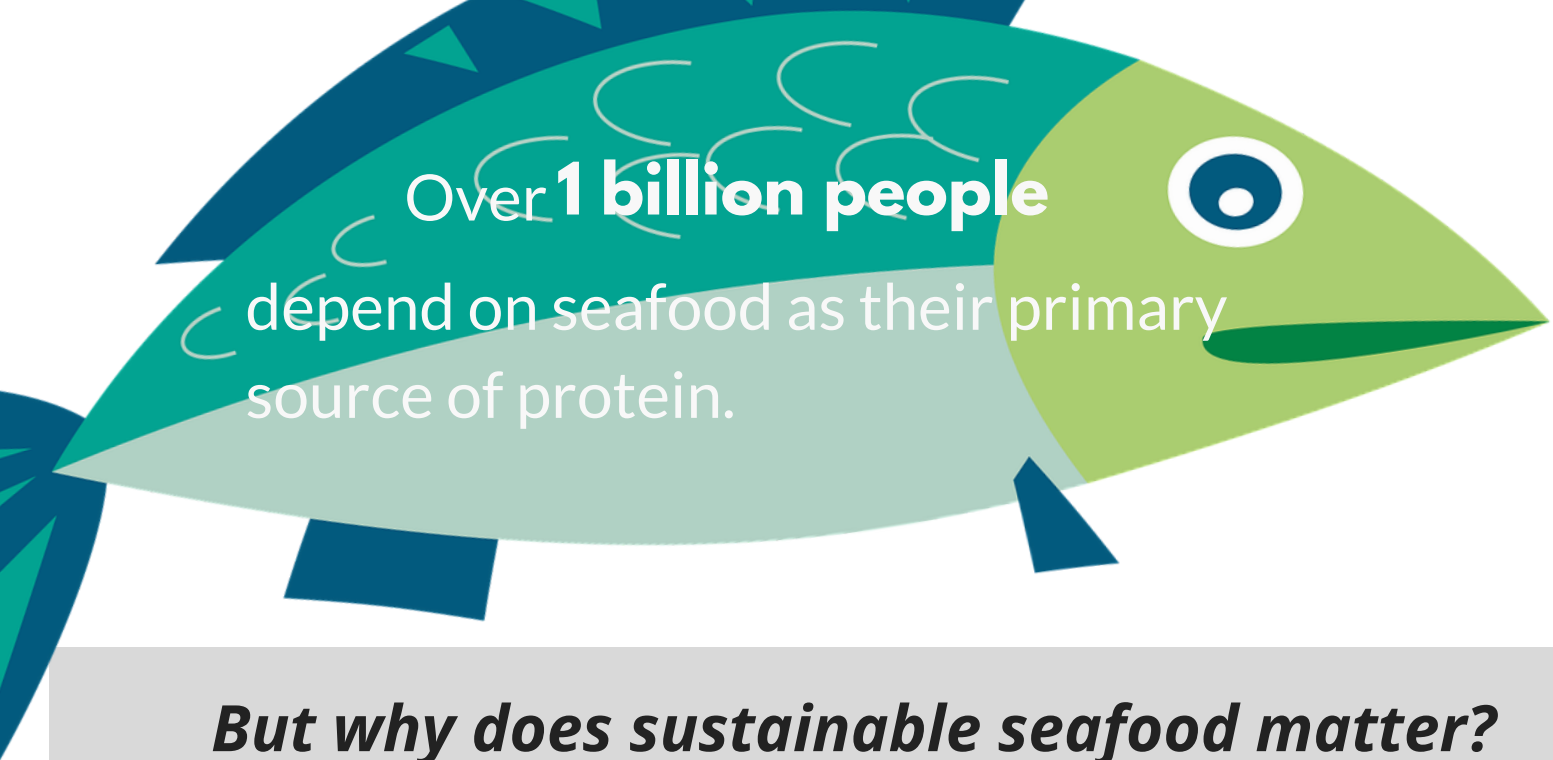


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*Help us inspire our
youth to lead advocacy
for sustainable
seafood...*

**and protect our
ocean.**

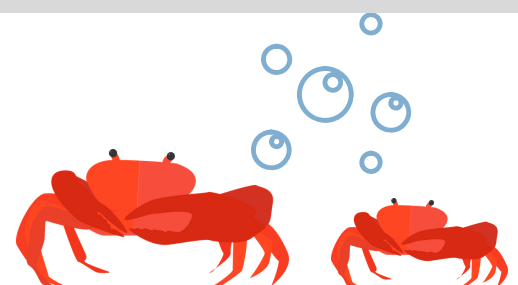


But why does sustainable seafood matter?

Overfishing is one of the **biggest threats facing our oceans today**. Roughly 90 percent of the world's assessed fish stocks are now fully fished or overfished according to the most recent report by the UN's Food and Agriculture Organization (FAO). This **leaves just 10 percent of fish stocks** underfished – a number that has decreased almost continuously since 1974. Choosing sustainable seafood helps to replenish fish stocks.

Why is our world's ocean essential?

- Our ocean maintains earth as we know it by **regulating the climate**, supplying oxygen to the atmosphere, and by maintaining the lives of the millions of organisms that make up the complex marine food web.
- Beyond the animals that live directly in the ocean, the marine ecosystem also **supports terrestrial creatures** such as bears, birds, and humans.
- Humans need the ocean as a source of food, for our **livelihoods**, as part of our cultures, and for a healthy life.

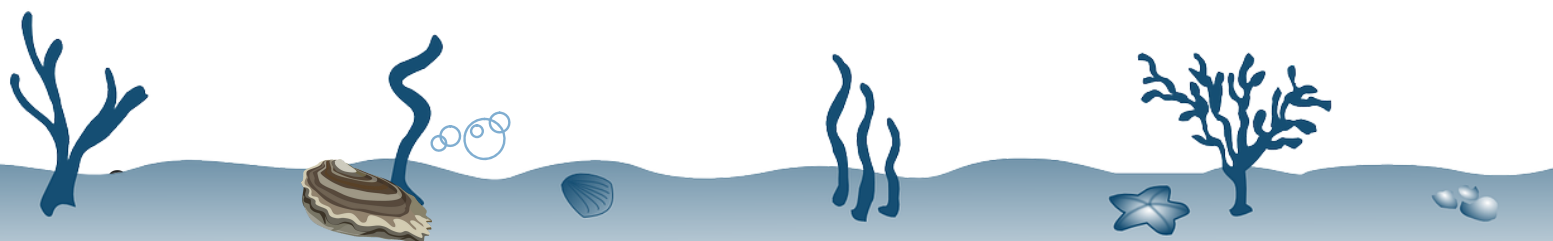
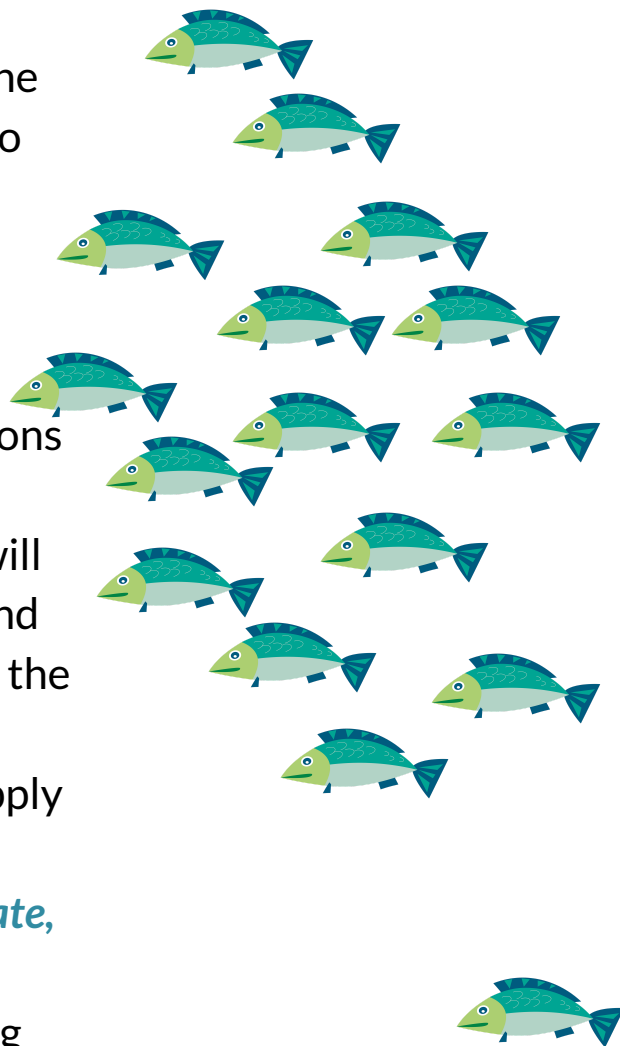


Dear Teachers...

The seafood industry is an expansive business that touches upon many corners of human life; ranging from supplying protein in our diets, to providing employment for communities to being a tool of creativity and history for seafood chefs. With the many avenues seafood shapes, it is significant to highlight how *the growing demand for it is contributing to declining fish populations.*

Especially, as the planet faces environmental challenges such as *climate change, ocean acidification and habitat destruction*, conversations about *resource extraction* have become particularly relevant. In this section, students will learn about key terms related to aquaculture and wild fishing, the criteria of sustainable seafood, the social and economic factors that influence the industry to thereafter analyze, interpret and apply their findings in hands-on and inquiry based activities. The ultimate objective being to *educate, equip and empower students to be stewards for sustainable seafood choices.* Thank you for caring and helping us build a sustainable future for our oceans!

Best fish wishes,
The Ocean Wise Education Team



“Be aware my local actions have a global impact.”

LESSON 1 GRADES 10-11

The ocean is a massive body of water that connects all forms of human life; both locally and globally. A major link humans have worldwide is our dependence on the ocean for seafood. This lesson will emphasize the wide reach the seafood industry truly has through the use of maps, stats and videos. Moreover, the overarching theme of this lesson highlights how the actions of the students are part of the seafood industry, therefore the end of the activity is reflective to showcase how they are included in these interactions; proving that we are all connected to the ocean.

Students will be able to:

- ✓ Recognize the local and global value of the seafood industry
- ✓ Acknowledge that the ocean provides a valuable resource for humanity
- ✓ Identify how we are connected globally via the seafood industry
- ✓ Discuss how the ocean contributes to sustaining human life

? CRITICAL QUESTIONS

Why is the ocean important? What resources does the ocean offer? Where around the world is seafood produced?

▶ LESSON GUIDE

1) **Discuss:** Ask students whether they know where their seafood is from? Bring the short [video](#) clip by Sea Around Us on to a screen to demonstrate how industrial fisheries' have expanded globally.

Optional: Afterwards, play [Ocean Wise Sustainable Shrimp Farming in Vietnam](#) to show how Ocean Wise chef Ned Bell went to the source of the shrimp he uses in Vancouver restaurants.

2) **Activity:** Divide the class into groups and assign each group an location to focus on: North America, Europe or Asia.

3) **Workbook Page 1&2:** With the information on these pages, the group must write down their answers to the scenarios based on their assigned location listed to explore local and global connections and challenges of the seafood industry.

4) **Reflection:** Have each group share how their area are affected by the discussion questions. Emphasize how Asia (particularly underdeveloped areas) would be the first to be significantly hit if the seafood industry collapsed due to exhausted fish populations.

The ocean and life in the ocean shapes the earth



The ocean is the largest feature on our planet and thus has a large impact on all life.

Materials

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

💡 RESOURCES (Click on them!)

- [Food and Agriculture Organization of the United Nations: The State of World Fisheries and Aquaculture 2018](#)
- [Musqueam: An Introduction-Hunting and Fishing](#)
- [SOFIA 2018: Stats of global consumption and production of seafood](#)
- [Quartz: Farms under the sea could feed the world in 2050](#)

"I will ask where my seafood comes from when I'm at the grocery store or restaurant."

Aquaculture has the objective of meeting the growing global demand for seafood by creating reliable farming systems. These systems use different techniques to mimic natural aquatic ecosystems. Conversations about benefits, challenges and possible improvements to make aquaculture sustainable remain. This lesson facilitates learning about different aquaculture systems and prompts students to critically assess the pros and cons of each to reflect upon the importance of being informed consumers.

LESSON 2 GRADES 10-11

Students will be able to:

- ✓ Understand and can evaluate aquaculture practices
- ✓ Recognize the goal of aquaculture in regards to food stability
- ✓ Assess the differing methods/techniques of aquaculture
- ✓ Critically analyze the impacts of aquaculture



CRITICAL QUESTIONS

What is aquaculture? Why is aquaculture used? What are the methods/techniques of aquaculture? What are the challenges and benefits of aquaculture?

The ocean made the earth habitable



Aquaculture mimics the rhythms of the ocean in order to successfully farm seafood.

Materials

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

LESSON GUIDE

- 1) **Discuss:** Relate aquaculture to agriculture: because just like agriculture it has differing methods and animals involved. Review the videos in the resource section.
- 2) **Workbook Page 3-5:** Divide the class into small groups. This workpage outlines differing aquaculture systems. You can bring the following [slideshow](#) up about what criteria to keep in mind when creating a sustainable aquaculture system.
- 3) **Workbook Page 6:** Assign each group an aquaculture system for them to answer the prompts to pick the fish farm method they believe to be the most sustainable (consider life span, reliability of crop, input to harvest etc). To walk the student through this process they will list the following:
 - a) Pros of the system
 - b) Cons of the system
 - c) Potential solutions
- 4) **Reflection:** Share answers with the class. Review the Best Aquaculture Practices: [OW Responsible Aquaculture](#) to discuss measures taken to certify sustainable aquaculture locally. What would the students do the same and differently in creating a fish farming system?



RESOURCES (Click on them!)

- [PBS: Aquaponic farming saves water, but can it feed the country?](#)
- [Seachoice: Aquaculture Methods](#)
- [CEFAS: Sustainable Aquaculture](#)
- [Seafood Watch: Fishing & Farming Methods](#)
- [Aquaponics Systems](#)
- [DIY Aquaponics in the classroom](#)

“I will check out the Ocean Wise recommendation web page”

LESSON 3 GRADES 10-11

A substantial step towards supporting our oceans is defining sustainable seafood and learning how choosing sustainable seafood has such a large impact on our oceans and has a large ripple effect on society. This module addresses sustainability as it pertains to aquaculture, to facilitate a creative project to showcase how aquaculture can further improve. Moreover, the students will share strategies and ideas to maximize economic and social growth in connection to aquaculture.

Students will be able to:

- ✓ Students collaborate to create criteria to determine sustainable seafood choices
- ✓ Define sustainability in connection to ocean health
- ✓ Explore how aquaculture can be sustainable and unsustainable
- ✓ Collaboratively identify solutions to further sustainable aquaculture

The ocean and humans are inextricably interconnected



Sustainable seafood is important for feeding the world and caring for the ocean.

Materials

- Student Workbook
- Pen/Pencil
- Audio visual system
- Whiteboard or poster paper

? CRITICAL QUESTIONS

What is sustainability in connection to ocean health? What is the difference between sustainable and unsustainable aquaculture? What role can we play individually and/or collaboratively to be a steward for sustainable aquaculture?

▶ LESSON GUIDE

- 1) **Discuss:** In a group discussion, define what being sustainable means in terms of ocean health. Write their answers on a whiteboard/poster paper to discuss.
 - 2) **Activity:** Divide the class into small groups. Each group is going to be a team of the ‘Ocean Wise Sustainable Seafood Department’ and they must review aquaculture facilities to be Ocean Wise recommended. To do so they will create their own sustainability criteria. *Example:* fish must be a local species, no use of chemicals, limit destruction of natural habitats, regulations in place to ensure health of stock etc.
- Workbook Page 7 & 8:** On these pages, there are real candidates that were reviewed by the Ocean Wise Seafood team. The students must review the candidates to determine whether it will be recommended or not based on the criteria they created.
- 3) **Reflection on Workbook Page 9:** Share with the rest of the class which candidates were recommended or not by your team and explain why. Review the following [slideshow](#) that breaks down the Ocean Wise criteria for sustainable aquaculture. The first candidate was recommended by the official Ocean Wise Seafood Team while the second candidate was declined a recommendation.

💡 RESOURCES (Click on them!)

- [Ocean Wise: To Eat or Not to Eat Farmed Fish?](#)
- [Ocean Wise: Feeding Farmed Finfish Sustainably](#)
- [Ocean Wise: Ocean Wise and Sustainable Seafood](#)
- [Ocean Wise: What is an Ocean Wise Assessment?](#)
- [Ocean Wise: Seafood Recommendations for Sustainability](#)
- [Ocean Wise: Our Standards](#)

“I will equip myself with the knowledge to recognize different methods of sustainable seafood extraction.”

With the many articles, conversations and critiques of the seafood industry, it can generate confusion about the facts of farmed seafood and wild fishing; especially in raising awareness of their impact on aquatic life. This activity prompts critical thinking and analysis of the correlation between the seafood industry and the health of diverse ecosystems and species. Students will reflect to form independent opinions and ideas concerning the seafood industry's influence on social, economic and environmental spheres.

LESSON 4

GRADES
10-11

Students will be able to:

- ✓ Prepare an organized and informed debate to address an environmental dilemma
- ✓ Identify key methods of wild fishing
- ✓ Evaluate the impact of wild fishing and aquaculture
- ✓ Analyze the relationship between wild fishing and aquaculture

The ocean supports a great diversity of life and ecosystems



Aquaculture and wild fishing are both prominent forms of cultivating seafood.

Materials

- Student Workbook
- Pen/Pencil
- Audio visual system

? CRITICAL QUESTIONS

What are the key methods/techniques of wild fishing? What are the differences and similarities between aquaculture and wild fishing? What improvements can be put in place to support ocean health?

▶ LESSON GUIDE

- 1) **Introduction:** Watch the Ocean Wise [Wild vs. Farmed Seafood: Mythbusters](#) to prompt the concept that further investigation of these fishing methods are required.
- 2) **Workbook Page 10-11:** Divide the class into groups, they will review the articles provided to prepare for a class debate. The links in the resource section below can also be used.
- 3) The debate will be based on the following statement: Farming fish addresses declining wild fish populations.
- 4) **Workbook Page 12:** The debate will be organized into 3 sections outlined in the workbook to cover social, economic and environmental factors. Use this [teacher's guide to introducing debates](#) to help facilitate the activity if needed.
- 5) **Reflection:** Host the debate with the teacher as a mediator and reflect upon the value of both aquaculture and wild fishing in meeting the rising demand for seafood due to the growing global population.



RESOURCES (Click on them!)

- [Ocean Wise: Fishing and Farming Methods](#)
- [Global Aquaculture Alliance: Environmental Impact of Aquaculture](#)
- [Environmental Science: Environmental Consequences of Fishing Practices](#)
- [Ocean Wise: Wild vs. Farmed Seafood: Mythbusters](#)
- [Ocean Wise: Haidi Gwaii Shore Lunch w/ Ned Bell](#)
- [TED-ed: Will the ocean ever run out of fish?](#)

"Advocate for sustainable choices at my school and in my community."

How and where we receive our seafood is directly affected by environmental forces and in turn environmental forces are impacted by how we produce and consume seafood. This link is significant to understand how personal actions have a tangible impact on marine ecosystems. These impacts can be seen in the short and long term and comparing these outcomes demonstrates to students the importance of ocean stewardship.

LESSON 5 GRADES 10-11

Students will be able to:

- ✓ Confidently discuss the impacts of climate change upon the seafood industry
- ✓ Compare and contrast different environmental phenomena
- ✓ Assess the short term and long term environmental impacts of aquaculture
- ✓ Learn how climate change relates to aquaculture

The ocean is a major influence on climate and weather



The seafood industry can have various short term and long term impacts on the environment.

Materials

- Student Workbook
- Pen/Pencil
- Audio visual system

? CRITICAL QUESTIONS

What are some of the positive and negative impacts of aquaculture upon the environment? How does aquaculture compare to agriculture? How does aquaculture affect the climate?

▶ LESSON GUIDE

- 1) **Introduction:** In groups, assign each group an aquaculture system (as outlined on **page 3-5** of the workbook) and provide the students with workbook **page 10** outlining key challenges aquaculture systems could present to explore the impacts these factors have on the seafood industry.
- 2) **Workbook Page 13 & 14:** The students must critical analyze how their aquaculture system will be affected by the key terms in the short and long term (Rising sea levels, ocean acidification and microplastics).
- 3) **Reflection:** Have students share their findings and reflect upon how they can play a role in the impacts discussed.



RESOURCES (Click on them!)

- [Ocean Wise: Spot Prawn Fishery](#)
- [Coast Salish Peoples Clam Gardens](#)
- [Fisheries and Agriculture Organization of the United Nations: Impacts of climate change on fisheries and aquaculture: Pg. 623-626](#)
- [TED-ed: Underwater farms vs climate change?](#)
- [Bon Appetit: Brad Explores an oyster farm](#)
- [National Lobster Hatchery: The Lobster Process and Release](#)

“I will encourage my family and school to purchase fish from sustainable sources.”

Integrated multi-trophic aquaculture systems are a hallmark of farmed seafood and displays key components of marine ecosystems in how animals rely on each other to uphold balance and stability of their habitat. This structure facilitates the cycling of nutrients and energy flow throughout the ecosystem. This lesson will provide students with the tools to learn about the dynamics of multi-trophic aquaculture systems and challenge them to create their own fish farm to include key features that shape ocean life.

LESSON

6

GRADES

10-11

Students will be able to:

- ✓ Identify components of multi-trophic aquaculture systems
- ✓ Observe the interconnected nature of ecosystems
- ✓ Understand the dynamics of multi-trophic aquaculture
- ✓ Question and create a sustainable fish farm

The ocean and the life in the ocean shape the features of the earth



Aquaculture mimics ocean ecosystems through cycling nutrients in the environment.

Materials

- Student Workbook
- Pen/Pencil
- Audio visual system
- Poster Paper, or 3D printing materials or computers

? CRITICAL QUESTIONS

How are nutrients cycled in aquaculture? How can animal interactions be used to create more sustainable farms? What are the challenges of raising several animals at a time? How can aquaculture improve to be more sustainable in the future?

▷ LESSON GUIDE

- 1) **Introduction:** Watch the following [video](#) from DFO that breaks down multi-trophic aquaculture.
- 2) **Workbook Page 15 & 16:** Each student will be given a list of animals that they will then use to create a sustainable multi-trophic aquaculture system.
- 3) The workbook will break down the process of assembling an Integrated Multi-Trophic Aquaculture system by answering prompts such as:
 - Which animal/s will you ultimately harvest? Why?
 - What animals outside of the list will you add to your aquaculture system? Why?
 - List how 3 animals from your system serve you as a fish farmer. After answering the prompts, have the students draw/create the aquaculture system using either poster paper, 3D printing or Canva.
- 4) **Reflection:** Share their aquaculture systems with the class and discuss their answers to the questions.

💡 RESOURCES (Click on them!)

- [DFO: Communities and Engagement](#)
- [DFO: Aquaculture Research](#)
- [Video by EU Environment: Aquaculture & Sustainability](#)
- [Video: Ocean Forest-Sustainable Aquaculture](#)
- [Global Aquaculture Alliance: Multi Trophic Levels](#)

“Talk to people in the seafood industry to learn first hand about the socio-economic connections ”

LESSON 7 GRADES 10-11

Aquaculture is an innovative form of seafood production that is evolving and improving as the industry explores its strengths and weaknesses. To examine the process of innovation, students will exercise their creativity and entrepreneurship to assess aquaculture and how it can be enhanced for the betterment of our oceans. This will be particularly valuable in having socio-economic factors being a key influence of the decision making.

Students will be able to:

- ✓ Assess aquaculture from a variety of perspectives.
- ✓ Analyze the social, environmental, and economical impact of aquaculture
- ✓ Innovate new ways to improve seafood sustainability through collaboration

The ocean is largely unexplored.



Aquaculture is continuously innovating to improve its systems..

Materials

- Student Workbook
- Pen/Pencil
- Audio visual system

? CRITICAL QUESTIONS

What are the different ways people engage with aquaculture? How does the innovation of aquaculture reflect these perspectives? What are the pros and cons when collaborating these perspectives in aquaculture?

▶ LESSON GUIDE

- 1) **Introduction:** Discuss how aquaculture is constantly innovating and changing as we learn more about best practices. What do we currently know about aquaculture and areas of improvement? Watch DFO's [video](#) about aquaculture innovation to help facilitate this conversation.
- 2) **Workbook Page 17-19:** Divide the class into 4 groups. Assign each group an area of social focus for which aquaculture can have an impact as outlined on the workbook page. On these workbook pages, are resources that reflect the social focus, provide time for the group to review and discuss.
- 3) **Activity:** Then divide the group again, this time the new groups should have at least 1 representative from the previous group; the result being the new groups have a mix of social focuses.
- 4) The group then share their findings and compare how the aquaculture industry impacts them.
- 5) **Reflection:** Review outcomes and share what similarities and differences were identified. Additionally, explore how these social focuses are connected via aquaculture.



RESOURCES (Click on them!)

- [Forbes: 5 Innovations in Aquaculture Worth Catching On Now](#)
- [Ocean Wise: Variety is the Spice of Aquaculture](#)
- [Squamish Nation Stewardship](#)
- [Ocean Wise: Geoduck Aquaculture](#)
- [Ocean Wise: Wolf-eels: Sustainable Seafood?](#)
- [DFO: Innovative Tools in Aquaculture](#)

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.

Secondary Level

Criteria Category	Extending	Proficient	Developing	Emerging
Questioning	-Makes inquiries that include independent investigation to provide additional background information	-Asks testable, increasingly abstract questions suitable for answering through scientific investigations	-Considers key theme of concept to develop ideas and understanding	-Engages with the concept to explore key ideas, with adult guidance
Procedures and Evidence	-Applies multiple investigations to cultivate a robust set of data	-Plans and uses appropriate investigative methods and materials to collect reliable data	-Utilizes some of the lesson materials to inform research	-Uses methods and materials provided in lesson, with adult guidance
Perspectives and Ethics	-Outlines multiples perspectives to connect local and global impacts on ocean health through independent research	-Considers local environmental, social, economic and ethical impacts on ocean health through research	-Recognizes the multifaceted nature of ocean health	-Makes personal connections to understand the interconnectedness of the ocean, with adult guidance
Communicating	-Demonstrates an in depth understanding by sharing comprehensive and innovative ideas	-Provides supportive and constructive feedback by selecting relevant information	-Shares ideas and opinions with use of some of the information provided	-Engages in discussions to explore concepts, with adult guidance

Special Thanks!

Tiare Boyes

Natividad Chen

Mitchell Sattler

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ocean wise®

