Will the salmon return?

STATISTICS 12

The intention of this learning activity is for students to make a connection between place and people with respect to the salmon returning to rivers to spawn. Students will consider the importance of salmon, a keystone species, from the perspective of some local First Peoples and communities that are located on salmon bearing watersheds. Students will analyze data that addresses the number of salmon returning and the temperature of oceans and rivers. Students will determine if there is a correlation between these two variables and discuss the impact of climate, warming waters, and health of the salmon run. What impact will this have on local communities? What solutions do First Peoples and others have as stewards of the land? What do students believe is the root of the problem and what do they propose to solve the problem?

Videos of this activity's writer and reviewers discussing design considerations and Indigenizing math are available on Focusing on Competencies in Math.

Core Competencies

- Communicating: Connecting and Engaging with Others
    - I share my ideas and try to connect them with others' ideas.
- Critical and Reflective Thinking: Analyzing and Critiquing
    - I can develop or adapt criteria, check information, assess my thinking, and develop reasoned conclusions, judgments, or plans.
- Social Awareness and Responsibility: Contributing to Community and Caring for the Environment
    - I can identify ways my actions and the actions of others affect my community and the natural environment.

First Peoples Principles of Learning

- Learning involves recognizing the consequences of one's actions
- Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place)
- Learning recognizes the role of Indigenous knowledge
- Learning is embedded in memory, history, and story

Aboriginal Worldviews and Perspectives

- Connectedness and Relationships
- Local Focus
- Engagement with the Land, Nature, and Outdoors

Big Ideas

Statistics plays an integral role in research, decision making, and policy in society.

Curricular Competencies

- Think creatively and with curiosity and wonder when exploring problems
- Engage in statistical thinking to answer questions connected with place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures
- Explore research questions with persistence and a positive disposition
- Reflect on statistical thinking
- Incorporate First Peoples worldviews, perspectives, knowledge, and practices to make connections with statistical concepts
- Content
    - common graphical representations of variation (e.g. broken line graphs, tables)
    - association between two variables (e.g. finding a correlation)

Cross-Curricular Connections

BC First Peoples 12

- Big Idea
    - The impact of contact and colonialism continues to affect the political, social, and economic lives of BC First Peoples.

- Curricular Competencies
    - Assess the connectedness or the reciprocal relationship between people and place (cause and consequence)
    - Explain and infer perspectives and sense of place, and compare varying perspectives on land and place (perspective)

- Content
    - traditional territories of the BC First Nations and relationships with the land

Environmental Science 12 and Specialized Science 12

- Big Idea (Environmental Science 12)
    - Human actions affect the quality of water and its ability to sustain life.

- Big Idea (Specialized Science 12)
    - Climate change impacts biodiversity and ecosystem health.

- Curricular Competencies
    - Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest
    - Apply First Peoples perspectives and knowledge, other ways of knowing, and local knowledge as sources of information
    - Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies
    - Express and reflect on a variety of experiences, perspectives, and worldviews through place

- Content
    - water quality parameters and bioindicators
    - changes to climate systems

English First Peoples 12

- Big Idea
    - The exploration of text and story deepens our understanding of diverse, complex ideas about identity, others, and the world.

- Curricular Competencies
    - Analyze how First Peoples languages and texts reflect their cultures, knowledge, histories, and worldviews
    - Construct meaningful personal connections between self, text, and world
    - Identify bias, contradictions, distortions, and omissions

- Content
    - a wide variety of BC, Canadian, and global First Peoples texts

The Learning Activity Plan

The Hook

Introduce the activity by showing both videos —looking at two points of view of salmon spawning.

Meet a local legend: The salmon
https://www.youtube.com/watch?time_continue=49&v=aRe1ePS_hwg&feature=emb_logo

Sockeye salmon return to BC's Adams River
https://www.youtube.com/watch?v=LFKQffjMUPk

Teacher-Led Discussion

- What is a salmon run?
- How often do salmon return?
- Why is it important for the salmon to return to the river?
- What factors would negatively impact the return of the salmon?

Student-Led Small Group Discussion

- Divide the class into groups of 3-4.
- Distribute an article or story (one per group).
- Each group reads the article or story and highlights the big ideas from what they have read. They then compose at least one question for class discussion.
- Students share what they have learned to the class and pose their question for the class to consider and discuss.

Students collectively compose a "guiding question" from what was discussed to guide their thinking and learning.

Write the "guiding question" on the board as the learning intention of this learning activity.

Suggested readings

BC sockeye salmon return thrills onlookers despite concerns over decline
https://www.cbc.ca/news/canada/british-columbia/sockeye-salmon-return-2018-adams-river-b-c-1.4862291

Return to the water: First Nations relations with salmon
http://www2.laiwanette.net/fountain/return-to-the-water-first-nations-relations-with-salmon/

Shuswap late-run sockeye drop by 700,000
https://www.saobserver.net/news/shuswap-sees-drop-in-returning-late-run-sockeye/

Salmon Boy by Donna Joe (2001)
http://www.harbourpublishing.com/title/SalmonBoy

Graph and Data Analysis

Distribute all four data pieces (as seen below) to each of the small groups to analyze:

- What trends do you see over time?
- Are the trends comparable between each data set? What's the same? What's different?
- Is there a correlation between water temperature and the salmon run?

Have students record their findings. Building Thinking Classrooms (or whiteboards) can be used to brainstorm ideas, record findings, and generate a strategy to determine if there is

a correlation between the two variables. Depending on prior knowledge of students, or post discussion, you might want to differentiate the difference between correlation and causation.

Climate Change Indicators: Ocean Heat
https://www.epa.gov/climate-indicators/climate-change-indicators-ocean-heat

Climate Change Indicators: Sea Surface Temperature
https://www.epa.gov/climate-indicators/climate-change-indicators-sea-surface-temperature

How climate change is impacting the salmon on Canada's west coast
https://alliance2030.ca/climate-change-impact-salmon/

Data from Department of Fisheries and Oceans Canada

Year	Adams River escapement
1998	871,184
1999	314,416
2000	754
2001	16,796
2002	3,738,273
2003	354,534
2004	2,732
2005	34,880
2006	1,459,401
2007	52,713
2008	149
2009	37,861
2010	3,859,983
2011	148,169
2012	0
2013	124,576
2014	707,087
2015	5,485
2016	36
2017	18,239
2018	535,564

Students will collectively and collaboratively calculate the correlation coefficient and determine if there is a relationship between water temperature and the salmon run. Students will display their findings and calculations so that they are visible and can be shared with others.

Gallery Walk

Each group will choose a representative to stay with their calculations. The remaining students will engage in a gallery walk and visit other groups to hear what they have found and learned. The student remaining will explain their group's thinking process and findings. Gallery walkers will return back to their group and share any information that might influence their findings. Students in each group will make any revisions to their calculations and submit their final draft.

Students go back to the "guiding question" and are asked if they could answer the question with what they have found. Is their answer reasonable? How do they know? What did others find?

Engage students in a class discussion about what they have learned:

- Did they answer the "guiding question"?
- What do they still need to learn?
- What do they still need to know?
- What would they like to know?
- What impact does water temperature have on salmon runs?
- What impact does this have on First Peoples and communities?
- What other impacts can you think of?

Make a Prediction

Ask students:

- What do you anticipate the salmon run populations to be in one-year?
- In five-years, ten-years, twenty-years?
- What needs to be done to reduce (or reverse) the population reduction?

Conclusion

End the learning with these videos, emphasizing the importance of the First People's worldview and perspectives on the salmon and the teachings of the salmon to influence our worldview.

Salmon Circle (Adams River)
Available on: Focusing on Competencies in Math.
https://www.openschool.bc.ca/competenciesmath/index.html

Lake Babine Nation Sockeye
https://www.youtube.com/watch?v=5HNScooAWfg

Journal Reflection (adapt to the learning experiences of your class)

Students are asked to write a journal reflection on their learning experience:

- What role does salmon play for First Peoples? Why is it so important?
- What role does statistical data play when thinking about the environment?
- Without the use of data, graphs, and statistical calculations, what would you need to notice that would indicate to you there was a problem with the salmon run?

Extensions

- Go to the river where the salmon spawn. Witness the return of the salmon.
- Situate yourself in place (by the river) and have an Elder speak about the salmon.
- Write a letter to local government about what you have learned about the salmon and advocate for action to address the issues of the salmon run and river temperatures.
- Make a presentation to local government to advocate for action to save the salmon.
- See BC Salmon conservation websites for further information:

  Save Our Wild Salmon
  https://www.wildsalmon.org/

  Pacific Wild
  https://pacificwild.org/

  Rain Coast Conservation Foundation
  https://www.raincoast.org

  Wilderness Committee
  https://www.wildernesscommittee.org/

Assessment (Single Point Rubric)

Not meeting expectations	Criteria	Meeting expectations
	Think creatively and with curiosity and wonder when exploring problems using common graphical representations of variation (e.g. broken line graphs, tables): • Small group discussion • Gallery Walk	
	Engage in statistical thinking to answer questions connected with place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures: • Small group discussion • Class discussion • Journal Reflection	
	Explore research questions with persistence and a positive disposition to find an association between two variables (correlation): • Data and graph analysis • Choosing which data to represent 2 variables • Creating a data table • Calculate the correlation coefficient • Check table for significance	
	Reflect on statistical thinking: • Was their solution reasonable? (small group) • Gallery Walk • Journal reflection	
	Incorporate First Peoples worldviews, perspectives, knowledge, and practices to make connections with statistical concepts: • Videos • Storybook • An Elder (if possible)	