CLIMATE CHANGE: MELTING GLACIERS AFFECT SEA LEVEL? GR 3-5 (LESSON 1-5)

Elder Quote/Belief: *"…snow seeing less snow on the high elevation of the mountains, problem for drinking water…"*[i]

"From an early age, hunting, fishing, trapping and berry picking has been an integral part of the fiber that makes me who I am today. I am 63 years old and Cordova has always been my home. In my younger years, I concentrated on my career of commercial fishing and help to raise my three children. It was my desire to teach them all that I knew ~ like bringing in firewood to heat our home during the long winter month, hunting moose, deer and ducks, smoking and canning fish, gathering mushrooms and berries ~ all things to maintain a subsistence lifestyle." -Mark King, Cordova

Grade Level: 3-5

Overview: Sea ice is melting fast. This is largely due to the rising water temperatures. Scientists are out in the fields gathering data on sea ice to find clues of how the earth is adapting to the changes that are happening. The Chugach Elders have been noticing small changes in the climate for years and have adapted. Although presently, Elders feel the changes have been happening much more rapidly and see the negative impacts on our subsistence lifestyle.

Standards:

AK Cultural:	*AK Content Science*:	*CRCC*:
B2- make effective use of the knowledge, skills, and ways of knowing from their own cultural traditions to learn about the larger world in which they live	**A3-** develop an understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and local applications provide opportunity for understanding scientific concepts and global issues.	**G7 -** Students should be knowledgeable about environmental and natural impacts of the area.

Lesson Goal: Research about rising sea level, the impacts that happens and how does this affect the traditional subsistence lifestyle of our region.

Lesson Objective(s): Students will:

- Research about sea ice melting
- Create an experiment using ice to explain about rising sea level
- Create an electronic presentation of gathered research and the outcome of the experiments
- Apply the new Sugt'stun/Eyak vocabulary words to their work

Vocabulary Words: Sugt'stun Dialects

English:	Prince William Sound:	Lower Cook Inlet:	Eyak:
Ice	Cikuq	Cikuq	La' (glacier)
Melt	Uruglluni	Uruglluni	
Land	Nuna	Nuna	
Water	Meq	Meq	Giyah
Rise	Qulwarluni	Qulwarluni	
Salt	Taryuq	Taryuq	

Materials/Resources Needed:

- Invite Elder/Recognized Expert
- Camera
- 7 empty water bottles (per group)
- Table salt
- A freezer (to place water bottles)
- 2-bottles of white glue
- 1-box Borax (powdered soap)
- 2-Large mixing bowl
- 2-Spoon
- 2-Cookie sheet/plastic tray
- Measuring cup
- Blue food coloring
- Water
- Paper towel
- Zipper-lock bag (to keep when done)
- Sketch pad or drawing paper

Websites:
http://www.eyakpeople.com/dictionary

About TEK
- https://nca2014.globalchange.gov/report/sectors/indigenous-peoples#tab2-images

Climate Change Explanation
- https://www.nps.gov/subjects/climatechange/explainingccvideos.htm

Lesson of sea level rising

- https://www.calacademy.org/educators/lesson-plans/global-climate-change-and-sea-level-rise

Steps for goo project

- http://www.mykidsadventures.com/glacier-goo-project/

Nova Extreme Ice Movie

- https://video.search.yahoo.com/search/video?fr=yfp-t-s&p=nova+extreme+ice+movie%20-%20id=1&vid=db2aab0f6c8ebce1c716fc067112821c&action=view#action=view&id=6&vid=4902bda5e23c27b9c4c4a386ef4181bf (please preview the video because of length and depending on class time, you may want to select certain clips that emphasize the impacts of the glaciers melting)

Teacher Preparation:

- Invite an Elder or Recognized Expert to share on their knowledge of glaciers melting and changes in environment.
- Review with students the way to show respect for guests in classroom.
- Preview video clips to start the discussion of sea ice and the impacts.
- Gather enough clean empty water bottles for activity experiment (7 bottles per group of kids)
- Set out all the materials for students to read and view
- Preview https://nca2014.globalchange.gov/report/sectors/indigenous-peoples#tab2-images
    - This site discusses the importance of Traditional Ecological Knowledge (TEK), Indigenous Peoples, and Lands and Resources
- Work with students to come up with open-ended questions that will encourage more information from the Elder/Recognized Expert
- Assign groups of students to work together for the experiment.

"We were going to Columbia Glacier. I was all excited. This was thirty or thirty-five years ago.
Back then you could see the face of the glacier. It was right there, big as day. It wasn't like today. Nowadays, you can't see the face. You can look ten or fifteen miles up the valley and all you see are pieces of ice. But back then, you could see the face. It was awesome!"

–Patrick (Sweeney) Selanoff

Opening: Today, we are going to discuss glaciers. How many of you have seen glaciers? When we think about glaciers and hear stories about how they are melting, we become concerned. Let us delve into why scientists think glaciers are melting. Glaciers, melting ice, warming temperatures are creating the sea level to rise, impacting resources in the oceans. How does this affect the traditional subsistence lifestyle of our region?

Activities:

Class I:

1. View the following video clips with students before invited guest/s arrive:
   - Alaskans from Unalakleet to Kenai to Ketchikan are witnessing changes to their environment due to climate change. Erosion, invasive species, forest fires, flooding, thawing permafrost, melting ice, and shifting animal habitats are many of the changes taking place. This video describes steps being taken by some communities to adapt to these changes and to maintain their lifestyles in the face of climate change. Produced by Alaska Sea Grant and NOAA Alaska Region.
     - https://www.youtube.com/watch?v=sH4ronSe8BU

   - This video highlights Arctic marine mammals and birds and how they depend on sea ice, and how these animals will cope in the face of climate change. This is the third of a three-part series of compelling short videos showcasing the dramatic changes in Alaska's marine ecosystems through interviews with scientists and Alaska Natives. The videos were produced by Alaska Sea Grant in partnership with Alaska Ocean Observing System, Alaska Marine Conservation Council, and COSEE Alaska.
     - https://www.youtube.com/watch?v=7NLwGMAXFtc

2. Review Sugt'stun/Eyak vocabulary words with students.
3. Review with the class, importance of respectfully listening to the guest and collectively discuss open-ended questions to ask.
4. Introduce Elder/Recognized Expert to the class
5. Take pictures while students are asking questions, print pictures and give to the students.
6. Encourage students to ask questions
7. Document questions and responses on the board.
8. Have a discussion of what students learned from the guest and the video clips.
9. Collectively as class, create interview questions derived from the discussion.
10. Assign the students to take the interview questions home and interview an Elder about climate changes they have observed in their life time. Encourage the students to take pictures or video of their interview (with permission of their interviewee).
11. Ask students to bring in clean empty water bottles for the next class.
12. Enlarge the picture of Patrick Selanoff with his quote onto the whiteboard.
13. Have students view the movie 'Extreme Ice,' (it is about an hour, select clips if needed) this ties in nicely with the Patrick Selanoff's quote in regards to the Colombia Glacier.
14. Read Patrick Selanoff's quote out loud and have a discussion of the receding Colombia Glacier, as well as the other glaciers, being seen presently.
15. Several questions you can ask are as follows:
    a. If Patrick Selanoff saw these glaciers melting thirty to thirty-five years ago, what do you think will happen in the next thirty to thirty-five years from now?
    b. Why do you think the glaciers are melting?
    c. What do you think will happen if glaciers continue to melt?
16. Document responses.

Class II:

1. Explain to students they will be conducting an experiment with the water, salt and ice.
2. Elicit hypothesizes (guesses) from students on what they think is going to happen during experiment.
3. Document responses with group name/student's name beside the responses.
4. Place students in groups; they could use glacier names for their group name;
    a. If desired, the students could look at the pictures of glaciers in Prince William Sound and select a name for their group or you could create a list on the board.
    b. https://alaskaphotographics.photoshelter.com/search?I_DSC=glacier+prince+william+sound&I_DSC_AND=t&_ACT=search
5. Ask for a volunteer from each group to record/take pictures as their group is working on the experiment.
6. Have students write their group name on the seven water bottles and number the bottles 1-7, then label each with how much salt is in each:
    a. 1teaspoon of salt in bottle one, 2 teaspoons of salt in bottle 2, 3 teaspoons of salt in bottle 3, 4 teaspoons of salt in bottle 4, 5 teaspoons of salt in bottle 5, 6 teaspoons of salt in bottle 6 and no salt in bottle 7
7. Take pictures while students are in their working groups as they prepare their experiment with water, ice and salt.
8. Freeze bottled water after groups have filled their bottles with salt and water.

Class III

1. Have groups take their water bottles from the freezer.
2. Instruct students to take pictures/sketch of the seven water bottles.
3. Apply selected questions from and ask;
    a. What do you notice of the water bottle w/out salt?
    b. How did the salt affect the other bottles of water?
    c. Do you think this has anything to do with melting glaciers?
    d. How does this cause sea levels to rise?
4. Inform students all they have been working on will be used as a presentation to the class.

Class V

1. View 'Nova Extreme Ice movie' with the class.
2. Take pictures of this activity while students create their glacier.
3. Inform students that the class will make a glacier, when completed it will move like a glacier.
4. Put students into two groups and follow the steps to make the 'Glacier Goo,' from the website http://www.mykidsadventures.com/glacier-goo-project/
5. Have one group make the white 'Glacier Goo,' and the other the blue 'Glacier Goo.'
6. Divide the 'Glacier Goo,' into two after everything has been completed.
7. Have each group take a tray and play with the 'Glacier Goo.' They could add trees, objects at the bottom of the tray to observe what the glaciers are capable of.
8. Due to the glaciers melting;
    a. What do you think will happen if glaciers continue to melt?

Class VI

1. Explain to the students that they will be creating a presentation on glaciers melting, Elders stories and the Sugt'stun/Eyak words Give students time to gather resources, research about glaciers melting and work together to create a presentation.
2. Inform students include Sugt'stun/Eyak vocabulary words throughout their presentations.

Assessment:

- Students can explain glacier melt and the predicted sea rise.
- Students successfully created the experiment and can explain how it relates to glaciers.
- Students successfully created and presented an electronic presentation on their glacier melt research that included Sugt'stun/Eyak vocabulary words and Elders TEK.

[i] Mark King interview