



NAME OF THE LESSON

Grade(s): 5th
Lesson Duration: 8-10 45 mins periods
Course Name(s): 5th grade General Education
Lesson Author: Alyssa Zollinger

BIG IDEAS

Climate change is occurring and is causing some major changes to Earth's Spheres. As the Earth continuously gets warmer, the polar areas are also getting warmer. This is leading to the Arctic sea and land ice melting. This melting is harmful to the animals that live there. They are losing their home and struggling to survive. The melting has also led to an increase in sea level rise which affects all coastal environments.

EDUCATION STANDARDS

NGSS Performance Expectation(s):

- *5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact*

Science and Engineering Practices: (SEP elements connected to the PEs)	Disciplinary Core Ideas: (DCI elements connected to the PEs)	Crosscutting Concepts: (CC elements connected to the PEs)
Developing and Using Models Modeling in 3 - 5 builds on K - 2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model using an example to describe a	ESS2.A: Earth Materials and Systems Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems	Systems and System Models A system can be described in terms of its components and their interactions. (5-ESS2-1)

<p>scientific principle. (5-ESS2-1)</p>	<p>interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)</p>	
<p>Common Core State Standards:</p> <p>Math: 5. G.A- Graph points on the coordinate plane to solve real-world and mathematical problems.</p> <p>ELA:</p> <p>State Standards:</p>		

MEASURABLE STUDENT LEARNING OBJECTIVES

Students will be able to develop a model to show how two earth spheres interact.
Students will be able to explain how the cryosphere and biosphere interact together.

MATERIALS NEEDED

- Projector/ Smart Board
- Computer per student with headphones
- Construction Paper/ Poster Paper
- Observations and Wondering Worksheet (Lesson 1)
- Balloons (lesson 2)
- Lighter (lesson 2)
- Student Lab sheet (Lesson 4)
- WebQuest Worksheet (Lesson 5)

ENGAGING CONTEXT/PHENOMENON

For this lesson, students will get the opportunity to observe fantastic satellite images that show how the sea ice is disappearing. They will also get to see how this melting is impacting the Arctic animals.

Students in 5th grade love animals and this makes the material more interesting.

DATA INTEGRATION

Students will be exposed to a variety of NASA data. They begin the lesson by observing satellite data of the Arctic Sea Ice Extent over the years. They will discuss their observations and wonderings. Later on, students will evaluate NASA data for Sea Level Rise. Students will use this data to develop a line graph.

TEACHER BACKGROUND KNOWLEDGE

Climate change is a real effect that we are all going to deal with as the Earth continues to heat up. While we can not stop climate change, by educating ourselves and our students, we can make small changes to impact the effects of climate change. Over the past years, Earth's temperature has increased. This overall warming has impacted the glaciers and sea ice at the poles. The ice has been melting. Due to the warming temperatures all year, the Arctic has not been cold enough for a large amount of water to refreeze which has led to an overall decrease in Arctic Ice. With the lack of Arctic ice, animals who rely on the ice have been struggling to survive. The melting of the land ice has led to an increase in Sea Level Rise. In this lesson, students will learn that all of Earth's Spheres are connected, and therefore, as a change impacts one sphere, the others are impacted as well.

DIFFERENTIATION OF INSTRUCTION

- Small groups
- Various modes of instruction (videos, discussions, readings)
- Worksheets to be modified to meet IEP requirements
- Work to be lessened to meet 504 accommodations
- Plan for early finishers
- Plan groups and partnerships based on ability
- Lessen the amount of data to prevent students from getting

REAL-WORLD CONNECTIONS FOR STUDENTS

Temperatures have risen over the past few years which has led to an increase in land ice melting. This melting has led to an increase in sea level rise. Students will get to explore how the melting is impacting the various arctic animals. Students will get the opportunity to explore data in various modes to better understand what is happening.

POSSIBLE PRIOR or MISCONCEPTIONS

- *Global Warming has no effect on the Earth.*
- *Melting of Arctic land ice has no effect on me.*
- *Sea Ice melting causes sea level to rise*

LESSON PROCEDURE

5E	Details of 5E Lesson Implementation <i>(Visit BSCS to learn more about the 5E instructional model)</i>
<u>Engage</u>	<p>Lesson Objective: Students will be able to develop a model to show how two earth spheres interact.</p> <p>Students will be able to explain how the cryosphere and biosphere interact together.</p> <p>Procedure: <i>Lesson 1: Introduce the Phenomenon</i> Show the class the animation of the arctic sea ice. Students will observe the video clip and record their observations and wonderings on the note-taking sheet. This is the first viewing. Encourage students to watch carefully and jot down the most they can. Allow time for students to share what they are observing and what they may be wondering about after observing the clip.</p> <p>Now students will sign onto the website (https://svs.gsfc.nasa.gov/4435) and work with their group to record new observations from the additional clips and images. Allow students 20 minutes to gather new observations and to discuss what they are seeing with their groups.</p> <p>After a time, students are to share their observations with the class. What is everyone starting to notice about the arctic sea ice?</p> <p>At the end of the lesson show the last video, Climate Change: Our Connected Earth.</p> <p>Closure: Today we began learning about the Arctic Sea Ice. Using what we learned today, why should we care about sea ice melt?</p> <p>Differentiation:</p> <ul style="list-style-type: none"> ● Small groups ● Various modes of instruction (videos, discussions, readings) ● Worksheets to be modified to meet IEP requirements ● Work to be lessened to meet 504 accommodations ● Plan for early finishers ● Plan groups and partnerships based on ability <p>Standards Addressed</p> <ul style="list-style-type: none"> • <i>5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact</i> <p>Formative/Summative Assessments</p>

Formative Assessments: Teacher observations, class discussions, classwork, class notes
Summative Assessments: NONE

Resources

Schindler, T. L. (2023, August 25). NASA Scientific Visualization studio. NASA.
<https://svs.gsfc.nasa.gov/5036>

Explore

Lesson Objective:

Students will be able to develop a model to show how two earth spheres interact.
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Procedure:

Lesson 2: Global Warming Demonstration

Adapted from: <https://www.jpl.nasa.gov/edu/teach/activity/global-warming-demonstration/>

Before the demonstration, make sure that all students are set up so they can see what is happening. Make sure to check that no one is scared of popping balloons. Also, check for latex allergies.

This is a demonstration to show how air has a low heat capacity. Water has a high heat capacity and does a good job distributing heat which prevents the balloon from popping.

Do the demonstration and take time to ask students questions about their observations and new wonderings.

- How do you think this applies to the ice melts we looked at yesterday?

Finished early?: Allow students to explore Climate Kids
(<https://climatekids.nasa.gov/climate-change-evidence/>)

Lesson 3: Lab: How does sea ice affect sea level rise?

Students will conduct the sea level rise lab. They will work with their lab teams (groups of 3-4) to set up the investigation as instructed on their lab sheet. Students will then record water level changes in both bins every 5 mins. Students will record their data and observations in their science notebooks.

Resource:

<https://www.jpl.nasa.gov/edu/learn/project/how-melting-ice-causes-sea-level-rise/>

Student Worksheet-

<https://drive.google.com/file/d/1ZOT7X5GZ76q3tWJmxuYmRFzYvIOlifET/view?usp=sharing>

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Standards Addressed

- *5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact*

Formative/Summative Assessments

Formative Assessments: Teacher observations, class discussions, classwork, class notes

Summative Assessments: Lab Sheet

Resources

NASA. (2022, August 23). *Student project: How melting ice causes sea level rise.* NASA.

<https://www.jpl.nasa.gov/edu/learn/project/how-melting-ice-causes-sea-level-rise/>

NASA. (2023, March 22). *Educator guide: Global warming demonstration.* NASA.

<https://www.jpl.nasa.gov/edu/teach/activity/global-warming-demonstration/>

NASA. (n.d.). *How do we know the climate is changing?.* NASA.

<https://climatekids.nasa.gov/climate-change-evidence/>

Explain

Lesson Objective:

Students will be able to develop a model to show how two earth spheres interact.

Students will be able to explain how the cryosphere and biosphere interact together.

Procedure:

Lesson 4: Lab: Arctic Sea Ice Extent

This is a digital lab where students will explore how the Arctic sea ice extent impacts other Earth spheres. Students will work with a partner to explore the interactive website and answer the questions on their lab sheet. They will work through the various sections at their own pace. Teachers should be circulating to assist students with reading graphs and data presented throughout the activity. All questions should be answered with complete sentences and refer to data and evidence presented in the activity.

Resource:
<https://nasa.maps.arcgis.com/apps/MapSeries/index.html?appid=2adb302f548945d08f9aed5e41352255>

Should students finish quickly or need more information use this site.
<https://www.exploratorium.edu/climate/ice>

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Standards Addressed

- *5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact*

Formative/Summative Assessments
Formative Assessments: Teacher observations, class discussions, classwork, class notes
Summative Assessments: Lab Sheet

Resources
 Student Worksheet-
<https://drive.google.com/file/d/1NM8dB4vkmUbjbfEoGI4yehKkzky1RR9/view?usp=sharing>

Story map series. nasa.maps.arcgis.com. (n.d.).
<https://nasa.maps.arcgis.com/apps/MapSeries/index.html?appid=2adb302f548945d08f9aed5e41352255>

Elaborate

Lesson Objective:

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Procedure:

Lesson 5: Graph Sea Level Rise

Students will work with a small group to complete this activity. Students will set the scale, plot the points, and then answer the questions about the data.
 Data will be modified so 5th graders only see the information they need to plot.
 The questions will be used as students' exit tickets to assess how they are doing with meeting the standards.
 Teacher will pull a small group of struggling students to make sure they are set up for the

lesson before circling around to the other groups.

Lesson 6: WebQuest

Students will watch various videos to gather information about sea ice melt and its effects on various arctic animals.

Students will watch the video and record the answers to the questions on their worksheet.

Resource: <https://oceantoday.noaa.gov/fullmoon-seaice-whyisitshrinking/welcome.html>

Lesson 7: CER Response

Students will watch two videos from

<https://mynasadata.larc.nasa.gov/lesson-plans/when-land-ice-melts> and develop a CER response to answer the question- Will the melting land ice add more water to the oceans and cause sea levels to rise?

Students will use all the data they have collected from the previous lessons and the videos to develop a response.

Differentiation:

- Small groups
- Various modes of instruction (videos, discussions, readings)
- Worksheets to be modified to meet IEP requirements
- Work to be lessened to meet 504 accommodations
- Plan for early finishers
- Plan groups and partnerships based on ability

Standards Addressed

- *5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact*

5. G.A- Graph points on the coordinate plane to solve real-world and mathematical problems.

Formative/Summative Assessments

Formative Assessments: Teacher observations, class discussions, classwork, class notes

Summative Assessments: WebQuest Lab Sheet, CER response

Resources

US Department of Commerce, N. O. and A. A. (2017, January 12). *Sea ice: Why is it shrinking (part 1)*. Sea Ice: Why is it Shrinking (Part 1) | Every Full Moon | Ocean Today.

<https://oceantoday.noaa.gov/fullmoon-seaice-whyisitshrinking/welcome.html>

Data, M. N. (2019, April 1). *When land ice melts*. NASA.

<https://mynasadata.larc.nasa.gov/lesson-plans/when-land-ice-melts>

NASA. (2023b, May 22). *Educator guide: Graphing sea-level trends*. NASA. <https://www.jpl.nasa.gov/edu/teach/activity/graphing-sea-level-trends/>

Evaluate

Lesson Objective: Students will be able to develop a model to show how two earth spheres interact.

Students will be able to explain how the cryosphere and biosphere interact together.

Procedure:

Poster Session- Students will work with a partner to develop a poster to showcase their findings. Your poster should answer the question; If ice melts at the poles, what other parts of the world will experience the consequence? How will it impact the animals?

Letter to Representative- You will write a letter to your representative to inform them why they should care about the ice melting. Make sure to include the information you learned to support your answer.

Differentiation:

- Small groups
- Various modes of instruction (videos, discussions, readings)
- Worksheets to be modified to meet IEP requirements
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Standards Addressed

- *5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact*

Formative/Summative Assessments

Formative Assessments: Teacher observations, class discussions, classwork, class notes

Summative Assessments: Lab Sheets, Final Poster, Letter to Representative

Resources

Rubric for Poster

Category	4- Meeting	2- Partially Meeting	0- Not Meeting
Model	Model clearly shows how two spheres are	Model shows one sphere	No model was drawn

	interacting		
Labels	Model includes labels to support what is being shown.	Model includes some labels but some parts are still unclear.	No labels were included in the model.
Question	Model clearly answers the question “If ice melts at the poles, what other parts of the world will experience the consequence?”	Model partially answers the question. Parts are missing or unclear.	The question is not answered at all.
Conventions	Little to no spelling, grammar, and/ or punctuation errors.	Some spelling, grammar, and/ or punctuation errors are present.	Many spelling, grammar, and/ or punctuation errors are present.
<i>Rubric for Letter</i>			
Category	10- Meeting	5- Partially Meeting	0- Not Meeting
Question	Letter clearly answers the question “Why should we care about ice melt?”	Letter partially answers the question. Parts are missing or unclear.	The question is not answered at all.
Conventions	Little to no spelling, grammar, and/ or punctuation errors.	Some spelling, grammar, and/ or punctuation errors are present.	Many spelling, grammar, and/ or punctuation errors are present.

REFERENCES

Data, M. N. (2019, April 1). *When land ice melts*. NASA.

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NASA. (2022, August 23). *Student project: How melting ice causes sea level rise*. NASA.

<https://www.jpl.nasa.gov/edu/learn/project/how-melting-ice-causes-sea-level-rise/>

NASA. (2023a, March 22). *Educator guide: Global warming demonstration*. NASA.

<https://www.jpl.nasa.gov/edu/teach/activity/global-warming-demonstration/>

NASA. (2023b, May 22). *Educator guide: Graphing sea-level trends*. NASA.

<https://www.jpl.nasa.gov/edu/teach/activity/graphing-sea-level-trends/>

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Story map series. nasa.maps.arcgis.com. (n.d.).

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