





#### OUR ENVIRONMENT: OZONE LAYER

OVERVIEW:

Students will explore the Arctic using the Google Earth Voyager stories.

<ul> <li>SUBJECT/TOPIC: Science/ OZONE HOLE</li> <li>LEARNING OBJECTIVES: <ul> <li>Students identify various regions of the earth's atmosphere that have faced maximum impact of the upheavals of the ozone layer depletion.</li> </ul> </li> <li>Students will research and identify environmental changes that affect the environment through the ozone hole.</li> <li>Students will participate in collaborative discussions and identify threats to the Ozone layer.</li> <li>Students will apply their learnings in the form of an educational campaign informing the public of the problem and actions they can take to solve it.</li> </ul>	<ul> <li>GRADE LEVEL: 10th Grade</li> <li>LESSON SUMMARY: <ul> <li>Engage: Locate the ozone and draw conclusions about the climate and ecosystem based on Google Earth imagery.</li> <li>Explore: Gather information from multiple sources about the ozone hole.</li> <li>Explain: Identify changes to the Ozone layer, hypothesize the causes leading to the ozone hole.</li> </ul> </li> <li>Revise: Adjust hypotheses based on additional evidence from class discussion.</li> <li>Apply: Make an impact by creating an educational campaign and an action plan that addresses the threats of pollutopn to the ozone layer.</li> </ul>	
MATERIALS NEEDED: • Access to <u>Google Earth</u> . • Student copies of the <u>NCERT class10 textbook</u> • Student internet access.	INQUIRY: • How is the ozone hole caused? What are the consequences?	
SUSTAINABLE DEVELOPMENT GOALS: 13 CLIMATE CONTRACTION 14 LIFE 15 LIFE 15 CON LAND 15 CON L	<ul> <li>CULMINATING TASK/ASSESSMENT:</li> <li>Students will work collaboratively to create an educational campaign about the effects of climate change on the ozone layer in different parts of the world and what humans can do to help.</li> </ul>	

## LÉSSON PLAN

#### National Geography Standards:

Standard 14- How human actions modify the physical environment.

#### Next Generation Science Standards:

<u>3- LS4-4 Biological Evolution: Unity and Diversity</u>- Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

ENGAGE (15 minutes)	1. Share the following imagery of <u>the ozone hole</u> using Google Earth. Zoom in closer and explore multiple areas using Street View.	
	2. Ask students to share their ideas of the ozone layer based on what they see in the imagery. Document student responses	
	<ol> <li>Introduce the essential questions that will guide the inquiry investigation: How is the ozone hole caused? What are the consequences?</li> </ol>	
EXPLORE(25 minutes)	1. Provide students with copies of the <u>Changing Arctic Evidence Chart</u> .	
	2. Present the first source of information on the Arctic, the Google Earth Voyager Story.	
	3. Prompt students to record their observations.	
EXPLAIN (20 minutes)	<ol> <li>Organize students in partners. Ask each pair to share their observations from the google map :https://www.google.com/maps/d/edit?mid=1BAet0oC- YyO7TFXES_BQMiDheNkrvA7U&amp;usp=sharing</li> </ol>	
	2. Ask students how they think the biome has changed over time. Prompt them to record their thoughts in the <u>Changing Ozone layerChart.</u>	
	3. Ask partners to share their thoughts. (Possible student response: more vehicles and people due to increased tourism.)	
	4. Allow time for students to share their ideas with the class and ask	

# LÉSSON PLAN CONTINUED

REVISE(10 minutes)	1.	Following the discussion, prompt students to add to their hypotheses in the "Think" section of the <u>Changing Ozone layer Chart</u> .
	2.	Ask students to record any questions they have about the changing ozone layerand its effect on sustainability of life, in the "Wonder" section of the <u>Changing Ozone layer Chart</u> .

Next, repeat the process with a second source of information.

EXPLORE (20 minutes)	1. Present the second source of information, the casestudy with its relevant four pronged assessment.
	2. Prompt students to record their observations in the "See" section of the <u>Changing Ozone layer Chart</u> .
EXPLAIN (20 minutes)	1. Return students to partners. Ask each pair to share their observations from the case study assigned on ozone layer.
	2. Ask students how they think the Arctic tundra biome has changed over time based on this source of evidence. Prompt them to record their thoughts in the "Think" section of the <u>Changing Arctic Evidence Chart</u> .
	3. Ask partners to share their thoughts. (Possible student response: climate change is causing sea ice to form later and melt earlier, making it harder for polar bears to hunt seals.)
	4. Allow time for students to share their ideas with the class and ask questions about the ideas of others.
REVISE (10 minutes)	1. Following the discussion, prompt students to add to their hypotheses in the "Think" section of the <u>Changing Arctic Evidence Chart</u> .
	2. Ask students to record any questions they have about the changing Arctic and its effect on polar bears in the "Wonder" section of the <u>Changing</u> <u>Arctic Evidence Chart</u> .

## LÉSSON PLAN CONTINUED

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(Option to repeat this process with additional sources of information, each time resulting in an updated hypothesis.)

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EXPLORE(25 minutes)	<ol> <li>Share the third source of information, the YouTube.com video, <u>NASA</u> <u>Goddard: Older Arctic Sea Ice Disappearing</u>.</li> <li>Prompt students to record their observations from the video in the "See" section of the <u>Changing Arctic Evidence Chart</u>.</li> </ol>
EXPLAIN (20 minutes) depletion.	1. Return students to partners. Ask each pair to share their observations on ozone layer
	2. Ask students how they think the Arctic tundra biome has changed over time based on this source of evidence. Prompt them to record their thoughts in the "Think" section of the <u>Changing Arctic Evidence Chart</u> .
	3. Ask partners to share their thoughts. (Possible student response: there is less ice in the arctic and it has become younger and thinner.)
	4. Allow time for students to share their ideas with the class and ask questions about the ideas of others.

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REVISE (10 minutes)	Following the discussion, prompt students to add to the in the "Think" section of the <u>Changing Arctic Evidence</u> Ask students to record any questions they have about the and its effect on polar bears in the "Wonder" section of <u>Arctic Evidence Chart</u> .	ir hypotheses <u>e Chart</u> . changing Arctic of the <u>Changing</u>
APPLY (60 minutes)	Organize students into small groups. Each group will v collaboratively to create an educational campaign in the commercial, skit, song, poem or slideshow. Provide student access to the internet to research quest during the investigation and gather additional information the Arctic and its impact on polar bears.	work form of a poster, tions generated n about changes to
	<ul> <li>Educational campaigns should include the following:</li> <li>Facts about the causes and effects of changes to the biome.</li> <li>Facts about the impacts of changes to the Arctic on there.</li> <li>Actions that humans can take to reduce changes to protect polar bear habitat.</li> </ul>	e Arctic tundra n polar bears living the Arctic and ampaign to the

#### EVALUATE: CULMINATING TASKRUBRIC

	Exceeding	Meeting	Approaching	Beginning
Content Knowledge	Student demonstrates mastery of key concepts such as the characteristics of the Arctic tundra biome, the causes and effects of changes to the Arctic tundra biome and the impacts of these changes on polar bears.	Student demonstrates adequate understanding of key concepts such as characteristics of the Arctic tundra biome, the causes and effects of changes to the Arctic tundra biome and the impacts of these changes on polar bears.	Student demonstrates partial understanding of key concepts such as the characteristics of the Arctic tundra biome, the causes and effects of changes to the Arctic tundra biome and the impacts of these changes on polar bears.	Student lacks understanding of key concepts such as the characteristics of the Arctic tundra biome, the causes and effects of changes to the Arctic tundra biome and the impacts of these changes on polar bears.
Presentation	Presentation clearly and creatively communicates the causes and effects of changes to the Arctic, how those changes impact polar bears and what humans can do to help. Presentation draws on multiple sources of evidence from student research.	Presentation clearly communicates the causes and effects of changes to the Arctic, how those changes impact polar bears and what humans can do to help. Presentation draws on 1-2 sources of evidence from student research.	Presentation clearly communicates the causes and effects of changes to the Arctic BUT does not address the impacts on polar bears or what humans can do to help. Presentation is not supported by evidence from student research.	Presentation is lacking information about the causes and effects of changes to the Arctic AND does not address the impacts on polar bears or what humans can do to help. Presentation is not supported by evidence from student research.
Participation	Student did an equal share of the work; shared with, listened to, and showed respect for group members; stayed on task.	Student did a fair share of the work, was respectful to group members most of the time, and/or used most of the class time wisely.	Student did less than a fair share of the work, was sometimes disrespectful to group members, and/or wasted a lot of work time.	Student let others do most of the work, was rude or disrespectful, and wasted most of the work time.

### RESOURCES

ADDITIONAL	Related Google Earth		
RESOURCES:	• Google Maps.		
	BBC News Article: <u>Six Graphics that Explain Climate Change</u>		
	National Geographic Encyclopedia Entry: <u>Arctic</u>		
	National Geographic Kids Article <u>10 Facts About the OZONE LAYER</u>		
OPTIONS FOR DIFFERENTIATION	• Extension: Explore other examples of causes and effects of climate change on ecosystems.		
:	• Introduce fewer or additional sources of information for students to gather evidence.		
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