



12th GRADE
INQUIRY BASED LESSON PLAN

THE EVIL QUARTET

195 MINUTES

THE EVIL QUARTET

195 minutes

OVERVIEW

Students will explore the reasons for the loss of biodiversity using the Google Earth Creation tool and Earth Engine Time lapse and the impact it has on the biological wealth of our planet.

SUBJECT/TOPIC Biology/ Biodiversity	AGE LEVEL 12th Grade
<div data-bbox="66 810 126 869"></div> Learning Objectives <ul style="list-style-type: none"> Students will identify the causes of biodiversity loss and the impact it has on environment. Students will research and identify the human activities that have caused extinction of animals and plants. Students will participate in collaborative discussions and identify the species of animals and plants that have become extinct due to human activities. Students will apply their learnings in the form of an educational campaign informing the people of the problem, its impact on the environment and the actions needed to solve it. 	<div data-bbox="808 810 868 869"></div> Inquiry <p>What are the causes of biodiversity loss and how does it impact the environment?</p>
<div data-bbox="58 1356 118 1415"></div> Materials Needed <ul style="list-style-type: none"> Access to Google Earth. Student internet access. 	<div data-bbox="808 1356 868 1415"></div> Lesson Summary <p>Engage: Locate Amazon rainforest, Bering sea and Lake Victoria on the Google Earth where loss of biodiversity took place and draw conclusions from it</p> <p>Explore: Gather information from multiple sources about the loss of biodiversity that took place in Amazon rainforest, Bering sea and Lake Victoria due to human intervention.</p> <p>Explain: Identify the changes that took place, hypothesize the human activities that affected animals and plants in that region.</p> <p>Revise: Adjust hypotheses based on additional evidence from class discussion.</p> <p>Apply: Make an impact by creating an educational campaign and an action plan that addresses the threats of biodiversity loss due to human activities and the damage caused to the environment.</p>



Sustainable Development Goals



Culminating Task/Assessment

Students will work collaboratively to create an educational campaign about the causes of ozone depletion, impact it has on the living organisms and what activities humans can curb to prevent this loss.



Textbook Chapter

'Biodiversity' is a topic from the chapter "Biodiversity and Conservation" from Biology NCERT Textbook for Class 12



Engage (5 minutes)

1. Share the imagery of Amazon rainforest, Bering sea and Lake Victoria using Google Earth.
2. Ask the students to share their ideas about these places on what they see in the imagery. Document student responses.
3. Introduce the essential questions that will guide the inquiry investigation: What are the causes of biodiversity loss and how does it impact the environment?

Explore (25 minutes)

1. Present the first source of information on 'The Evil Quartet' using a Google Earth story. Introduce the story, read the information on each slide and share the images and videos of the places shown on the Google Earth.
2. Prompt the students to record their observations of the places shown on the Google Earth.
3. Students identify relationships in the places shown and form a hypothesis based on the information gained.

Explain (20 minutes)

1. Organize students into partners. Ask each pair to share their observations from the images and videos featured in the Google Earth Story.
2. Ask partners to share their thoughts on the common thing they noticed about the places shown on the Google Earth (Possible student response: Loss of plant and animal species due to human activities)
3. Facilitate whole group discussion in which students share their ideas about the environmental damage caused due to overexploitation by humans with their classmates and ask questions about the ideas of others.
4. Students test hypotheses and record their findings

Revise (10 minutes)

1. Students add new ideas to their hypotheses based on information gained in discussion.
2. Students to record any questions they have about the biodiversity loss and the impact it has on the environment.



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

Explore (25 minutes)

1. Present the second source of information, the Google Earth Voyager Story, 'Exploring Earth's Ecosystems'. Introduce the story and read the information on each slide and explore the imagery using Street View and 2D perspectives.
2. Prompt the students to record their observations.
3. Students identify the relationships in the ecosystems and form a hypothesis based on the information gained.

Explain (20 minutes)

1. Return students to partners. Ask each pair to share their observations from the Google Earth Voyager Story, Exploring Earth's Ecosystems.
2. Ask students how they think the ecosystems have changed over time based on this source of evidence. Prompt them to record their thoughts.
3. Ask partners to share their thoughts. (Possible student response: Human activity is changing ecosystems in profound ways, including driving the extinction of many species)
4. Allow time for students to share their ideas with the class and ask questions about the ideas of others.
5. Students test hypotheses and record findings.

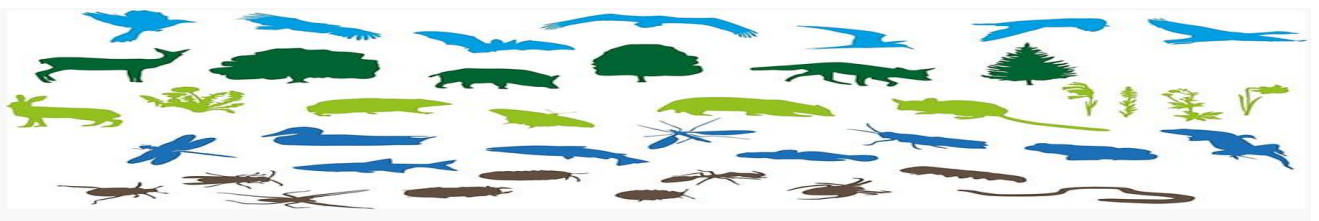
Revise (10 minutes)

1. Following the discussion, prompt students to note down their hypotheses on a sheet of paper.
2. Ask students to record any questions they have about the role of human activity in changing the ecosystems.

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

Apply (80 minutes)

1. Organize students into small groups. Each group will work collaboratively to create an educational campaign in the form of a poster, song, poem or slideshow.
2. Provide student access to the internet to research questions generated during the investigation and gather additional information about the role of human activity in the biodiversity loss.
3. Educational campaigns should include the following:
 - Facts about the causes and effects of the biodiversity loss.
 - Facts about the impacts of human activities on the ecosystem.
 - Actions that humans can take to prevent biodiversity loss and protect damage to the environment
4. Allow time for each group to present their educational campaign to the class.



Evaluate: Rubric

	Exceeding	Meeting	Approaching	Beginning
Content knowledge	Student demonstrates mastery of key concepts such as the biodiversity loss of Amazon rainforest, Bering sea and Lake Victoria; the causes of biodiversity loss in these areas and the impacts of these changes on the environment.	Student demonstrates adequate understanding of key concepts such as the biodiversity loss of Amazon rainforest, Bering sea and Lake Victoria; the causes of biodiversity loss in these areas and the impacts of these changes on the environment.	Student demonstrates partial understanding of key concepts such as the biodiversity loss of Amazon rainforest, Bering sea and Lake Victoria; the causes of biodiversity loss in these areas and the impacts of these changes on the environment.	Student lacks understanding of key concepts such as the biodiversity loss of Amazon rainforest, Bering sea and Lake Victoria; the causes of biodiversity loss in these areas and the impacts of these changes on the environment.
Presentation	Presentation clearly and creatively communicates the biodiversity loss of Amazon rainforest, Bering sea and Lake Victoria; the causes of biodiversity loss in these areas; the impacts of these changes on the environment and what humans can do to help. Presentation draws on multiple sources of evidence from student research.	Presentation clearly communicates the biodiversity loss of Amazon rainforest, Bering sea and Lake Victoria; the causes of biodiversity loss in these areas; the impacts of these changes on the environment and what humans can do to help. Presentation draws on 1-2 sources of evidence from student research.	Presentation clearly communicates the biodiversity loss of Amazon rainforest, Bering sea and Lake Victoria and the causes of biodiversity loss in these areas BUT does not address the impacts of these changes on the environment and what humans can do to help. Presentation is not supported by evidence from student research.	Presentation is lacking information about biodiversity loss of Amazon rainforest, Bering sea and Lake Victoria and the causes of biodiversity loss in these areas AND does not address the impacts of these changes on the environment and 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.

Additional Resources

- Related Google Earth Voyager Stories: Surveying Gorongosa's Biodiversity, Extreme biodiversity on the high seas
- National Geographic Society- People and Wildlife in India (Biodiversity Hot Spots)- <https://www.nationalgeographic.org/idea/people-wildlife-india/>
- National Geographic Society - Wildlife Conservation- https://www.nationalgeographic.org/encyclopedia/wildlife-conservation/?utm_source=BiblioRCM_Row
- National Geographic Society -International Day of Biodiversity- https://www.nationalgeographic.org/article/international-day-biodiversity/?utm_source=BiblioRCM_Row
- Google Earth Engine: Time lapse - <http://explorables.cmucreatelab.org/unreleased/landsat-thumbnail-generator/examples/landsat.html#v=-9.24944,-64.52914,2.902,latLng&t=3.23>
- Google Earth Engine Apps- <http://bit.ly/Amazon-Deforestation/> <http://bit.ly/Amazon-Forest-Fires>
- Biology NCERT Class 12 - <https://ncert.nic.in/ncerts/l/lebo115.pdf>
- Biodiversity and Conservation (International journal)- <https://www.springer.com/journal/10531>
- IUCN-<https://www.iucn.org/regions/europe/our-work/biodiversity-conservation>
- Biodiversity loss-A documentary-<https://www.youtube.com/watch?v=WKld7o6CISq>
- UNESCO-Learn to protect biodiversity-<https://www.youtube.com/watch?v=kHhspf5lfdE>

Options for Differentiation

- Extension: Explore other examples of causes and effects of human activity on ecosystems and how plants and animals are impacted.
- Introduce additional sources of information for students to gather evidence.

Credits

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