Explain: Pollution Crash Course: Damage and Recovery

INSTRUCTOR:
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Objective

You will design an infographic showing an ecosystem before and after pollution and propose solutions for recovery. You will explain how pollutants disrupt energy flow, affect species survival, and describe recovery strategies.

Background

Ecosystems are communities of living (biotic) and non-living (abiotic) things that interact and depend on each other for survival. Examples of biotic factors include plants, animals, and microorganisms, while abiotic factors include sunlight, water, and soil. Healthy ecosystems have a balance where energy flows from producers (like plants) to consumers (like animals) and decomposers (like fungi).

Pollution introduces harmful substances, called **pollutants**, into the environment. Examples of pollutants include oil spills, plastic waste, and toxic chemicals. These pollutants can block sunlight, poison animals, and destroy habitats, disrupting the flow of energy and causing some species to decline or even go extinct.

Ecosystem recovery happens when humans take actions, such as cleaning up pollution, reintroducing species, or protecting habitats, to help restore balance. Recovery can be challenging, but it's essential for maintaining biodiversity—the variety of life in an ecosystem—and ensuring that ecosystems can provide resources like clean air, water, and food.

Reflection Questions (Connect for All Students)

1. **Why is energy flow important for an ecosystem's survival?**
2. **How do pollutants like oil or plastic disrupt food webs?**
3. **Can you think of ways humans help ecosystems recover after pollution?**
4. **What are some challenges people might face when trying to restore ecosystems?**

Activity: Infographic Design

Step 1: Pre-Pollution Ecosystem

- Create a section of your infographic that illustrates a healthy ecosystem.

- Include details such as plants, animals, sunlight, water, and decomposers.
- Label how energy flows through the ecosystem (e.g., from the sun to plants, then to animals).

Step 2: Polluted Ecosystem

- Add a section to your infographic showing how a specific pollutant (e.g., oil, plastic, or chemicals) affects the ecosystem.
- Use arrows, diagrams, or symbols to show how the pollutant disrupts energy flow and species survival.
- Write a brief explanation of the changes caused by the pollutant.

Step 3: Recovery Plan

- Add a final section showing how humans can help the ecosystem recover.
- Include solutions such as removing pollutants, replanting vegetation, or protecting wildlife.
- Explain the steps for recovery and why they would be effective.

Pollution and Ecosystem Choices

Choose one type of pollution and its corresponding ecosystem to focus on for your infographic: (**11x17 - legal**)

1. **Oil Spill in the Ocean** – Effects on marine life and coral reefs.
2. **Plastic Waste in a River** – Impacts on freshwater species and water quality.
3. **Toxic Chemicals in a Forest** – Effects on plants, animals, and soil health.
4. **Air Pollution in a Grassland** – Impacts on plants, herbivores, and predators.
5. **Excess Fertilizer in a Wetland** – Effects on algae growth and aquatic species.

Sentence Stems for Student Thinking and Writing

For Explaining Changes in the Ecosystem:

- *"Before pollution, energy flowed through the ecosystem by ____. After pollution, this flow was disrupted because ____."*
- *"The pollutant caused harm to ____ by ____, which affected the entire ecosystem."*

For Justifying Recovery Strategies:

- *"One strategy to help the ecosystem recover is ____, because it will ____."*
- *"If we remove ____, it will help ____ survive and restore balance to the ecosystem."*

For Reflection Questions:

- *"Energy flow is important because ____."*
- *"Pollutants disrupt food webs by ____."*
- *"Humans can help ecosystems recover by ____."*
- *"A challenge in restoring ecosystems is ____."*

Name: _____ Date: _____

Reflection:

Rubric for Infographic

Criteria	Description	Points	Points Earned
Pre-Pollution Ecosystem	Clear, accurate depiction of a healthy ecosystem with labeled energy flow.	**5**	
Polluted Ecosystem	Detailed and accurate representation of pollution's effects on the ecosystem.	**5**	
Recovery Plan	Realistic and evidence-based recovery strategies with clear explanations.	**5**	
Design and Creativity	Infographic is visually engaging, well-organized, and includes diagrams, symbols, or arrows.	**3**	
Writing Quality	Explanations are clear, concise, and use academic vocabulary accurately.	**2**	
	Total	**20**	

Name: _____ Date: _____

Teacher Instructions

Objective

Students will analyze how pollution disrupts ecosystems, explain its effects on energy flow and species survival, and propose realistic recovery strategies using an infographic.

Materials

- **Student document and rubric**
- **Chart paper or digital infographic tools (e.g., Canva, Google Slides) / PDF's**
  - **Oil Spill in the Ocean** – Effects on marine life and coral reefs.
  - **Plastic Waste in a River** – Impacts on freshwater species and water quality.
  - **Toxic Chemicals in a Forest** – Effects on plants, animals, and soil health.
  - **Air Pollution in a Grassland** – Impacts on plants, herbivores, and predators.
  - **Excess Fertilizer in a Wetland** – Effects on algae growth and aquatic species.
- **Research materials (books, articles, internet access)**
- **Markers, colored pencils, or graphic design resources**

Lesson Steps and Timing

1. **Engage (5 minutes)**
   - Show a compelling image or short video of a polluted ecosystem (e.g., oil-covered animals, plastic-filled river).
   - Think-Pair-Share Activity:
     - *"What do you notice? How might pollution impact the living and nonliving parts of this environment?"*
   - Briefly discuss student observations to introduce the lesson objective.
2. **Explore (10 minutes)**
   - Students choose a type of pollution and corresponding ecosystem (e.g., oil spill in the ocean, plastic in rivers).
   - Provide quick access to pre-selected articles or handouts for research.
   - In pairs or small groups, students identify key impacts of their pollutant on the ecosystem.
3. **Explain (10 minutes)**

- Teacher explains the infographic components:
  - **Pre-pollution ecosystem**
  - **Polluted ecosystem and its effects**
  - **Recovery strategies**
- Show an example infographic, highlighting visuals, academic vocabulary, and evidence-based explanations.
- Encourage students to brainstorm ideas for their own infographic.

4. **Elaborate (30 minutes)**
   - Students begin creating their infographic, either digitally or on paper.
   - Circulate to provide guidance, answer questions, and ensure students stay on task.
   - Encourage students to focus on clear visuals, concise explanations, and realistic recovery strategies.
5. **Evaluate (5 minutes)**
   - Have students participate in a gallery walk, displaying their in-progress work.
   - Students leave constructive comments or sticky notes with questions or compliments for peers.
   - **Wrap up with a quick reflection:**
     - ***"What was the most surprising thing you learned about how pollution affects ecosystems?"***

Helpful Hints

- Keep materials ready for quick distribution (e.g., preprinted research articles or bookmarked websites).
- Provide a checklist or template for students to structure their infographic efficiently.
- Use a timer to keep students on track during work time.

Guiding Questions

1. **How does pollution disrupt energy flow in the ecosystem?**
2. **Which species or habitats are most affected by the pollution you chose?**
3. **What evidence supports the harm caused by this pollutant?**
4. **What steps could realistically help this ecosystem recover?**
5. **Why is restoring the ecosystem important for biodiversity and humans?**

Name: _____ Date: _____

Differentiation Strategies

1. **For Students Needing Support**
    - Provide partially completed templates or sentence stems for their infographic.
    - Pair them with a buddy for brainstorming and research.
    - Focus on one key aspect of the infographic at a time.
2. **For Advanced Learners**
    - Challenge students to include statistical data or a real-world case study in their infographic.
    - Encourage them to design an additional persuasive poster advocating for action.
3. **For ELL Students**
    - Provide a glossary of academic terms with images.
    - Use sentence frames to help structure their written responses.
    - Pair with a peer mentor who can help clarify instructions.
4. **For Visual Learners**
    - Emphasize the use of charts, symbols, and drawings to convey ideas.
    - Offer graphic organizers to map out their ideas before creating the infographic.
5. **For Students with Limited Technology Access**
    - Provide art supplies for a paper-based infographic.
    - Pair students to work collaboratively if tech resources are shared.