Connecting Social Issues and Human Health Inequities, Lesson 3

The Role of Green Spaces

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Published by *K20 Center*

Grade Level	9th – 12th Grade	**Time Frame**	240-300 minutes
Subject	Science	**Duration**	4-5 periods
Course	Biology, Environmental Science		

Essential Question

How do inequitable environmental factors affect human health?

Summary

During this third lesson in the Connecting Social Issues and Health Inequities unit, students will analyze satellite images of two locations, calculate the percentage of squares that are mostly forested and those that are mostly urbanized (using aerial images of two different zip codes with drastically different health issues), and write a CER that connects any differences between the two locations that would influence human health. At the conclusion of the lesson, students will write a proposal that they can present to community members, city council members, family, and peers that consider community-level changes, aim to improve air quality, and raise awareness of environmental racism.

Snapshot

Engage

Students analyze satellite images of two locations.

Explore

Using aerial images of two different zip codes with drastically different health issues, students calculate the percentage of squares that are mostly forested and mostly urbanized.

Explain

Students discuss their observations from previous activities as a whole group.

Extend

Students write a CER that connects the differences between the two locations that would influence human health.

Evaluate

Students create a proposal that they can present to community members, city council members, family, and peers that consider community-level changes, aim to improve air quality, and raise awareness of

environmental racism.

Standards

Next Generation Science Standards (Grades 9, 10, 11, 12)

HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-5: Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Oklahoma Academic Standards (Biology)

B.LS1.3 : Plan and conduct an investigation to provide evidence of the importance of maintaining homeostasis in living organisms.
B.LS1.3.1: Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Outside that range (e.g., at too high or low external temperature, with too little food or water available) the organism cannot survive.
B.LS2.2 : Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
B.LS2.2.1: Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease.
B.LS2.2.2: Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.
B.LS2.2.3: A complex set of interactions within an ecosystem can keep its number and types of organisms relatively constant over long periods of time under stable conditions.
B.LS2.2.4: If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient) as opposed to becoming a very different ecosystem.
B.LS2.2.5: Extreme fluctuations in conditions or the size of any populations, however, can challenge the functions of ecosystems in terms of resources and habitat availability.
B.LS2.5 : Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
B.LS2.5.1: Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes.
B.LS2.5.2: The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis.
B.LS2.6 : Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
B.LS2.6.1: A complex set of interactions within an ecosystem can keep its number and types of organisms relatively constant over long periods of time under stable conditions.
B.LS2.6.2: If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient) as opposed to becoming a very different ecosystem.
B.LS2.6.3: Extreme fluctuations in conditions or the size of any populations, however, can challenge the functions of ecosystems in terms of resources and habitat availability.

Attachments

- CER—The Role of Green Spaces - Spanish.docx
- CER—The Role of Green Spaces - Spanish.pdf
- CER—The Role of Green Spaces.docx
- CER—The Role of Green Spaces.pdf
- Community Project Proposal Student Instructions—The Role of Green Spaces - Spanish.docx
- Community Project Proposal Student Instructions—The Role of Green Spaces - Spanish.pdf
- Community Project Proposal Student Instructions—The Role of Green Spaces.docx
- Community Project Proposal Student Instructions—The Role of Green Spaces.pdf
- Driving Question Board—The Role of Green Spaces - Spanish.docx
- Driving Question Board—The Role of Green Spaces - Spanish.pdf
- Driving Question Board—The Role of Green Spaces.docx
- Driving Question Board—The Role of Green Spaces.pdf
- Lesson Slides—The Role of Green Spaces.pptx
- Proposal Rubric—The Role of Green Spaces - Spanish.docx
- Proposal Rubric—The Role of Green Spaces - Spanish.pdf
- Proposal Rubric—The Role of Green Spaces.docx
- Proposal Rubric—The Role of Green Spaces.pdf
- Zip Code Breakdown—The Role of Green Spaces - Spanish.docx
- Zip Code Breakdown—The Role of Green Spaces - Spanish.pdf
- Zip Code Breakdown—The Role of Green Spaces.docx
- Zip Code Breakdown—The Role of Green Spaces.pdf

Materials

- Lesson Slides (attached)
- CER- The Role of Green Spaces (attached; one per student)
- Zip Code Breakdown- The Role of Green Spaces (attached; one per student)
- Driving Question Board - (attached; one per student)
- Proposal Rubric- The Role of Green Spaces (attached; one per group)
- Proposal Project Instructions- The Role of Green Spaces (attached; one per group)
- Page protectors or dry erase pockets (optional; one per student)
- Dry erase markers (optional; one per student)
- Sticky notes
- Pens/pencils

Engage

Begin the lesson by projecting the unit's essential question on **slide 3** of the attached **Lesson Slides**.

Display **slide 4.** Share the lesson's learning objectives.

Display **slide 5.** Share the modified instructional strategy, Photo or Picture Deconstruction, with students. You do not need to cut the images for students to analyze the aerial photos.

Rather than having students work on just one photo, instruct them to compare the two photos on **slide 6**. Inform them that the residents who reside in zip code 73012 are generally healthier than residents who reside in zip code 73111. Have students identify some environmental factors that might contribute to this difference. Remind students to record and describe exactly what they see (people, places, objects) without interpretation.

Possible Student Inferences and Interpretations

Instruct students to infer and interpret what they saw with evidence from the picture to support their inferences. For example, students may infer that the first photo is in a more rural area compared to the second photo.

Ask students to hypothesize what they might not know about the map photographs and how they might find the information. Students should focus their attention on the area inside the faint red line.

Zip Code: 73111

Zip Code:73012

Teacher's Note: Formative Assessment

Move around the room, listen to the student conversations, and ask probing questions to deepen the conversation. Students should notice things that might play a role in asthma and respiratory illnesses.

Explore

Display **slide 7.** Pass out the attached **Zip Code Breakdown** handout, a transparency or page protector, and a dry erase marker. Instruct students to continue to compare the same aerial photos by placing the transparency over each photo. Have students use a dry erase marker to create a grid over the top of the photo. Recommend students use the mile markers on the roads. Use the image below as an example. For reference, this is the first photo used in the Engage section.

Next, instruct students to calculate the percentage of squares that are mostly forested and those that are mostly urbanized.

Teacher's Note: Photosynthesis

If this lesson is being taught to high school students, they should have some knowledge of photosynthesis. They don't need to remember or know the equation for photosynthesis. They just need to understand that an area with more plants should have cleaner air as compared to an area with fewer plants.

Display **slide 8.** Instruct students to have a discussion in their small groups about the following questions:

- What similarities did you notice between the two aerial map images?
- What differences did you notice between the two aerial map images?
- What does this mean?
- What evidence do you have to support your claim?

Teacher's Note: Formative Assessment

Listen to student conversations for differences in the two areas such as increased forests or green spaces, differences in the number of roads, buildings, or anything that might contribute to environmental pollution.

Explain

Display **slide 9.** As a whole group, facilitate a discussion to allow students to share what differences they noticed in the two areas. During this discussion, ask students what they remember about photosynthesis that might have an effect on air quality.

Teacher's Note

Ask questions like, *what happens when we increase industrialized areas and reduce green spaces?* The students should be able to connect that increasing industrialized areas and reducing green spaces will increase environmentally related health issues.

Display **slide 10.** This is a good time to refer back to the **Driving Question Board** handout. Ask students if they have answered any questions that were originally added to the board. Additionally, ask if there are new questions that should be added to the Driving Question Board.

Teacher's Note: Formative Assessment

Ensure that students are able to connect that increasing industrialized areas and diminishing green spaces will increase environmentally-related health issues.

If students are unable to make that connection, walk them through the proposal instructions. If they cannot make the connections between the environment and related health issues, they will struggle to make sense of future discussions and assignments.

Extend

Display **slide 11.** Share the instructional strategy, Claim, Evidence, Reasoning (CER), with students. Pass out the attached **CER** handout and instruct students to independently write a claim related to the differences between the two locations that would influence human health. Encourage them to use information from the previous lessons as their evidence or reasoning.

Teacher's Note: Formative Assessment

You can use the CER as a formative assessment. Although CERs are often used in the Evaluate phase, this storyline isn't over yet, so there is still time to correct misconceptions. Since this assignment is independent, it enables the teacher to know which students need remediation.

Evaluate

Display **slide 12.** Share the beginning of the final product proposals for the storyline with the students. Instruct students to create a proposal that they can present to community members, city council members, family, and peers that consider community-level changes, will improve air quality, and raise awareness of environmental racism.

Remind students to think about what they have learned in the previous lessons and begin by addressing the problem, providing evidence for what they are claiming, and providing a possible solution.

Divide students into small groups. Pass out the attached **Community Proposal Project** handout and instruct them to begin their proposals by discussing the following prompts:

- What is the problem?
- What do you know about the problem that other people should know?
- What evidence can you provide to support what you are claiming?
- What are some possible solutions to this problem?

Teacher's Note: Final Product Proposals

In the next two Evaluate sections, students will create a proposal that they could and should, if possible, present to community members, city council members, family, and peers. Students will create these proposals in groups.

Resources

- EpicTop10.com. (2019, July 3). *Photosynthesis.* [Image]. https://www.flickr.com/photos/182229932@N07/48187656411
- Google maps satellite. (n.d.). *Oklahoma City, OK*. [Aerial map photographs]. https://earth.google.com/web/@35.48264792,-97.4791978,363.52415431a,121151.59788577d,35y,0h,0t,0r
- K20 Center. (2020). Claim, Evidence, Reasoning (CER). Strategies. https://learn.k20center.ou.edu/strategy/156
- K20 Center. (2021). Driving Question Board. Strategies. https://learn.k20center.ou.edu/strategy/1511
- K20 Center. (2020). Photo or Picture Deconstruction. Strategies. https://learn.k20center.ou.edu/strategy/140