The University of Texas at Austin
Environmental Science Institute

Cultivating Science and Environmental Justice

Lesson Plan for Grades: High School
Length of Lesson: 75 minutes

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Subject area/course:
- Environmental Science or Biology

Materials:
For each student
- Laptop
- Handouts (listed below)

For each group
- Poster board
- Markers

TEKS/SEs:
§112.37. Environmental Systems, Beginning with School Year 2010-2011
(1) Scientific processes. The student, for at least 40% of instructional time, conducts hands-on laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:
- (B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.

(5) Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:
- (A) summarize methods of land use and management and describe its effects on land fertility

(9) Science concepts. The student knows the impact of human activities on the environment. The student is expected to:
- (A) identify causes of air, soil, and water pollution, including point and nonpoint sources;
- (B) investigate the types of air, soil, and water pollution such as chlorofluorocarbons, carbon dioxide, pH, pesticide runoff, thermal variations, metallic ions, heavy metals, and nuclear waste;
- (C) examine the concentrations of air, soil, and water pollutants using appropriate units

Lesson objective(s):
- Students will form a deeper understanding of the relationship between environmental pollution and disease/premature death.
- Students will be able to define and explain environmental justice.
- Students will be able to understand how toxins enter the body as a result of environmental pollution and the long-term damage that can result.

Differentiation strategies to meet diverse learner needs:
- The teacher should ask students whether they prefer to read or watch videos to learn about concepts; then have students learn in their preferred learning style. However, the teacher may assign students certain methods to improve their skills. For example, if a student prefers reading, teachers may have them watch a video and take notes to improve their listening skills.
- ELL students and students with learning disabilities should have multiple forms of instruction including visual and written instruction sheets as well as a verbal instruction and demonstration.

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- This lesson can be adapted in many ways depending on the resources. This lesson can be done completely online (zoom/online learning) and instead of making a poster board the students use Google slides and work in break out rooms. In a regular classroom if the students have access to technology (laptops, or tablets) the students can perform the lesson as listed. If due to a lack resources, the students don't have access to technology all of the handouts and articles can be printed instead, and the lesson can be done completely without the use of technology.

ENGAGEMENT (15 minutes)

- The teacher will start the class by sharing the following question: *What is Environmental Justice?*
- The class will now engage in a think-pair-share. The students will be given 1 minute to think about the answer on their own. Once the minute is up the teacher will instruct their students to turn to the person nearest to them (or whatever method the teacher has been using) and discuss with each other what they think environmental justice is. The students will be given 2 minutes to discuss with their partner.
- Once the students have been given enough time to talk the teacher will call on a few pairs to share what they think environmental justice is. The teacher will take the time to write the most important part of what the student are saying on the board.
- The teacher will continue asking pairs for their answers until the class has a working definition of what environmental justice is (this entire process should take about 5 minutes).
- The teacher will now play part of Hot Science At Home "Cultivating Science and Environmental Justice" video. The teacher can start the video at the beginning or the segment from 2:00 – 8:00.
- The teacher will now give the students a chance to see if they want to change or add anything to their definition of environmental justice.
- Additional questions that can be asked during the engagement portion of the lesson, depending on the amount of time left and whether the teacher wishes to discuss these questions.
    1. Can you think of recent environmental disasters that are examples of environmental injustice or have you experienced something like this?
    2. Why would companies build their waste sites in these areas in the first place?

Transition: "Now that we have an idea about what is environmental justice, we are going to look at individual cases more closely."

EXPLORATION (25 minutes)

- The teacher divides the students into groups of four. Each group will be assigned a location from the list below. The locations can be assigned randomly, or the teacher can have the students pick. The teacher can add additional towns if necessary, for larger classes, or chose fewer cities for smaller classes.
    1. Flint, MI
    2. Love Canal, NY
    3. Navajo Nation, NM
    4. Martin County, KY
    5. Newark, NJ
    6. Estill County, KY
    7. Johnson County, IN

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- Once groups are assigned a location, each person in the group selects a role:
    1. Leader: Responsible for leading group discussion and holding everyone accountable
    2. Timekeeper: Keeps track of how much time has passed, and keeps the group on task
    3. Reporter: Presents their groups poster to the class, and is the group's spokesperson
    4. Designer: Responsible for designing the poster

  Students are able to help other group members with their roles. The roles ensure that all group members are participating and engaging with the material.
- The students will have 25 minutes to research their assigned location and create a public service announcement that explains the environmental issues affecting the area.
    1. The teacher will instruct the students to use the *Articles (Student Handout)* or the printed handouts (if not using laptops) to find about the environmental issues at their location. As some of the articles are quite long, groups can skim the material for the most relevant information. If the students feel like they need additional information they can look up other resources.
    2. As each team explores the information about their location, teams will fill out the *Exploration Student Worksheet* to use as a reference for creating their poster.
    3. Teams will then create a public service announcement. How it looks in the end is entirely up to the group. Each public service announcement should address the questions listed on their handout unless otherwise specified.
- As the students are working the teacher will walk around, answering any questions and formatively accessing the students. The teacher ensure that all students are actively participating and staying on task. The teacher will also take note of anything the stands out during the group discussion that they may want to bring up later during the explanation.

Transition: "I heard a lot of great conversations as I was walking around and since it looks like all the groups have finished their posters let's go ahead and talk about these different cities"

EXPLANATION (30-35 minutes)

- The team posters can be presented in chronological order, in the order of severity, in order of current status, or whichever way the teacher feels will allow the students to understand the material to the fullest.
- Teacher should allot 5 minutes for each group: 2 for the presentation and 3 for questions. As the group is presenting, the rest students should be filling out handout.
- "I need the Reporter from (location name) to stand up and present your public service announcement to the class."
- The selected Reporter will present their group poster to the class.
- "Thank you for presenting, (student name). Does anybody have any questions for this group? I also want to mention (directed towards the group presenting) everyone in the group is responsible for answering these questions, not just the Reporter."
- Students will take the time to ask questions, and the group will answer them to the best of their ability. The teacher will take note of how well the group is able to answer the questions directed towards them. If the students do not have any questions, they will encourage the class to ask questions or the teacher may ask one.
- The steps listed above will be repeated for each group until every group has presented.
- Once all the groups have been given the chance to present the teacher will begin a discussion about the additional questions listed on their handout.

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Alternative:

- If there is a limited amount of time, instead of doing group presentations the teacher can have the students do a gallery walk or a rotating station where the groups move through the different group posters and read the information on them for themselves.
- As the students are reading the different posters, they should be writing down any questions they may have and filling out the *Explanation Student Handout*. If doing a gallery walk, the reporter will stay behind to answer them. If doing rotating stations, after the students have visited each poster the teacher can open the floor for questions. Each group can answer questions about their location to the best of their ability.

Transition: "Everyone did an amazing job researching your locations and sharing what you learned with your classmates. We are going to look deeper into the consequences individuals face as a result of environmental pollutants"

ELABORATION (25 minutes)

- The teacher will start by either passing out a copy of the Elaboration Article or having the students pull up the article on their laptops. "I want everyone to take the next 15 minutes to read over this article about Chemical Trespass and discuss it with your group. On the board you will notice that I have written down a few questions I want you to discuss as a group." The teacher will either write the questions down or have them in a PowerPoint.
    a) Which groups have higher chemical burdens than others, and why?
    b) What is the most interesting fact you learned from this article?
    c) Why is this topic, the chemical burden on the body, such a complex and controversial topic?
    d) How does the topic being discussed in this article make you feel?
    e) What are some questions you still have?
- As the students are reading and discussing the article the teacher will walk around and listen to the student's discussion making note of any important conversation points and ensuring that everyone is on task.
- "Now that the 15 minutes are up let's go ahead and talk about some things you learned from the article." The teacher calls on different groups and asks them to answer a specific question from the list above.
- Repeat this process for all the questions and the teams. Call on different group members not just the Reporter.

EVALUATION (throughout entire lesson)

- Formative assessment will be performed throughout the lesson. As the students are working in their groups during the *Explore* and *Elaboration* stages, the teacher will be walking around assessing the students. The teacher will be making note of any interesting comments made, how much each student is contributing to the work being completed and assessing the students overall understanding of the material.
- The teacher will collect the *Exploration Student Worksheet and the Explanation Handout.*
- A summative assessment can be done at the end of the lesson in the form of an exit ticket where the students have to answer and explain one of the following questions? This exit ticket is optional and up to teacher discretion.
    1. What does environmental justice mean to you?
    2. How can we as a society make sure that environmental justice is enforced and that everyone has the opportunity to live in a safe environment?
    3. What does the phrase "your zip code matters more than your genetic code" mean?

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SOURCES AND RESOURCES

- *Hot Science At Home* with Dr. Monica Ramirez-Andreotta "Cultivating Science and Environmental Justice": https://www.esi.utexas.edu/talk/cultivating-science/
- **Websites that are linked in the Explore and Elaboration Section**
    1. https://www.nationalgeographic.com/environment/article/flint-water-crisis-fifth-anniversary-flint-river-pollution
    2. https://grist.org/justice/love-canal-the-toxic-suburb-that-helped-launch-the-modern-environmental-movement/
    3. https://sites.duke.edu/lit290s-1_02_s2017/2017/03/03/uranium-contamination-in-the-navajo-nation-an-environmental-justice-impact-analysis/
    4. https://www.nbcnews.com/news/us-news/we-ve-been-forgotten-newark-n-j-toxic-superfund-site-n1240706
    5. https://www.nrdc.org/onearth/small-towns-battle-against-radioactive-fracking-waste
    6. https://www.nrdc.org/onearth/after-children-began-getting-sick-dozens-parents-took-hard-look-their-towns-toxic-legacy
    7. https://www.atsdr.cdc.gov/HAC/pha/MartinCountyCoalSlurryRelease/MartinCountyCoalSlurryHC080706.pdf

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EXPLORATION: Articles (Student Handout)

Instructions: Your team will be assigned one of the locations below. Read the article and with your group develop a public service announcement sharing what you learned. As you are reading, answer the questions in the *Student Worksheet Handout* to create your poster. After reading the article if you feel like you need more information feel free to do additional research.

Articles:

- Flint, MI: https://www.nationalgeographic.com/environment/article/flint-water-crisis-fifth-anniversary-flint-river-pollution
- Love Canal, NY: https://grist.org/justice/love-canal-the-toxic-suburb-that-helped-launch-the-modern-environmental-movement/
- Navajo Nation, NM: https://sites.duke.edu/lit290s-1_02_s2017/2017/03/03/uranium-contamination-in-the-navajo-nation-an-environmental-justice-impact-analysis/
- Martin County KY: https://www.atsdr.cdc.gov/HAC/pha/MartinCountyCoalSlurryRelease/MartinCountyCoalSlurryHC080706.pdf
- Newark, NJ: https://www.nbcnews.com/news/us-news/we-ve-been-forgotten-newark-n-j-toxic-superfund-site-n1240706
- Estill County, KY: https://www.nrdc.org/onearth/small-towns-battle-against-radioactive-fracking-waste
- Johnson County, IN: https://www.nrdc.org/onearth/after-children-began-getting-sick-dozens-parents-took-hard-look-their-towns-toxic-legacy

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EXPLORATION: Student Worksheet

Name: _____ Date: _____

Public Service Announcement!

1. What city or county are you covering?

2. What problem is the community facing? What caused it?

3. When did it happen?

4. How did the disaster impact the community living there? Were there any long-term consequences?

5. What's the demographic of the community?

6. Other interesting facts about the community.

7. Was there a personal account from someone who lived there mentioned? If so, what was did they share?

8. What's the current condition of the community?

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EXPLANATION: STUDENT HANDOUT

As you listen to the groups present their public service announcement, fill in the following chart.

Name of City/County	What happened?	Impact on the community

Additional questions to consider.

1. Where there any patterns or trends you noticed between the different locations?

2. What was typically done to help the communities after the issues were discovered? Was it enough?

3. Do you have a personal experience with something like this? If so, what happened?