

## **Living With Lead: Lessons for Environmental Justice and Citizenship**

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#### **Abstract**

The purpose of this unit will be to have students learn about the dangers of lead and its impact on health in order to inform their knowledge and understanding of how lead and other environmental toxins affect the environments they live in and the health and overall well being of those who live in those physical locations. This curriculum unit is also designed to inform students about lead and toxin crises that are well publicized and not so well publicized. This unit aims to demonstrate that environmental justice is not a concept that is exclusive to a particular city or town such as Flint, Michigan, but that environmental injustices exist in communities, both large and small, urban and rural communities across the United States and the globe. This unit aims to inform students about the microcosm of environmental injustice with the hope of turning students into agents and advocates of environmental justice. This unit will educate students and lay the foundation for their newly cultivated roles as ambassadors in environmental citizenship.

#### **Keywords**

**Lead, Lead poisoning, lead legislation, lead regulation, lead paint, toxins, toxicity, environmental justice, environmental citizenship, Philadelphia, Flint, water crisis, analyzing informational texts, central theme, interpreting facts, research project**

#### **Rationale**

Philadelphia is an old city. It has been around since the commencement of our nation. It has been at the forefront of political and various cultural changes as we moved into the era of industrialism, and for this reason, it is a bed of toxicity. As a teacher at George Washington Carver High School for Engineering and Science, my students represent nearly every zip code from across the city. However, our campus sits on the perimeter of what was known as Philadelphia's "lead belt." When University of Pennsylvania professor of pediatrics, Herbert Needleman and social activist Barry Commoner, teamed up to determine why children in certain schools were lagging so far behind students in other local schools, lead testing of children in schools just eight blocks from our campus revealed a startling truth: children who lived in Kensington and certain sections of North Philadelphia had elevated lead levels in their teeth, suggesting that lead exposure had occurred and its effects were manifesting in the academic performance of these children .

The history of lead in our nation and our city is linked to our desire to advance our culture, values and aesthetics. At a time, lead was added to gasoline in order to improve the performance of a car's engine in power and longevity. For similar reasons, this heavy metal was also added to paint. Lead helped create particular pigments, reduced drying time and increased its durability. For decades lead loomed large as a valuable resource. As the years passed, observers, particularly doctors, began to collect data on children and the effects that lead exposure had on

them. They began to notice that serious complications arose. Some children and adults became seriously ill; some even died. However, as with many other pathogens, medical care providers also discovered that lead is often most dangerous to the developing bodies and minds of children. After decades of debate between the medical community and the lead industry, changes in its use ensued.

Warren's (2000) study *Brush with Death: A Social History of Lead Poisoning* explores three modes of lead exposure: occupational, environmental and pediatric (pg. 3). While occupational lead exposure is nothing to overlook, the main focus of this curriculum unit will focus on the environmental and pediatric exposures that have and continue to have the most insidious effects on public health in the United States.

Even as policies set in the recent past concerning lead have seriously tempered the American public's industrial exposure to lead, the spectre continues to haunt vulnerable populations in our nation's oldest urban settings including Philadelphia. Poor African American and Latino children are affected at a higher rate than more affluent children. Many homes in the neighborhoods here contain lead paint and many neighborhoods have contaminated soil, exposing those children to lead. As a result of these residual exposures and the implications of even low-level exposure, awareness of the dangers to Philadelphia's families is paramount. Through this curriculum unit, students will understand the significance of lead and the ways that its presence continues to impact the health and safety of our communities.

### **Lesson Orientation**

This unit is designed to introduce students to the crux of the Flint water crisis, the effects that lead and other toxins has on the body, the historical uses of lead in our society, some of the major regulations and legislation drafted to protect the public from lead exposure as well as lead's impact on the city of Philadelphia specifically.

### **Lead in Our Lives: The Flint Story**

This lesson is designed to introduce students to the dangers of lead exposure and give details of how this fairly recent and memorable tragedy unfolded. Through this lesson, students will learn what happened and how those events have devastated this small city vulnerable, angry and irreparably damaged.

### **The Effects of Lead on the Body**

This lesson will introduce students to some of the ways that lead exposure occurs. Students will learn how this heavy metal enters the body, where it travels and where it deposits. This lesson will also talk about the adverse effects that lead exposure has on lead poisoned victims physically as well as the long-term effects it has on our society.

### **The Historical Implications of Lead Poisoning**

This lesson is designed to explain the historical uses of lead and how it came to be so prevalent in our environment through the use of household and industrial paints, leaded gasoline as well as toys, jewelry, imported goods, etc.. This lesson also talks about the initial discoveries made linking acute illness in children and the battle undertaken by the medical community and other anti-lead advocates to ban the widespread use of lead. This lesson will also explain how the definition of lead poisoning has changed within the medical and scientific communities throughout the 20th century.

### **Lead Legislation and Regulation**

This lesson is designed to introduce students to major federal laws and regulations written and passed to protect citizens from lead exposure through water, air, and soil as well as the role and function of the Environmental Protection Agency. Students should have some knowledge of how laws/ordinances lead to regulation.

### **Lead's Impact on Philadelphia**

This lesson is designed to explore the impact that lead has had in Philadelphia residents. It will trace the history of lead poisoning advocacy in the city in the past and present as well as explore policies for monitoring public safety from lead exposure in schools and residences.

### **Unit Logistics**

The scope of this curriculum unit is designed to be implemented and the culmination projects completed over approximately a 2-3 week period with 45 minute class periods. This unit utilizes informational texts and is geared toward upper middle school students. However, the decision to utilize adapted periodicals through NewsELA as the primary reading materials allows teachers to easily adapt lessons and reading materials to accommodate multiple reading levels. While this curriculum unit was developed using Grade 7 Common Core and Pennsylvania English Language Arts Standards, this unit could be modified to accommodate instruction through grade 12. Additionally, the use of news clips and documentaries allows further differentiation for students by providing multimodal information presentation.

*\* Note- If you opt to print the NewsELA readings associated with the lessons, please be sure to select the appropriate reading levels when printing the articles according to the needs of your students*

### **Strategies**

This curriculum unit attempts to utilize instructional strategies that emphasize peer collaboration as well as student inquiry-driven learning. The goal of this unit is to raise awareness about the effects of lead exposure and help students discover ways of helping mitigate the impact that lead

has had on our local and national environment. With teacher and peer support, students will work toward designing a work product that will educate community stakeholders about the significance of this public health issue. In order to facilitate the effective implementation of this unit, students may need to be familiar with the following instructional tools/methods:

- Jigsaw Reading
- Cornell Notes
- Gallery Walk/Carousel
- K-W-L chart
- Tchart

### **Objectives**

Students will be able to (SWBAT):

- understand the medical, social, and economic impacts of lead
- identify the characteristics of lead and its exposure at various levels on the human body
- identify the historical use of lead in Philadelphia and other similar cities in the region
- identify past and current sources that pose a risk to citizens
- explain and analyze primary sources (legislation) that monitors and remediates lead exposure.

### **Vocabulary Taxonomy**

Deciliters  
Micrograms  
Blood Lead  
Bone Lead  
Corrosion  
Policy  
Legislation  
Regulation  
Environmental Protection Agency  
Center for Disease Control

## **Lesson Plans**

Name \_\_\_\_\_ Date \_\_\_\_\_

### **Lesson One- Lead in Our Lives: The Flint Story**

**Standards:** CC.1.2.7.C Analyze the interactions between individuals, events, and ideas in a text. RI.7.3 Analyze the interactions between individuals, events, and ideas in a text (e.g., how ideas influence individuals or events, or how individuals influence ideas or events).

**Materials:** Copies of the articles or computer access (laptop), Post-It Notes, K-W-L graphic organizers, investigation folder

**Objective-** SWBAT identify significant individuals, events, and ideas in a text IOT analyze their interactions as well as understand the medical, social, and economic impacts of lead

**Warm Up** On your KWL chart, write down what you already know or think you know about the lead crisis in Flint, Michigan in the “K” section of the graphic organizer. Please be ready to share something you write down.

Look at the text features of the article and write down one word or phrase that grabs your attention on the Post-It note. When you have written down your word or phrase, turn and talk to your elbow partner about your word or phrase. Then share 2-3 key ideas that came up in your discussion.

**Whole Group Activity:** Read [The Flint Water Crisis Article](#)

**Collaborative/Individual Activity:** Based on the information read in the article, develop 2-3 questions based on information gathered from the text. Record those questions in the “W” section of your graphic organizer. After creating your questions, use sources from the Internet excluding Wikipedia to find answers to your questions. Record your answers to the questions you wrote down under the “L” section of the graphic organizer.

Name: \_\_\_\_\_ Date \_\_\_\_\_

K-W-L Chart

What I Know/Heard About Lead:	What I Want To Know About Lead:	What I Learned About Lead Through the Reading

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**Exit Ticket-** Write a 5-7 sentence summary of the Flint Water Crisis.

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**Name** \_\_\_\_\_ **Date** \_\_\_\_\_

**Lesson Two-The Effects of Lead on the Body**

**Standard:** CC.1.2.7.A Determine two or more central ideas of a text and analyze their development over the course of the text; provide an objective summary of the text. RI.7.2 Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.

**Materials** Video, handouts, graphic organizers, chart paper, markers, computers

**Objective** SWBAT identify two or more central ideas of a text IOT analyze their development over the course of a text as well as identify the characteristics of lead and its exposure at various levels on the human body.

**WarmUp :** Take one of the T-chart graphic organizers on your table. Look at the infographic on your table. On the left side of the T-chart, list 3 things you notice and on the right side of the T-chart list 3 questions you have about the information you viewed/read.

**Lead Poisoning Infographic**

T-chart

Three Things I Observed on the Infographic About Lead:	Three Questions or Wonderings I Have About What I Have Observed on This Infographic:

**Whole Group Activity** Watch the Short Video on lead poisoning and write down 2 new things you learned about lead’s effect on the body in the box at the bottom under your T-chart. [Lead Poisoning Video CK12](#)

Two Things I Learned From the Video About How Lead Affects The Body:
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**Collaborative/Individual Practice:** As a class, we will popcorn read the first four paragraphs of the NewsELA article “Lead Poisoning: A Contributor to Higher Crime Rates?” and identify/discuss the main ideas presented.

Then in your table groups (4 people per group), we will do a jigsaw. Each person will count off by 4.

- \* All 1’s will read the subsection titled “Older Cities Still Have Lead Problem.”
- \* All 2’s will read the subsection titled “Researcher: Lead Poisoning, Crime Are Connected.”
- \* All 3’s will read the subsection titled “Lead Pollution: An Unsolved Problem.”
- \* All 4’s will read the subsection titled “Third Grade is Critical.”

After reading your assigned section of the article, find the chart paper with your subsection heading written on it and form a group with the other students who also read the same subsection as you.

With your group members, use the markers at your station to write down one idea you read/thing you learned in that section. Try to make sure to cover the most important ideas.

Choose one group member to report out what your group recorded to the rest of the class.

**Remember your group is teaching the information in your section to the rest of the class who did not read the same section as you. [Lead Exposure and Crime Article](#)**

**Exit Ticket-** Write down one thing you learned and one question you have about today’s lesson.

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Graphic Organizer for Student Notes from Jigsaw Charts

“Older Cities Still Have Lead Problem”



Researcher: Lead Poisoning, Crime Are Connected

Lead Pollution: An Unsolved Problem

Third Grade is Critical

Name: \_\_\_\_\_ Date \_\_\_\_\_

**Lesson Three-The Historical Implications of Lead Poisoning**

**Standard:** Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.

**Materials:** Cornell Notes graphic organizer, copies of the article,

**Objective** SWBAT identify key details IOT identify the central ideas of a text IOT compose a summary as well as identify the historical use of lead in Philadelphia and other similar cities in the region.

**WarmUp:** Preview the article and record 5-7 questions in the “Questions” section of your Cornell Notes organizer based on a preview of the text features of the article that you would like to be able to answer after reading the article. [History of Lead Article](#)

**Whole Group Activity:** With your tablemates, read the article.

**Collaborative/Individual Practice:** Answer the questions you posed in the “Questions” section of your Cornell Notes. Compare answers with your elbow partner. Place an asterisk next to any questions for which you could not find answers.

**Closing:** Complete the summary section of your Cornell Notes graphic organizer and place your completed Cornell Notes in your investigation folder.

### Cornell Notes

Name:	
Topic:	
Class Period:	
Date:	
Questions I Have About the What I Will Learn About the History of Lead From This Article: _____ _____	Notes on What I Have Read About Lead in This Article: _____ _____



**Objective** SWBAT to conduct short research projects IOT determine the role/function of the Environmental Protection Agency explain and analyze primary sources that monitor and remediate lead exposure.

**Warm Up: Please obtain a laptop. One table partner will come retrieve the graphic organizers for your group, markers and a piece of chart paper**

**Whole Group Activity: Today we will conduct an inquiry driven investigation. Our goal is to answer the following question:** What is the Environmental Protection Agency?

In order to make appropriate inferences about the role of the EPA with respect to lead and lead safety, your group/table will be assigned a piece of **legislation** to investigate. For this task, you will need to read the legislative summary and create a bulleted list that explains the purpose of the law on the chart paper given. After each group has posted their chart paper, we will conduct a gallery walk. As you move with your group/tablemates from poster to poster, fill in the information reported on the legislation that your classmates have reported on. After completing your organizer, return to your seats. Then using the information you have gathered, write a CER paragraph-response that explains your understanding of the EPA's role with respect to lead.

**Collaborative/Individual Practice:** Read each of the EPA legal summaries and complete a quick-write on what you read. Then group with your classmates who read the same legislative summary and create a poster on the chart paper that summarizes your assigned act. These "acts" will be used later to inform your culminating activity/task.

[Safe Water Drinking Act Summary](#) (SWDA)

[National Environmental Policy Act Summary](#) (NEPA)

[Clean Water Act Summary](#) (CWA)

[Toxic Substances Control Act Summary](#) (TSCA)

[Residential Lead-Based Paint Hazard Reduction Act of 1992 Summary](#)

[Clean Air Act Summary](#) (CAA)

[Resource Conservation and Recovery Act Summary](#) (RCRA)

[Comprehensive Environmental Response, Compensation and Liability Act Summary](#) (CERCLA)

Name \_\_\_\_\_ Date \_\_\_\_\_

Safe Water Drinking Act

The National Environmental Policy Act

Clean Water Act

Toxic Substances Control Act

Residential Lead-Based Paint Hazard Reduction Act

Clean Air Act

Resource Conservation and Recovery Act

Comprehensive Environmental Response, Compensation and Liability Act
My Inference About what the Environmental Protection Agency is:

Name \_\_\_\_\_ Date \_\_\_\_\_

**Lesson Five-Lead's Impact on Philadelphia**

**Standard:** CC.1.2.7.I Analyze how two or more authors present and interpret facts on the same topic. RI.7.9 Analyze how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.

**Materials:** Computers, handouts of the reading from *Lead Wars* (pgs. 63-66), copies of the graphic organizer

**Objective:** SWBAT analyze how two or more authors writing about the same topic shape their presentations of key information in order to determine the extent to which evidence or

interpretation of the facts differ as well identify past and present sources that pose a risk to citizens

**Directions:** Now that we have learned some of the ways that lead impacts our world, we will now focus on how lead has impacted our local region and about what action has been taken to deal with lead in Philadelphia.

**Warm Up:** In the space provided, please respond to the following using your knowledge or your best inferencing skills:

Where do Philadelphians most often encounter lead? Is lead exposure in Philadelphia better or worse than places like Flint, Michigan? Explain your answer.

Where do Philadelphians most often encounter lead?	Is lead exposure in Philadelphia better or worse than places like Flint, Michigan? Explain your answer.

**Reading Choice #1** *Lead Wars: The Politics of Science and the Fate of America's Children* (pages 63-66).

**Reading Choice #2** [Philly Lead Article](#)

**Reading Choice #3** [City of Philadelphia Lead Website](#)

**Reading Choice #4** [Philly Lead Certification Article](#)

**Collaborative/Individual Practice:** For this part of the lesson, select **TWO** of the **FOUR** source options. Then using the information you learned in each selected text, write an explanation of what you learned about the impact of lead on Philadelphia as you understand it.

**Lesson Five Graphic Organizer**

**Name:**

**Date:**

<b>Reading Selection Number One Summary:</b>	<b>Reading Selection Number Two Summary:</b>

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### Reading Analysis

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### LEAD AWARENESS FINAL PROJECT

CC.1.4.7.U Use technology, including the Internet, to produce and publish writing and link

W.7.6 Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.

CC.1.4.7.V Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

CC.1.4.7.W Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

#### **PART ONE**

**Directions:** For your final project, you will use your knowledge of lead toxicity to create your own Lead Awareness Website using Google Sites **OR** a Lead Awareness Poster using Google Slides. Using your class materials from our lessons and additional research, you will work with your group members to design a website that reflects your collective knowledge of lead as a

local, national and international public health threat. In your planning, your group must decide what information to include and how the information posted will be generated. Any graphs, charts, tables or images not created by you must be cited to avoid plagiarism. Please consider the following questions to help you develop topics to be included in your publication. You may also add your own ideas to this list:

- 1) What is lead?
- 2) Where does environmental lead come from?
- 3) Why is lead exposure of any kind dangerous?
- 4) What effects can lead have on people?
- 5) Who are the people most at risk for lead exposure?
- 6) What is lead used for?
- 7) Who regulates lead usage?
- 8) What impact has lead had on our city? Our country? Our world?
- 9) What are the symptoms of lead poisoning?
- 10) What should someone do if they think they have been exposed to lead?
- 11) What should someone do when they know they are or have been exposed to lead?
- 12) What community supports are there to support those who have been exposed to lead or can help monitor lead exposure?
- 13) Where is lead exposure most prominent?

## **PART TWO**

After you have generated your publication, your group will present your website or poster to the class in a presentation that will last 5-10 minutes.

## **PART THREE**

Once your presentations are complete, each group must create a public page or account on the social media platform of their choice. each team is required to post the link to their website or poster to their page. Each team must post something related to lead awareness once per day for the next school week with the goal of having your posts shared, reposted, etc. Each team must track the number of “friends/followers,” shares, likes and comments. (Perhaps the team with the highest statistics will win a prize).

My social media platform choice:
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## **Potential Resources for Additional Research for Your Publication Completion**

[Overbrook Environmental Education Center](#)

[WHO Infographic on Lead Paint Bans](#)

[Dietary Responses to Lead](#)

[West Philly's Water History](#)

[Exemplar for Lead Brochure](#)

[Possible Reading on Urban Green Spaces](#)

**Marine Toxicity**  
**Water Documentary**  
**Flint Water Film**  
**Another Flint Film**  
**Lead in Schools Article**

**Standards**

ELA 1.4 Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.

-CC.1.4.7.A Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information clearly.

-CC.1.4.7.A Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information clearly.

-CC.1.4.7.C Develop and analyze the topic with relevant facts, definitions, concrete details, quotations, or other information and examples; include graphics and multimedia when useful to aiding comprehension. E07.C.1.2.2 E07.E.1.1.2

-CC.1.4.7.K Write with an awareness of the stylistic aspects of composition.

- Use precise language and domain-specific vocabulary to inform about or explain the topic.
- Use sentences of varying lengths and complexities.
- Develop and maintain a consistent voice.
- Establish and maintain a formal style.

-CC.1.4.7.X Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

-CC.1.4.7.U Use technology, including the Internet, to produce and publish writing and link W.7.6 Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.

-CC.1.4.7.V Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

-CC.1.4.7.W Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

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