# Toxic Avengers

***Tools for uncovering the human geography of pollution***

**Authors:** Jenny Lovell, Ph.D. Student, Environmental Studies, UC Santa Cruz.

Dawn Krenz, Science Teacher, Watsonville High School, Watsonville CA

**Field tested with:** 10th Grade, Watsonville High School, Watsonville, CA (Fall, 2014)

**Module Type:** Classroom Inquiry-based Activity

**Duration:** one 30 min preparation lecture, and two 2-hr class session

**Key materials:**

* Computer or device with a web browser (IE®, Google Chrome®, Firefox®, etc.), and Microsoft Word® installed - one for each group

**Concepts:** Demographic data, Environmental Justice, Toxic Cleanup

**Skills:** Designing a testable question, Formulating a hypothesis, Gathering appropriate web-based data, Synthesizing and Presenting an inquiry-based project

**NGSS Practices:** Asking questions, Obtaining, Evaluating and Communicating Information, Argument from evidence

# Overview:

This project is an opportunity for students to learn a basic understanding of Environmental Justice (EJ) and how to use geographic data to visualize issues of social inequality. By the end of the lesson students will learn:

* How to look up public census data
* How to find toxic sites in their neighborhood
* How to formulate a testable question regarding census data and toxic sites
* How to synthesize data and draw conclusions that answer their questions
* The key components of presenting a social science project to an audience

**Navigate:** [Background](#h.30j0zll) [Materials &Time](#h.3znysh7) [Starting Point](#h.2et92p0) [Procedures](#h.tyjcwt) [Standards Supplementalh.3dy6vkm](#h.3dy6vkm)

# Background for Teachers

**Why this matters:** Environmental Justice (EJ) is a great subject to get students engaged about their neighborhoods and health. EJ traces the geographic inequalities of environmental impacts. It is an interdisciplinary type of inquiry, making it relevant to many courses in grades 10 through 12. Students gain a better understanding of how to formulate and answer complex questions, gather data, and present conclusions in an interdisciplinary group setting.

**Assumed background:**

· Income inequality: the industrial revolution (Standard 11.3)

· **Race** and class divisions (Standard 11.11)

· US history up to and including the Civil Rights Movement (Standard 11.10)

**Special context:** Environmental Justice (EJ) is a term used to describe the trend of environmental impacts disproportionately affecting minority communities. The history of the EJ movement in the US includes an empowering story of civil protest and action by minority and female leaders. Although EJ specifically refers to minority groups, the Toxics Movement was closely related and shares the common interest of all people having the right to a clean and healthy environment.

**Scaffolding supplements:**

EJModule.pptx - power point presentation introducing EJ concept and vocabulary

EJActivity.docx - handout for students to follow the in-class activity

EJRubric.docx - evaluation form for the teacher and students to peer-grade their classmates

# Module Description

## Materials:

* Chrome books
* If no internet access, pre-print census and toxic site maps and data for your city or region

## Preparation:

* Print one “Activity” sheet and one “Rubric” sheet for each student
* The EJ Powerpoint will need to be projected, along with the introductory video
* Give each student 3 pieces of small paper (8 ½ x 11 cut in thirds) for question brainstorming

## Timeline:

This module is designed for two, two-hour class periods. The first class is meant to get the students intrigued about the subject, get familiar with the data sources, and formulate testable questions. The second class period is primarily for the groups to complete their research and prepare their presentations.

Class Number 1 provides the scaffolding for the whole module. The Teacher introduces EJ with the topic with a hook (1. Hook, 15 mins), which includes a couple of questions for the students to answer individually and a fun cartoon video. The Teacher then gives a brief presentation to introduce basic vocabulary and some historic background about EJ (2. Key Terms Overview, 10 mins). Finally, the Teacher will introduce the Census Bureau, the Department of Toxic Substance Control (DTSC) (3. Introduce Data Sources, 10 mins). At the completion of the data sources review, the Teacher will transition into Costa’s concept of question complexity (Costa Level Questions, 10 mins). This is meant to give the students a good foundation in how to formulate a testable question. They will then jump into formulating their own questions through an exercise (Question Formulation, 30 mins). After they are done warming up their questioning minds, they will break into groups and start forming their group questions (Groups Question Formulation, 45 mins).

Class Number 2 provides the in-class time for the students to complete their inquiry and present their results to their classmates. First, the Teacher will get the students reoriented to the subject by answering a question about toxics and demographics, then reviewing the Activity sheet (7. Reboot, 15 mins). The students will then have time to formulate their group questions (8. Group Question Formulation, 15 mins). It is crucial that the Teacher checks in with each group to make sure that the question is testable and complex enough. During this time periods, once the groups finish their questions, they need to assign each member a specific role. The students will have a large period of time to work on gathering data, answering their questions, and preparing their presentations (Independent Group Work, 45 mins). Finally, the students will present their projects to the class, followed by a brief self-grading exercise within each group (Group Presentations, 45 mins)

## Starting Point For Inquiry:

Guiding questions for this module include:

* How do demographics tell a story about a place?
* What is the relationship between a neighborhood’s racial makeup, income and toxic waste sites?

At the conclusion of this module, students should understand exactly what environmental justice is. They should be able to identify an example of both environmental justice and injustice to the class. Students will be able to explain what demographics are and what a toxic waste site is.

## Detailed Procedure:

Class Period Number 1

1. Hook (15 mins) At this time, start the powerpoint presentation. The first slide will be:
   1. Do Now: How would your health be different if you grew up in Los Angeles? What about Seattle? Why?
   2. Introduce the Worksheet that the students should be filling in as the lesson progresses.
   3. Show video-Cartoon on Environmental Justice: (<https://www.youtube.com/watch?v=NDF5apIFocg>) **Stop at 8:35**
2. Key Terms Overview (10 mins) (Use EJ Module Powerpoint) The powerpoint slideshow is meant to introduce the students to the topic of environmental justice
3. Introduce Data Sources (10 mins)
   1. Explore the EJView website as a class, populating the map in different ways. The students can work in groups for a few minutes to understand the different possible uses of EJ View.

(<http://epamap14.epa.gov/ejmap/entry.html>)

1. Costa Level Questions (10 mins): come back to power point to discuss Costa’s levels of questions, be sure they understand that that they need to **come up with one level 2 question per group**
2. Question formulation (30 mins)
   1. Read paragraph about toxic movement (see EJNotes.docx)
   2. Write question #1 - level 1
   3. Crumple up and throw across the room to another student
   4. Write question #2 - level 2
   5. Crumple up and throw across the room to another student
   6. Write question #3 - level 3
   7. Crumple up and throw across the room to another student
   8. Teacher summarizes 3 levels of questions, answers student questions, reviews
3. Groups Question Formulation (45 minutes)

Class Period Number 2

1. Reboot (15 mins) The “Reboot” is meant to go with the powerpoint presentation, starting with “Day #2: Toxic Avengers” slide.
   1. “Do Now” question at the beginning of class: “What is a toxic site? What are demographics?”
   2. Review the Activity Worksheet, Rubric they will be using to self-grade, and where they left off in the last class
2. Group Question Formulation (15 mins)
   1. Teacher walks around and make sure the group questions are a) testable and b) that it’s a 3rd level question
   2. Assign roles of group (scribe, presenter, google doc)
3. Independent Group Work (45 mins)
   1. Gather data to answer their questions
   2. Answer questions, write conclusions
   3. Prepare for group presentations (every member must say something)
4. Group Presentations (45 mins)
   1. Each group has 3 minutes to present their projects (assuming 30 student class)
   2. Using the grading rubric, each student will grade their own group
   3. Using the grading rubric, each student will grade their own group
5. Finish Mayah’s Lot video (5 mins)
   1. (<https://www.youtube.com/watch?v=NDF5apIFocg>) **Start at 8:35**
   2. Show Robert Bullard’s quote about environmental justice

## Assessment Methods:

The Checklist is designed as a teacher- and peer-evaluation technique. Not only do the group members grade themselves (only their group), but also the teacher uses the Checklist during the group presentations to ensure all required project parts are complete within each group. All group members receive the same grade for the project.

## Possible pitfalls:

Students may become overwhelmed with the amount of data available. The question formulation step is very important in limiting the amount of confusion and overload inherent in the project, which is why so much time is allotted to this element of the module. Teachers also need to check in often during the group research portion of the activity to make sure the students are staying on track to only answer their question.

The subject is very emotionally loaded, especially regarding issues of race. Teachers may want to end with a positive anecdote about community empowerment. Suggested stories include [Mothers of East Los Angeles](http://web.archive.org/web/20080406123621/http://www.mothersofeastla.com/).

## Glossary:

**Census**: information about the people of the US collected every 10 years by the government

**Gender**: sex (male or female)

**Race**: ethnicity or nationality (caucasian, african american, etc.)

**Education**: how far in school a person went (Education < 12G is less than 12th grade)

**Per Capita Income**: amount of money earned each person earns

**Demographics**: information about populations (per capita income, education, etc.)

**Toxic Waste**: solid, liquid, or vapor that can cause harm to living creatures

**EPA**: Environmental Protection Agency

**Environmental Injustice**: occurs when local governments or companies build environmentally detrimental infrastructure in minority communities

# NGSS Standards Addressed

**Disciplinary Core Ideas**

LS2.A: Interdependent Relationships in Ecosystems

**Science & Engineering Practices**

1. Asking questions (for science) and defining problems (for engineering)

2. Developing and using models

**Cross Cutting Concepts**

1. Cause and effect: Mechanism and explanation

# Guide to supplemental materials

**Lectures**

*Lecture*: The initial lecture (EJModule.pptx) gives students the scaffolding for understanding glossary words, the history of the subject matter, and how the data they will be exposed to is used to answer questions. All images are sourced or referenced in the EJModule.pptx file. If there is no source or reference for an image then it was created by the authors Jenny Lovell or Dawn Krenz.

**Labs (or Activities)**

*Activity:* The Activity is the worksheet given to each student to follow along as they complete the activity (EJActivity.docx).

**Videos**

**Mayah’s Lot Environmental Justice Comic Cartoon**

**http://cuer.law.cuny.edu/?page\_id=1272**

**Assessment Materials**

*Checklist*: The Rubric is used by all students to peer grade their fellow classmates’ work (EJChecklist.docx). **Note: the checklist is handed out at the same time as the Activity sheet so that the students are aware of all expectations throughout the research process.**