

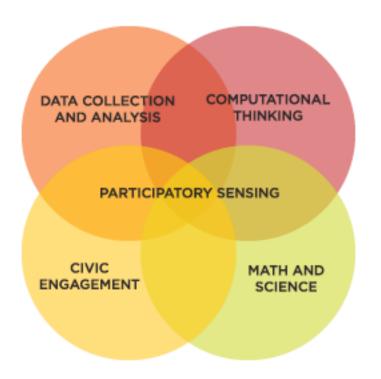
Office of Curriculum, Instruction, and School Support





Mobilizing for Innovative Mathematics/Science Teaching and Learning A Partnership between LAUSD and UCLA

MOBILIZE 2014-2015 Science Curriculum









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Welcome to Mobilize

Mobilize is an innovative partnership between UCLA and LAUSD that is funded by the National Science Foundation to develop barrier-breaking curriculum in science, mathematics, and computer science to teach students to think creatively, constructively, and critically about the role of data in science and in every-day life. Mobilize centers its curricula around participatory sensing campaigns, in which students use their mobile devices to collect and share data about their community and their lives, and analyze these data to gain a greater understanding about their world.

Mobilize breaks barriers by teaching students to apply concepts and practices from computer science and statistics in order to learn science and mathematics. Mobilize is dynamic: each class will collect its own data, and each class will have the opportunity to make unique discoveries. We use mobile devices not as gimmicks to capture students' attention, but as legitimate tools that bring scientific enquiry into our every-day lives.

In addition to addressing particular science education standards, Mobilize will lead students to:

- understand how data are used by professionals to address real-world problems;
- understand that data are used in all facets of modern life;
- understand how data support science to identify and tackle real-world problems in our communities;
- analyze statistical graphics to identify patterns in data and to connect these patterns back to the real world;
- understand that by treating photos, words, numbers, and sounds as data, we can gain insight into the real world.
- learn to analyze data, including: posing questions that can be answered by considering relations among variables in a dataset, using collected data to generate hypotheses for future data collection, critically evaluating shortcomings and strengths in the data and the data collection process, and informally evaluating hypotheses using data at hand







Unit Overview

Standards:

ESS3.C: Human Impacts on Earth Systems

The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.

Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.

Science Learning Objectives:

Students will learn what trash, recyclable, compostable and upcycled items are. Through laboratory investigations and data collection of their habits, students will quantify the amount of trash they generate on a daily basis, explore their disposal habits, consider the ramification of the products they consume, and develop a plan to reduce the impact their trash has upon the environment. Students will be able to identify that the rate of trash generation in our country far exceeds the rate at which nature can biodegrade. Students will learn that the manner in which we handle our trash potentially affects biodiversity and the environment that supports it.

Mobilize Learning Objectives:

Students will understand that data, especially those collected through **Participatory Sensing**, can be used to understand daily habits and real-world processes. Personal data can be compared to national or local practices to (what would be the goal for this...to understand how individual patterns relate to national, local trends?). Students will learn to be critical about what data show as well as what they do not show. They will be able to identify patterns in data so that they may be able to evaluate the use of data as evidence in claims. They will know how to interpret statistical graphs to gain understanding about real-life processes. They will know how to formulate questions and hypotheses that can be addressed by the data at hand.

Technology Requirements:

- Computer
- LCD projector
- Speakers
- Internet
- Class time in computer lab/cart (2 -3 days)
- Smartphones or mobile devices i.e. tablets, iPod touch

Time Requirements:

Approximately 9 90-Minute Periods

Background and Prerequisites:

This Mobilize unit is designed to empower students to consider the impact of human activity on the environment. Students will have the opportunity to connect many ideas from the Biology course in a meaningful way. Students are introduced to the concept of civil engagement through the use of **Participatory Sensing** via the Mobilize APP. Students begin the process considering the impact of Big







Unit Overview

Science Curriculum

Data on their lives and how we can use technology to tackle difficult problems. Upon completion of the unit introduction, students will predict the amount of trash they generate on a daily basis. Using the Mobilize APP, students will have the opportunity to gather data about their trash generation, identify their consumption habits, compare their personal data to the class, read about various ecological impacts trash has upon their community and the ecosystem, explore national waste data and create research questions regarding trash. Armed with data collected at the school site, students will seek solutions to an environmental problem they have identified regarding waste.

To maximize the efficacy of this unit, students should have been taught the following topics prior to starting the unit:

- a. Photosynthesis: Plants absorb carbon from the air and via photosynthesis incorporate it into plant materials that are also usable to other consumers.
- b. Food Web and Energy Pyramid: Energy moves through the ecosystem through feeding relationships. Much energy is lost as it moves through the trophic levels. A healthy ecosystem depends upon decomposers that constantly cycle matter through the ecosystem. Producers are necessary in converting light energy into chemical energy and are the food source for most other consumers in the food web.
- c. Carbon Cycle: Carbon moves through the ecosystem in many different ways. The carbon cycle is composed of both natural processes such as volcanic eruptions and photosynthesis as well as human processes such as burning of fossil fuels.

If your students have not covered the topics above, some support materials have been provided in the reference section.

Cooperative Grouping and Teamwork:

This unit will require students to work in small teams in many portions of the unit. There are many forms of cooperative grouping used in the classroom. The particular type may vary as long as students have assigned roles and are accustomed to the requirement of individual and shared tasks. Examples of opportunities to use cooperative grouping are interspersed throughout the unit. Should this type of grouping be new to your classroom, please refer to the reference section for support materials.







Lesson Flow Diagram

Lesson One: 1 day What is trash?

Objective: Students reflect on trash and are introduced to the unit question: "How is my trash a societal concern?"

Enduring Understanding:

There are many differing opinions and perceptions about trash consumption. We must look at large data sets to understand the reality of the trash problem.

↑ □

Lesson Two: 1 day Do I think trash is a problem?

Objective: Students upload and use the Mobilize Trash Campaign to collect data about their personal trash consumption.

Enduring Understanding: Students develop a common understanding of trash and how it might be classified. Students will also learn how participatory sensing technology can be used to collect reliable data to address: "Is my trash a societal concern?" ■ 署

Lesson Three: 1 day What do Humans do with waste?

Objectives: Students create a model sanitary landfill in order to understand the decomposition process.

Enduring Understandings: After two-weeks of data collection, students understand that sanitary landfills slow down the rate of decomposition for all items, even those that readily biodegrade.



Lesson Six: 1 day What does my trash data say?

Objectives: Students use the trash dashboard to analyze personal and class data. Students identify personal habits, develop research questions and explore evidence that supports the claim that trash is a societal concern.

Enduring Understanding: By examining, I can quantify **my** impact on the environment.

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Lesson Five: 1 day What is Big Data?

Objectives: Students consider what data is, sources of data, and ways to analyze data.

Enduring Understandings:

People generate large amounts of data everyday. Analyzing data can contribute to the decision-making process. Technology has changed the ways we can collect and analyze data.

Lesson Four: 1 day What do Humans do with waste?

Objectives: Students review the carbon cycle and brainstorm environmental problems facing society. Students explore the idea of "good data" and choose a category of trash to focus on.

Enduring Understandings:

Trash is directly connected to the carbon cycle. Reliable data is required to answer the unit question.

Legend

 $\Re = \text{Cell phone/mobile device} \quad \blacksquare = \text{discussion} \quad \blacksquare = \text{tech/computer use}$

↑ = data collection/analysis = reading







Lesson Flow Diagram

Lesson Seven: 1 day What do news sources say about trash?

Objectives: Students read multiple articles about trash in order to identify additional evidence for: "How is my trash a societal concern?"

Enduring Understanding: Upon analyzing the trash data and then reading articles, students will understand the cumulative effect of trash; we all contribute to the problem and must work together toward a solution. 🖳 🕇 🖊

Lesson Eight Part One: 2 days Is my trash a societal concern?

Objectives: Students create an action plan to reduce the societal concern of trash.

Enduring Understanding: Students take ownership of the effect their choice has on the environment and develop tools to reduce that impact.

Lesson Eight Part Two: 2 days Is my trash a societal concern?

Objectives: Students share their actions plans with their classmates.

Enduring Understanding: Students provide evidence through research and personal data to answer: "How is my trash a societal concern?" ■







Lesson 1: What Do I think About Trash?

Time: 1 90-minute period

Lesson Overview

Students view photographs of various types of trash and the context in which it was generated and then record their observations or thoughts. Next, students will work collaboratively to guess how much trash each student creates in a day. Teams create a class visualization of these guesses and consider how they could collect actual data instead of their guesses. The unit question: "Is my trash a societal concern?" is introduced as the area of focus for the entire unit. Students are introduced to the idea that to answer questions such as our unit question, we must have a way to collect reliable data. Guessing the items of trash we create, merely allows us to form an opinion, not a claim, as it is not centered based on data. (Science Practice: Analyzing Data and Creating Explanations)

NGSS Standards:

ESS3D: Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

Mobilize Goals:

- understand how data supports science to identify and tackle real-world problems in our communities;
- analyze statistical graphics to identify patterns in data and to connect these patterns back to the real world:

Enduring Understanding

There are many differing opinions and perceptions about trash and our consumption habits that generate it. We can better understand our consumption through collecting and analyzing data. We must look at large data sets to understand the totality of the trash problem.

Language Objective

1. <u>CSS.ELA-Literacy.CCRA.SL.1</u> Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Materials:

- Computer with Biology Trash PowerPoint
- LCD Projector
- Post Its
- Poster Paper
- Markers







Lesson 1: What Do I think About Trash?

Performance Task/Essential Question

"What Do I think about trash?". Through photographs, group discussions, exploring estimates, and graphic visualizations, students explore their current perceptions of trash.

Vocabulary (in context of this lesson)

- Values-a numeric amount that may be mathematically manipulated or visually represented.
- Guess-a value chosen by an individual that may or may not be based on logic
- Estimate-a guess based on logical rationale or prior experience
- Data-information gathered through observation or measurement
- Quantitative-providing numeric values rather than descriptors
- Graph- a type of visualization that typically displays data. In this lesson students graph their estimates







Lesson 1: What Do I think About Trash?

Lesson 1— One Day			
Teacher/Student Activities	Time / Notes		
Engagement:	Time Suggestion:		
1. Inform the students that an important skill or trait that future employers are looking for is the ability to contribute to a team to complete a task. To build this skill, students will work collaboratively in teams of four to five. Within this team, each person will have an assigned role and jobs to help the team complete their tasks during key experiments and their final project. a. Remind the class of the different roles in their group. Possible cooperative group roles include: (see student job description) i. Team Manager ii. Procedure Specialist	15 minutes Total Cooperative group work		
 iii. Supply Master iv. Recycling Engineer 2. 4 Square Brainstorm: □Using the Mobilize Biology Trash PowerPoint, guide the students to complete the 4 square trash introduction. Instruct the Supply Masters to retrieve the materials from your designated location. Circulate around the room while the teams are completing the poster. Make sure that the entire team is contributing and that the assigned role is simply recording for the group. After two to three minutes, progress to the next slide to help teams generate more ideas. a. Purpose: The Powerpoint presentation in this lesson provides students an opportunity to view photographs of trash and explore their initial opinions and ideas they have surrounding the unit question. Images range from open landfills to photographs of trash washed upon the shore. b. The following members are responsible for recording the ideas of the group in the appropriate box. i. Team Manager-Box 4 What are Challenges related to trash? ii. Procedure Specialist-Box 3 What are benefits of trash? iii. Supply Master-Box 2 What questions do you have about trash? iv. Recycling Engineer-Box 1 What do you know about trash? 			
 3. Project PowerPoint images of trash/landfill. For each slide, students will write down in their science notebooks one observation or opinion for each image in complete sentences. This is individual task. a. ELD connection: Give the students possible sentence starters to guide their thinking: i. This image is related to ii. This photo is not related to me because iii. I believe iv. I observe 			
 ₹ Team Brainstorm: Round Robin: 4. Proceed to the slide with the team Brainstorm topic, "Trash, is it something to worry about?" Working in student groups, review the following rules, checking for understanding by asking a student from each team to repeat and explain their understanding of the rule or the implication for their team. 	Time Suggestion: 15 minutes		







Lesson 1: What Do I think About Trash?

B HOMEWORK:

In your science journals:

- 1. **Recall:** How did your team develop their estimate for the amount of trash generated in one day?
- 2. **Explain:** Explain whether you think a guess is different than a prediction.
- 3. **Opinion:** Why do you think that the amount of garbage per person has increased dramatically over the last 40 years?
- 4. **Wonder**: How could we use technology to collect better data regarding the amount of garbage we each produce?

Remind students to bring their phones tomorrow!







Lesson 2: Do I Think Trash Is A Problem?

Time: 1 90-minute period

Lesson Overview

Students will explore the different terms used to describe trash and form a common understanding of trash, recyclable, and compostable. They will observe the amount of trash collected by the teacher in one day and then consider different methods to collect data of their own trash. Using sample garbage from the teacher, students will upload and use the Mobilize Trash Campaign to collect data about their personal trash consumption. They will learn that they can use mobile technology to collect data and explore their personal habits. We will use the data to explore our unit question, "Is my trash a societal concern?"

NGSS Standards:

ESS3D: Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

Mobilize Goals:

- understand that data are used in all facets of modern life:
- understand how data support science to identify and tackle real-world problems in our communities;
- critically evaluate shortcomings and strengths in the data and the data collection process

Enduring Understanding

Students develop a common understanding of trash and how it might be classified. Students will also learn how participatory sensing technology can be used to collect reliable data.

Language Objective

<u>CCSS.ELA-Literacy.RST.9-10.7</u> Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

<u>CCSS.ELA-Literacy.SL.9-10.1c</u> Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

CCSS.ELA-Literacy.SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task







Lesson 2: Do I Think Trash Is A Problem?

- 1. Students will listen to the opinions and positions of their peers to evaluate and or refine their own thinking.
- 2. In writing, students will defend their opinions by providing their rationale.
- 3. Students will present their observations and opinions in a team and class discussion.

Materials:

- Computer with Biology Trash PowerPoint
- LCD Projector
- Post Its
- Poster Paper
- Markers
- Mobile Device
- Mobilize APP
- CENS Participatory Sensing Video
- Teacher's trash collected for one day
- Handout 1: Tracking Trash Data Chart.
- **Handout 2:** Mobilize App Instruction Sheet

Performance Task/Essential Question

"What is Trash?" Through photographs, group discussions, exploring estimates, and graphic visualizations, students explore their current perceptions of trash.

Vocabulary (in context of this lesson)

- Survey
- · Participatory Sensing
- Trash/garbage/waste
- Recycle/Recyclable
- · Compost/Compostable
- Campaign







Lesson 2: Do I Think Trash Is A Problem?

	Teacher/Student Activities	Time / Notes
<u>Warm</u> 1.	We left off considering what types of data we could collect to understand the questions we have had about trash. ?" How might we use data to help us answer this question? "What is the impact of trash on our society and environment?" Individual Journaling a. Remember that data is considered plural, hence the use of "are".	7 minutes
	Allow the team manager at each station to share out their team's predictions for the amount of garbage generated by each team Transition students back to trash and methods of colleting data rather than just guessing, by showing them a bag of garbage that you collected the previous day (Note: teacher, collect all your garbage within a 24 hour period.) a. Revisit the previous days activity by reminding the students of their graph they made with their team trash guesses. Reveal the amount of individual pieces of garbage you, the teacher, generated in 24 hours. Weigh the total trash and reveal the weight. b. Poll the class with a thumbs up/down, "How many are surprised by the amount of garbage I created?" c. Ask the class: i. Look at the variation in guesses made by your teams in terms of the amount of trash, why do you think there is so much variation in the team's responses? ii. We want students to consider whether in reality each person creates vast different amount of trash and how the methods they used to develop their guess impacts the values they came up with. iii. How could we get collect accurate data for the entire class? d. Ask the students to consider the following question and respond in their notebooks,	Time Suggestion:
4.	 i. "What factors may influence the amount of trash a person generates in one day?" In other words, is the number of trash items shown by the teacher a "fair" representation of his or her daily trash? We want students to think about the variability in the data they collect and potential reasons for this variation. e. If we want to compare the amount of trash each person is creating, then we all need to use the same methods of collecting data. This will allow us to determine that the variation in trash data is more likely due to the individual's habits. At this point, we have not defined what garbage is. For the class to collect "good" data, we need to have the same understanding of the terms that we are using. Point out to the class some of the different terms you have heard students use to refer to the garbage. a. Say: "During the course of this unit we will use garbage, trash, solid 	
	b. Ask: Hold up a recyclable item such as a bottle or can in the air, "Is Allow the team manager at each station to share out their team's predictions for the amount of garbage generated by each team Transition students back to trash and methods of colleting data rather than just guessing, by showing them a bag of garbage that you collected the previous day	Time Suggestion:







Lesson 2: Do I Think Trash Is A Problem?

B HOMEWORK:

For homework, students will document the trash they generate beginning after school today until they go to sleep Sunday. This will provide 4 days of data collection, 2 school days and 2 non school days. Be sure to remind students to consistently upload and share their data.

Students should create a concept map in their notebook showing the relationship between the concepts covered today. To start this concept map, students should dedicate two pages in their notebook. Remind students that concepts maps show the relationships between two or more ideas in a visual manner. Example can be found in appendix.

- Trash
- Compost
- Recycle
- Data

Possible connecting terms may include: participatory sensing, society, measure, technology etc.

Reminder:
The students
need to
collect data
for four days.
So this lesson
needs to be
assigned on a
Wednesday
or Friday.







Lesson 3: What Do Humans Do With Trash?

Time: 1 90-minute period

Lesson Overview

Students create a model of a sanitary landfill in order to understand the ways in which our approach to deal with waste impacts the natural decomposition process. The amount of waste we create and the inability for it to biodegrade in the human life span is an example of the imbalance often present within our societies. Mismanagement or accidents involving our waste disposal may lead to pollution. Students will brainstorm the types of ways trash may be a societal concern in small groups and then use an example of the trash dashboard to formulate some of the questions they are interested in exploring.

NGSS Standards:

LS4D: Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

ESS3D: Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

Mobilize Goals

- understand that by treating photos, words, numbers, and sounds as data, we can gain insight into the real world.
- learn to analyze data, including: posing questions that can be answered by considering relations among variables in a dataset, using collected data to generate hypotheses for future data collection, critically evaluating shortcomings and strengths in the data and the data collection process, and informally evaluating hypotheses using data at hand.

Enduring Understanding

After two-weeks of observing their individual models, students understand that sanitary landfills slow down the rate of decomposition for all items, even those that readily biodegrade.







Lesson 3: What Do Humans Do With Trash?

Language Objective

<u>CCSS.ELA-Literacy.RST.9-10.7</u> Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

<u>CCSS.ELA-Literacy.SL.9-10.1c</u> Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

Materials:

- Computer with Biology Trash PowerPoint
- LCD Projector
- Sanitary Landfill Supplies: See materials list for experiment
- Student Handout 1: Sanitary Landfill Activity and Student Handout
- Student Handout 2: Team Copies 16 Circle Challenge

Performance Task/Essential Question

"What is Trash?" Through photographs, group discussions, exploring estimates, and graphic visualizations, students explore their current perceptions of trash.

Vocabulary (in context of this lesson)

- Sanitary Landfill
- · Biodegrade/biodegradation
- Visualization
- Autotrophs*
- Heterotrophs*
- Decomposers*







Lesson 3: What Do Humans Do With Trash?

		Times / Natas
Warm	lla:	Time / Notes
1.	Showing students a photograph of a sanitary landfill, ask the students what ultimately happens to the paper they wrote their homework on it was thrown away and sent to a landfill? a. Be as descriptive as possible and you may choose to use pictures to help explain your thinking, Ask the students to silently complete a read-around with their table. Students will switch notebook with a partner at their table. They will quietly read their Warm Up response and then write down in their notebook: a. I agree with because b. I disagree with because	Time: 7 minutes
Loca	on Engagement:	
	on Engagement: Poll the class with a "thumbs up-thumbs down", how many students predicted that their paper homework would break down over time and disintegrate or disappear?	
2.	Ask several students to share why they think the paper would break down over time.	Note: Students will
3.	Remind students that the key players in the Food Web and Carbon Cycle are autotrophs (organisms that generate their own food energy through photo or chemosynthesis and the decomposers). Decomposers release the minerals such as nitrogen, back to the soilthe amount of time it takes something to break down depends upon many variables such as temperature, biodiversity of microbes in the soil, and oxygen content.	need to understand the role of decomposers in an ecosystem prior to this
4.	Show the students the Garbage Video to review the ecological benefits of decomposers: http://www.teachersdomain.org/asset/tdc02_vid_decompose/	lesson. If they have not learned about
Less	on Exploration:	energy transfer in the food web and
5.	Introduce the term biodegradation to the students. Biodegradation is the rate at which an item breaks down or biodegrades. Today, you will create a model of a landfill to determine the rate at which common materials such as paper and food biodegrade or if they biodegrade at all. a. During this portion of the lesson, teams will create two models of a landfill, an open pit and a sanitary landfill. The students will use materials provided to document the rate of decay of common items such as paper or fruit. By constructing the model and carrying out observations over time, students should see that common items do not biodegrade easily in a sanitary landfill. This is in stark contrast to composting in which all the necessary ingredients for optimal decomposition of certain materials are provided.	the carbon cycle then that should be done prior to this lesson. See example.
	b. Pass out the student directions for the constructing a sanitary landfill and	
	on Engagement: Poll the class with a "thumbs up-thumbs down", how many students predicted that their paper homework would break down over time and disintegrate or	

1. Poll the class with a "thumbs up-thumbs down", how many students predicted that their paper homework would break down over time and disintegrate or







Lesson 3: What Do Humans Do With Trash?

B HOMEWORK:

For homework, students will continue documenting the trash they generate beginning after school today until they go to sleep Sunday. If students are not using mobile devices to track their trash, then they should manually input their trash data using the WebFront End for their homework.

Add the following terms to your concept map:

- Sanitary Landfill
- Biodegrade/biodegradation
- Visualization
- Autotrophs
- Heterotrophs
- Decomposers







Lesson 4: What Does Nature Do With Trash?

Time: 1 90-minute period

Lesson Overview

Students review the carbon cycle through playing a game in groups. This game allows students to revisit the components of the carbon cycle and consider the elements of the cycle that are unique to human activity. The raw materials, energy required creating and shipping products, and eventual process of disposal all connect back to the carbon cycle. Next, student groups will access their prior knowledge and brainstorm environmental problems they believe exist in our world today. Referring back to the unit question, students reflect upon the sources through which they learned about these environmental problems. Rather than relying upon data or analysis presented externally, students are empowered to collect their own data and explore their personal impact upon the environment. Through a whole group activity, the teacher will mediate and exploration of the idea of "good data"—what does that look like and how can we be more critical about data that we look at. Lastly, students will choose a category of trash (landfill, recyclable, compostable) to focus on.

NGSS Standards:

LS4D: Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

ESS3D: Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

Mobilize Goals

• critically evaluating shortcomings and strengths in the data and the data collection process

Enduring Understanding

All products and foods come from resources harvested from our planet. There are natural cycles that typically balance inputs and outputs. The rate of which humans consume goods is greater than most cycles can balance, trash is a prime example. Reliable data is required to answer the unit question.







Lesson 4: What Does Nature Do With Trash?

Language Objective

- 2. CCSS.ELA-Literacy.RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem
- 3. CSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- 4. <u>CCSS.ELA-Literacy.CCRA.SL.4</u> Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Materials:

- · Computer with Biology Trash PowerPoint
- LCD Projector
- Student Handout 1 (Class set) Carbon Cycle Game Exploration
- White board or poster paper
- Can of Pepsi/Coke or photographs

Performance Task/Essential Question

What does nature do with waste?

Vocabulary (in context of this lesson)

- Food Web
- Decomposers
- Autotrophs
- Heterotrophs
- Data







Lesson 4: What Does Nature Do With Trash? Time / Notes Warm Up: Read the Monty Python lyrics from Decomposing Composers projected. Draw a picture Time: 7 to describe how decomposers help the environment. Be sure to use labels/descriptions minutes and arrows in your diagram. Beethoven's gone, but his music lives on And Mozart don't go shopping no more You'll never meet Liszt or Brahms again And Elgar doesn't answer the door · Schubert and Chopin used to chuckle and laugh Whilst composing a long symphony But one hundred and fifty years later There's very little of them left to see They're decomposing composers There's nothing much anyone can do You can still hear Beethoven But Beethoven cannot hear you Connect to student's prior knowledge by reviewing the food web and the role of decomposers in breaking down matter and returning it to the ecosystem. Key discussion points to reinforce include: a. Decomposers are our natural recyclers. b. Energy from the sun is captured through photosynthesis and stored within the plants. c. Autotrophs and heterotrophs which including decomposers are all interconnected within the food web. Note: **Lesson Exploration:** Students will 1. **Carbon Cycle Game Exploration:** will allow students to rotate the classroom need to visiting different stations that represent various components of the Carbon cycle. understand Students will first have the opportunity to explore different elements of the carbon the role of cycle through a game that introduces students to different components of the cycle decomposers in a meaningful way. Depending upon your students familiarity with the Carbon in an Cycle, you may choose to have students complete the following reflection questions ecosystem or use the review video found at the following hyperlink (also embedded in prior to this powerpoint) http://education-portal.com/academy/lesson/cycles-of-matter-thelesson. If they nitrogen-cycle-and-the-carbon-cycle.html#lesson. have not a. What happens to carbon atoms as a result of respiration? learned about b. What happens to carbon atoms as a result of decomposition? energy c. What happens to carbon atoms as a result of combustion? transfer in the d. Much of the food eaten by each organism is metabolized (broken down) in food web then cell respiration. Why is this so? What does the organism need and get out of that should be this process and how does it get it? Hint: Food Web and Energy Pyramid done prior to In the course of the carbon cycle, are carbon atoms themselves ever created? this lesson. Ever destroyed? Ever changed into other kinds of atoms? Ever changed into other compounds? Explain. 2. Selecting Logo Partners: Throughout this unit, students will be working in **Lesson Exploration:** Note:

1. Carbon Cycle Game Exploration: will allow students to rotate the classroom visiting different stations that represent various components of the Carbon cycle. Students will first have the opportunity to explore different elements of the carbon

Students will need to understand







Lesson 4: What Does Nature Do With Trash?

BHOMEWORK:

For homework, students will continue documenting the trash they generate. Remind students to upload and share their data at the end of the day.

Reflect: Think about the Mobilize App and the photos you have been taking. How has this data collection process affected what, when, or how you throw something away? Add your thinking to your concept map.







Lesson 5: What is Big Data?

Time: 1 90-minute period

Lesson Overview

This inquiry lesson will engage students' thinking about Big Data and how it affects their lives. Students will become aware that Data are everywhere, and in this age of technology, they must become users of data and not just generators of data. They will become aware of the large amounts of data they generate through social media, how it is monitored and analyzed, and therefore their role in generating data responsibly.

This lesson will set the stage for computational thinking, the conceptual underpinnings of computer science, as well as many modern scientific and mathematical disciplines. What is data and how the use of data in today's society affects us is foundational to this unit. Having students think of how and why marketing companies use data to affect teens will be a catalyst to have student think about how they can use data and computers to analyze data in their own lives to engage students in problem solving using computational and statistical thinking.

Enduring Understanding

Upon completing this one-day lesson, students will have the long-term understanding about the amount of data they generate in this age of technology, and become more aware of the number of ways data is being collected, with their approval, but also some ways in which data is used.

Students will have the lasting understanding of modes of data collection, data usage, and data Visualization. Discussions around these topics will help students become more aware of their role in creating data as well as the implications for future jobs.

Language Objective

- 1. Students will use complex sentences to construct a summary statement about their understanding of data, how it is collected and how it is used.
- 2. Students will present their summary statements and engage in a class discussion stating their position in reference to those presented by their peers.
- 3. Students will use complex sentences to write two paragraphs addressing the overarching question for the lesson: **How can data affect my life now and in the future?**

Additional Materials:

A chart-size copy of the Four-Fold organizer

Lesson Power Point: Lesson 5_Big Data in Our Lives.pptx

PBS Video: Hunting for Cool

Student Handout 1 The Data Four-Fold organizer

Student Handout 2 Video Notes Organizer

Performance Task/Essential Question

Based on evidence presented from several social networks and industry data sources, students make a claim in response to the prompt:

How can data affect my life now and in the future?







Lesson 5: What is Big Data?

Claims will be supported by three pieces of evidence selected from the presented sources. Students are required to generate a summary statement based on this evidence.

This question is asked initially to collect students' prior knowledge regarding data and again at the end of the lesson to assess learning. The guiding question for the lesson is: How and Why is data collected on you and your family? Discussions around this topic will help students become more aware of their role in creating data, as well as the implications for their future.

□ Vocabulary

Students may need frontloading of the following terms:

- · Big Data
- · Target audience

Focus group







Lesson 5: What is Big Data?

Lesson 5 – One Day	
Teacher/Student Activities	Time / Notes
Working collaboratively, students will engage in a brainstorming activity that will provide foundational ideas and understandings that will be used to construct arguments about how data is collected and used. Students will complete Student Handout 1, the Four-Fold organizer, as a tool to sort ideas for discussion on four prompts: (Slide 2) • What is data? • How is it used? • Where does it come from? • How can data affect my life now and in the future?	Time Suggestion: 28-30 minutes Total The Four-Fold organizer is a modification of the Frayer Model, which is a vocabulary development tool. In contrast with providing a straight definition, the model
1. Pass out the Four-Fold organizer as you explain the brainstorm activity to the students. The questions should not be pre-printed on the organizer. Have students write them in as they appear on the screen, which will allow them ample time to think on each idea before moving to the next idea. This organizer will be collected to assess the level of student knowledge prior to the lesson and again after the lesson. (Accept all answers with clarification)	helps to develop a better understanding of complex concepts by having students identify not just what something is, but where it comes from, or how it is used. The center of the
The Round Robin approach below for sharing answers in this activity ensures that every student will have a chance to respond with assistance from the team and is thus held accountable for contributing.	diagram shows the concept being identified, while the quadrants around the concept are used for providing other details.
IDEA BRAINSTORM: Round Robin (Slide 3 & 4): Divide students into groups of three or four. Review the Team Rules: 1 Have each team number off from 1 to 4	Time Suggestion: Individual Brainstorm Rules & Poibts - 3 mins to review & Check for understanding
 Have each team number off from 1 to 4. Tell students they will be given a topic to brainstorm. Students will first write down their ideas individually for 2-3 minutes, without talking or discussing ideas yet. Next students will put their ideas together as a team. They will have 5 minutes to develop a team strategy for providing answers. 	Guidelines, which are set for classroom discussion, generate an equitable environment for students to share ideas. They
 4. Tell students that each team will be called on for one idea and then the next team will be called on or a different idea. 5. All member #1s will provide the answer to the first question in round one. All member #2s will give the answer to the second question, in round two, and so on. Strategize to ensure that no one on your team will run out of ideas to share. 	ensure that all students are included in the discussion. Setting clear student expectations is critical in building an environment in which students can explore and discuss ideas, build arguments, and critique
IDEA BRAINSTORM: Round Robin (Slide 3 & 4): Divide students into groups of three or four. Review the Team Rules:	Time Suggestion: Individual Brainstorm Rules & Poibts - 3 mins to review & Check for 14-2-2014
1 Have each team number off from 1 to 4 27	understanding







Lesson 5: What is Big Data?

Teacher/Student Activities

5. Explain the Team Points:

- a) Teams will gain a point for each idea shared.
- b) Repeating an idea already given by a previous team will cause you to lose a point, so <u>LISTEN</u> carefully.
- c) 'Pass' if your team member has no ideas. No points will be gained or loss.
- d) Wait time for each idea is 5 seconds. (Count down "5-4-3-2-1".)

Check for understanding by asking a student from each team to repeat and explain their understanding of the rule or the implications for their team.

Note: Points are an excellent management tool. It ensures teams are listening to all of the answers, so they won't repeat an answer. It also prevents

listening to all of the answers, so they won't repeat an answer. It also prevents students from **shouting out answers**, which would **also results in the loss of a point**. In that each answer must be given within 5 seconds, teams stay on task.

Begin with **Individual Journaling:** (Slide 5) It is critical for students to first develop their own ideas and therefore have the ability to contribute ideas and strategies to the team as a whole.

Each question appears one by one on the slide.

- 1. Reveal Question 1 and have students write the question in the top left quadrant. Allow students a couple of minutes to generate ideas just on question 1.
- 2. Reveal question 2, which should be written in the top right quadrant, allowing a couple of minutes of think time.
- 3. Reveal question 3 in the same manner.
- 4. Prior to answering question 4, have teams strategize and share answers for 1-3 via Round Robin.

Note: Students' ideas about "data" may be narrow, focusing on T-charts and graphs generated in class. By engaging students in this brainstorming activity we will determine their current knowledge level, any misconceptions, and how to build on their current foundation. Some students may have a broader sense of data connected to technology, which will expand the level of others during the sharing process.

Using the Round Robin rules:

- 1. Call on every team for an answer to question 1, starting with team1, member 1. Member 1 will answer for each team. Record each answer in the top left quadrant of a chart size copy of the Four-Fold. Clarify answers as needed, trying not to reject any answers if possible.
- 2. Continue with **Round 2**, collecting an answer for question 2, from member 2 of every team. Wait only 5 seconds for each answer, and continue recording answers on a chart size copy of the Four-Fold.
- 3. After each round and all teams have answered, record a point per team for every answer. Make note of points that were lost or teams that passed.

Time / Notes Check for understanding:

- hat's an important point in the rules?
- an you add to this?
- ill you loose points for a pass?
- an you add to what was said?"

Time Suggestion:

Brainstorm- 6 min (2 min each question)

Note: Do not provide ideas for students. Critical thinking must be fostered. Students will build on their ideas or gain new insights from team members during the team strategy time.

Sharing – 9 minutes (3 min each quad)

5. Explain the Team Points:

- a) Teams will gain a point for each idea shared.
- b) Repeating an idea already given by a previous team will cause you to lose a point, so LISTEN carefully.
- c) 'Pass' if your team member has no ideas. No points will be gained or loss.

Check for understanding:

- hat's an important point in the rules?
- Revised 4-2-2014







Lesson 5: What is Big Data?

EXPLORATION: Now we will look at a real life example of how data is collected from teens and how it is used. This should add to students' ideas about data and how it affects their lives.

■ Video Introduction: It is a Frontline Documentary (slide 7)

- 1. As you discuss the background of the video give students **Handout 2: Video Notes Organizer** (slide 8) to take notes while watching the Video.
- **2. Background:** Hunting for Cool is a Frontline documentary on 'coolhunting'. Coolhunting is a term coined in the early 1990s by marketing professionals whose job was to observe teens and predict changes of new or existing social trends.
- 3. Have students explore the idea of "cool" in preparation for the video.
 - * If someone asked you "What is cool today?" what would you say?
 - * Who defines "Cool?" Is it teens or is it what is advertised?
- * What influences you to follow trends? Why is this important to stores? Take a few answers to prepare students for what they will see.

Video Notes Questions:

- **1. What data is collected or presented?** In this video you will hear a large amount of facts or data about teens. Capture it in quadrant 1.
- 2. How is the data being collected? You will see coolhunters collecting data about teens. Write what it is in quadrant 1 and in quadrant 2 write how they are collecting data.
- **3. How is the data being used?** What data do marketers want and how will they use that data? Capture this information as you can in quadrant 3.
- 4. How can data affect my life now and in the future?

Challenge Students to take as many notes as possible.

"Let's see which team will 'collect' the most correct data?"

EXPLORATION/ EXPLANATION:

■ Video: Hunting for Cool (Slide 9)

- **1. Start Video:** The video presents data on just how large the teen market is and how much money teens and their parents spend each year.
- 2. Use teachers' notes on data from the video in handouts:

 After the video, discuss Questions 1-3. Ask students what they could add to the question "What is Data?" Make a new chart for video information.

Revisit the essential question: **How does this data affect me now and in the future?** In your adult life, i.e. jobs?

Give students 1-2 minutes to fill in the last quadrant with the answer to the essential question.

3. **Collect the Data Four-folds and video notes**. Compare students' answers to the essential question before and after the video.

B HOMEWORK:

Science Journals: In your journals reflect on the main questions of the lesson:

- · What is data?
- · How is it used?
- · Where does it come from?

<u>Time Suggestion:</u> Introduction – 3-5 minutes

Handout 2 will keep students engaged in the ideas of data while watching the data and provide new ideas about data and how it is used.

These are questions are to get students thinking about why certain marketing organizations would want data on teens?

Video - 8 min

NOTE: Students may want to discuss being trendsetters, but focus them on Data.
Using a Four-Fold to write ideas on "What data is being collected on teens, why, and how is it collected?"







Lesson 6: What Claims Can I Make About My Trash?

Time: 1 90-minute period

Lesson Overview

Using the questions developed in lesson three and those provided by the teacher, students use the trash dashboard to explore and analyze their personal and class data. Students identify their personal habits that may impact their trash generation, explore possible research questions and explore evidence that supports the claim that trash is a societal concern.

NGSS Standards:

LS4D: Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

ESS3D: Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

Mobilize Goals

- analyze statistical graphics to identify patterns in data and to connect these patterns back to the real world;
- understand that by treating photos, words, numbers, and sounds as data, we can gain insight into the real world.
- learn to analyze data, including: posing questions that can be answered by considering relations among variables in a dataset, using collected data to generate hypotheses for future data collection, critically evaluating shortcomings and strengths in the data and the data collection process, and informally evaluating hypotheses using data at hand

Enduring Understanding

By examining the Dashboard, I can quantify my trash's impact on the environment.







Lesson 6: What Claims Can I Make About My Trash?

Language Objective

<u>CCSS.ELA-Literacy.RST.9-10.7</u> Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Materials:

- Computers for each students
- Mobilize Dashboard URL and Student login information
- Student Handout 1: Analyzing Trashboard Graphic Organizer
- Student Handout 2: for Trash Template
- LCD Projector

Performance Task/Essential Question

What claims can I make about my trash?

Vocabulary (in context of this lesson)

- Visualization
- GPS







Lesson 6: What Claims Can I Make About My Trash?

	Teacher/Student Activities	Time / Notes
Warm 1.	<u>Up:</u> Review the class list of questions students developed in lesson four. Remind the	In advance, pull up the
	students that they are reviewing their data to find answers to the questions that	plot builder of
	they generated. If the questions do not appear to drive analysis of the graphics,	some student
	you may add questions similar to those listed below and can also be found in the	data ⊑ .
	Analyzing TrashBoard Graphic Organizer.	Computer
		access for all
		students in
		required for
		this activity.
1.	Inform the students that there are two sets of data that we will be exploring today.	<u>Time</u>
	The data is displayed on what we call the dashboards. The first set of data we will	Suggestion:
	look at is our individual data. Once we have looked at our own patterns, then we will look at the data collected for the entire class.	<u>50</u>
	a. If computers are limited, have students pair up with their Upcycle partners	
	to take turns using the terminal to view their trash data on the Dashboard.	
2.	↑ Students will then log in and begin exploring first their personal data on the	
	dashboard. Ensure that students are looking at their individual data, not the entire	
	class. Students may not be able to answer every question, especially if they	
	entered the data in manually on a computer.	
	a. What day did you produce the largest amount of trash?	
	b. What two-hour window did you create the largest amount of trash?c. Looking at the histogram at the bottom of the screen, does the amount of	
	trash vary greatly or is it consistent? Why do you think that is?	
	d. What activity were you doing to generate that largest trash amount?	
	e. What did you learn about the amount of trash, recyclable, and	
	compostable items you create?	
	f. Do you have any habits or patterns that contribute to your trash	
	generation? Hint: look at the GPS map to see where you entered your	
	data and the word cloud. g. Of the recyclable and compostable items, how many items did you	
	actually recycle or compost?	
	h. In a paragraph, explain which visualization impacts you the most and	
	why? Be sure to include the visualization by screen grabbing the image.	
3.	Open another window and select to view the class data on the dashboard.	
	a. How does your daily average of trash items, recyclable items and	
	compostable items compare to your classmates? What factors do you	
	believe contribute to the difference in these numbers?	
	b. Look at the response data and time graphs at the bottom of the page. How does the data vary during the day?	
	c. Looking at the GPS trash data, what can infer about the habits of your	
	classmates before and afterschool?	
	d. Looking at the word web, what can you infer about the eating habits of	
	your classmates.	
	e. Do students recycle at your school? Use at least two visualizations to	







Lesson 6: What Claims Can I Make About My Trash?

1	Inform	the students that there are two sets of data that we will be exploring today.	Time
•		ata is displayed on what we call the dashboards. The first set of data we will	Suggestion:
		t is our individual data. Once we have looked at our own patterns, then we	50
		ok at the data collected for the entire class.	
		If computers are limited, have students pair up with their Upcycle partners	
		to take turns using the terminal to view their trash data on the Dashboard.	
2.	↑ ≯St	udents will then log in and begin exploring first their personal data on the	
		oard. Ensure that students are looking at their individual data, not the entire	
		Students may not be able to answer every question, especially if they	
		ed the data in manually on a computer.	
		What day did you produce the largest amount of trash?	
		What two-hour window did you create the largest amount of trash?	
	C.	Looking at the histogram at the bottom of the screen, does the amount of	
	۵	trash vary greatly or is it consistent? Why do you think that is?	
		What activity were you doing to generate that largest trash amount? What did you learn about the amount of trash, recyclable, and	
	е.	compostable items you create?	
	f.	Do you have any habits or patterns that contribute to your trash	
	1.	generation? Hint: look at the GPS map to see where you entered your	
		data and the word cloud.	
	а	Of the recyclable and compostable items, how many items did you	
	9.	actually recycle or compost?	
	h.	In a paragraph, explain which visualization impacts you the most and	
		why? Be sure to include the visualization by screen grabbing the image.	
3.	Open	another window and select to view the class data on the dashboard.	
	a.	How does your daily average of trash items, recyclable items and	
		compostable items compare to your classmates? What factors do you	
		believe contribute to the difference in these numbers?	
	b.	Look at the response data and time graphs at the bottom of the page.	
		How does the data vary during the day?	
	C.	Looking at the GPS trash data, what can infer about the habits of your	
		classmates before and afterschool?	
	d.	Looking at the word web, what can you infer about the eating habits of	
	_	your classmates.	
	e.	Do students recycle at your school? Use at least two visualizations to	
	f	support your claim. Select two visualizations you believe strongly supports the claim, "Trash is	
	1.	a problem at my high school?" Explain why you chose each one.	
		a problem at my might solloof: Explain why you onose each one.	

■ HOMEWORK: Look over your concept map. What are three things you can add to your concept map from the trash data you looked at today? Add those three items.

Create a claim that addresses the question, "Is trash a societal concern?" and cite three pieces of evidence from your personal data.







Lesson 6: What Claims Can I Make About My Trash?







Lesson Seven: What Claims Are Made About Trash in the News?

Time: 1 90-minute period

Lesson Overview

Students will look at their Sanitary Landfill models and identify how the structure impacts the rate of decomposition. Students break up into expert groups and are assigned different news articles to read. Through paired readings and graphic organizers, students work together to identify the author's claim made in the article and the evidence provided to support their stance. These articles are potential sources of evidence for students to use when answering the unit question as well as helping students to select an area of focus for their final project.

NGSS Standards:

LS4D: Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

ESS3D: Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

Mobilize Goals

 understand how data support science to identify and tackle real-world problems in our communities;

Enduring Understanding

Upon analyzing the trash data and then reading articles, students will begin to understand the cumulative effect of trash. Students are able to make claim regarding trash that is supported by multiple sources of evidence. Students should be able to cite evidence to the claim that we all contribute to the problem and must work together toward a solution.







Lesson Seven: What Claims Are Made About Trash in the News? Language Objective

<u>CCSS.ELA-Literacy.RST.9-10.8</u> Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

<u>CCSS.ELA-Literacy.RST.9-10.9</u> Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

<u>CCSS.ELA-Literacy.SL.9-10.4</u> Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task

Materials:

- Student Handout 1: News Graphic organizer
- Student Handout 2: News articles

Performance Task/Essential Question

What claims are made about trash in the news?

Vocabulary (in context of this lesson)

- Sanitary Landfill
- Claim
- Evidence
- Validity
- Reliability
- Extrapolation







Lesson Seven: What Claims Are Made About Trash in the News?

	Teacher/Student Activities	Time / Notes
<u>Wa</u>	 We started this unit with the hopes of discovering how our trash impacts the world around us. Have students check in on their sanitary landfill models and view whether the materials have begun decomposition. Claim: Sanitary landfill structures slow the rate of decomposition. What observational evidence would you need from your model to support or refute this claim? Write this down into your notebook. 	
	Students should then find their reuse partners and share three things that they have learned so far about their personal trash through the Mobilize App and the data from the dashboard.	
Le	sson Exploration:	
1.	Inform the class that today we are going to look at what other people are saying about trash. We can use this information to answer some of the questions we still have regarding trash. The articles will also help students to focus on an area they may be interested in researching for their final project. Students will complete a literature review of three articles regarding trash: trash in China, marine garbage patches, and trash generation on school campus during lunch.	Time Suggestion:
	a. Graphic Organizer: Prior to passing out the article, review the graphic organizer that students will be using to collect information in. Inform the students that the graphic organizer is designed to help students identify the claim the author is making, the evidence provided that supports the claim and how the article may apply to the unit question.	
	Partner Reading Strategy: Number students off 1-3. Students will show their number on their fingers and find a like partner. Once partnered up, review the partner reading strategy. Each pair will have the same article. Partner A reads the first paragraph, then partner B gives a summary or main point statement in the paragraph. Partner B reads the second paragraph, then partner A gives the summary statement. Repeat the pattern until the end of the reading	
	b. Once the article is completed, students will return to their original teams and share what they learned regarding garbage by sharing the main idea and the quotes that they selected.	
	c. The articles should encourage students to think about trash on a larger scale than themselves or their friends. Collecting data over weeks and years or a larger sample size, such as China's population size requires computational power of technology.	
	Students should find their reuse partner and share their thoughts regarding the homework question, "Did the APP change how much trash they created?" Lead the class to share out what there thoughts are about collecting this data and how their awareness of having to document their trash may impact the validity of the data. a. Ask the Team manager to poll the team: How might your trash data	
	sson Exploration:	
1.	Inform the class that today we are going to look at what other people are saying about trash. We can use this information to answer some of the questions we still have regarding trash. The articles will also help students to focus on an area they	Time Suggestion:







Lesson Seven: What Claims Are Made About Trash in the News?

	-
Add three things you learned from the articles and or your research to your concept map.	







Lesson 8: Is trash a societal problem and can we help solve it?

Time: Four 90-minute periods

Lesson Overview

Through reviewing the evidence collected in throughout the unit, internet research and discussions, students create an action plan centered on an area of focus: landfill, recyclable and compost in hope to reduce the impact their topic has upon the environment. Students will create visually stimulating informational presentations similar to a Public Service Announcement in hope of educating and influencing their peers to make choices that will help reduce the impact of trash.

NGSS Standards:

LS4D: Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

ESS3D: Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

Enduring Understanding

Students take ownership of the effect their choice has on the environment and develop tools to reduce that impact as well as provide evidence through research and personal data to answer the unit question.

Language Objective

<u>CCSS.ELA-Literacy.RST.9-10.8</u> Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

<u>CCSS.ELA-Literacy.RST.9-10.9</u> Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

<u>CCSS.ELA-Literacy.SL.9-10.4</u> Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task







Lesson 8: Is trash a societal problem and can we help solve it?

Materials:

- Access to internet
- Poster Paper
- Marker
- Reference material for additional data such as books, websites (see Lesson 7 and 8 Website link handout), data pdfs (see reference folders for additional support materials)
- Student Handout 1: Lesson 8 PSA Graphic Organizer
- Student Handout 2: (Team Copies) PSA Rubric
- Student Handout 3: Peer Evaluation Rubric

Performance Task/Essential Question

Is trash a societal concern? What can I and my peers do to reduce or impact or design a solution to one aspect of the problem?

Vocabulary (in context of this lesson)

No new vocabulary







Lesson 8: Is trash a societal problem and can we help solve it?

Lesson 8-Two Days	
Part One	
Teacher/Student Activities	Time / Notes
Warm Up: Look at your Sanitary Landfill Models. What materials show evident that they have begun decomposing or biodegrading? Why are some materials breaking down at different rates? How does the structure of your model important the rate of biodegradation?	dence <u>15 minutes</u>
Have teams make a poster of their findings and share out their answerers to question?	to the
a. Poster should include: A claim about the two-landfill models.	
b. Observational Evidence to support their claim	
c. Explanation of what the observations taught them	
Lesson Elaboration: 3. In lesson 7, students chose a type of trash to further investigate. Share wit students that they will work collaboratively to develop a method to influence students at their school to change their habits thus reducing the amount of placed within the landfills. Students should be encouraged to utilize innovat methods, far beyond a poster or powerpoint. a. Public Service Announcements may be in the form of a 2-minute a blog, a social media page, a slideshow, comic strip, a blueprint for APP, Prezi presentation or brochure. Students should be encourag come up with other forms of PSA but must have the format approve you. Their PSA must include the following elements: i. Identify Type of Refuse: Recyclable, Compostable, Landfill ii. Definition in your own words iii. Amount of that type of refuse generated by this group, the cland America each year. iv. Five interesting facts collected from your research, experiment and or articles read in the classroom. v. Three or more data visualizations that illustrate the problem least two from the class data)	e access for research is most beneficial video, r an ged to ed by lass, ents (at
2. In lesson 7, students chose a type of trash to further investigate. Share wit students that they will work collaboratively to develop a method to influence students at their school to change their habits thus reducing the amount of placed within the landfills. Students should be encouraged to utilize innovations.	th Computer access for waste research is







Lesson 8: Is trash a societal problem and can we help solve it?

B HOMEWORK:		
Prepare for PSA presentatio	n	•

	Lesson 8 Part two		
	Teacher/Student Activities	Time / Notes	
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Varm Up: Students will complete the Lesson 8 Peer Evaluation Rubric	Computer access for research is	
	that documents the peer's individual contribution to the team over the PSA project.	needed	
1	. For every presentation, each team will help evaluate the PSA by completing a group rubric. Inform the class that the group rubrics will be returned back to each team. PSA's that earn less than a 4 will have the opportunity to revise their final project and resubmit to the teacher. (Subsequent submissions will not be shown to the class)	Time Suggestion: 2-3 periods depending on number of	
2	Final reflection either assigned as homework or in class essay when presentations are done: Students will revisit the guiding question from lesson four and submit a paragraph using the CEE process (Claim, Evidence, Explanation). Students that require additional writing scaffolding may use a graphic organizer similar to the Claims Evidence Template in Lesson 6.	presentations and length.	
3	Remind students to look over the last eight activities as a source of evidence to support their claims.		







Time

Science Curriculum

Lesson 8: Is trash a societal problem and can we help solve it?

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- Suggestion: 2-3 periods depending on number of presentations and length.
- 2. Final reflection either assigned as homework or in class essay when presentations are done: Students will revisit the guiding question from lesson four and submit a paragraph using the CEE process (Claim, Evidence, Explanation). Students that require additional writing scaffolding may use a graphic organizer similar to the Claims Evidence Template in Lesson 6.
- 3. Remind students to look over the last eight activities as a source of evidence to support their claims.
 - a. Guiding Question: "When it comes to trash and our environment, Can one person make a difference? Lessons to help students answer the question include:
 - i. Article analysis
 - ii. Garbage data collected by teams and the class
 - iii. Sanitary landfill model
 - iv. PSA
 - v. Carbon Cycle Game