4th grade, ELA/Science: Pollution
To what extent do humans impact their environment?
Houghton Mifflin Science Textbook Grade 4

Cassandra Spengler
Harwood Elementary, JSD #251
Rigby, Idaho

The Core Teacher Program
A program of the Idaho Coaching Network
Idaho Department of Education

Directions: Please type your name and unit title in the header. Then check each box that applies to your unit. Please note that while some categories were intentionally built into your unit via the online course modules (e.g. UDL and Webb’s DOK), others were not explicitly included and may not apply to your unit.

Universal Design for Learning (UDL)

- ✔ Multiple Means of Engagement
- ✔ Multiple Means of Expression
- ✔ Multiple Means of Representation

Differentiated Instruction

- ✔ Remediation
- ✔ ESOL
- ✔ Gifted/Talented
- ✔ Acceleration
### Webb's Depth of Knowledge - Level 1 (Recall)

<table>
<thead>
<tr>
<th>Task</th>
<th>No.</th>
<th>Yes</th>
<th></th>
<th>Task</th>
<th>No.</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who, What, When, Where, Why</td>
<td></td>
<td></td>
<td></td>
<td>Label</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Define</td>
<td></td>
<td></td>
<td></td>
<td>List</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify</td>
<td></td>
<td></td>
<td></td>
<td>Match</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illustrate</td>
<td></td>
<td></td>
<td></td>
<td>Measure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Webb's Depth of Knowledge - Level 2 (Skill/Concept)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Categorize</td>
<td></td>
<td></td>
<td></td>
<td>Estimate</td>
<td></td>
<td></td>
<td></td>
<td>Observe</td>
<td></td>
<td></td>
<td></td>
<td>Observe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classify</td>
<td></td>
<td></td>
<td></td>
<td>Graph</td>
<td></td>
<td></td>
<td></td>
<td>Organize</td>
<td></td>
<td></td>
<td></td>
<td>Organize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collect and Display</td>
<td></td>
<td></td>
<td></td>
<td>Identify Patterns</td>
<td></td>
<td></td>
<td></td>
<td>Predict</td>
<td></td>
<td></td>
<td></td>
<td>Predict</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compare</td>
<td></td>
<td></td>
<td></td>
<td>Infer</td>
<td></td>
<td></td>
<td></td>
<td>Summarize</td>
<td></td>
<td></td>
<td></td>
<td>Summarize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construct</td>
<td></td>
<td></td>
<td></td>
<td>Interpret</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Webb's Depth of Knowledge - Level 3 (Strategic Thinking)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess</td>
<td></td>
<td></td>
<td></td>
<td>Differentiate</td>
<td></td>
<td></td>
<td></td>
<td>Hypothesize</td>
<td></td>
<td></td>
<td></td>
<td>Hypothesize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construct</td>
<td></td>
<td></td>
<td></td>
<td>Draw Conclusions</td>
<td></td>
<td></td>
<td></td>
<td>Investigate</td>
<td></td>
<td></td>
<td></td>
<td>Investigate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critique</td>
<td></td>
<td></td>
<td></td>
<td>Explain Phenomena in Terms of Concepts</td>
<td></td>
<td></td>
<td></td>
<td>Revise</td>
<td></td>
<td></td>
<td></td>
<td>Revise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop a Logical Argument</td>
<td></td>
<td></td>
<td></td>
<td>Formulate</td>
<td></td>
<td></td>
<td></td>
<td>Use Concepts to Solve Non-Routine Problems</td>
<td></td>
<td></td>
<td></td>
<td>Use Concepts to Solve Non-Routine Problems</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Webb's Depth of Knowledge - Level 4 (Extended Thinking)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyze</td>
<td></td>
<td></td>
<td></td>
<td>Create</td>
<td></td>
<td></td>
<td></td>
<td>Prove</td>
<td></td>
<td></td>
<td></td>
<td>Prove</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply Concepts</td>
<td></td>
<td></td>
<td></td>
<td>Critique</td>
<td></td>
<td></td>
<td></td>
<td>Synthesize</td>
<td></td>
<td></td>
<td></td>
<td>Synthesize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connect</td>
<td></td>
<td></td>
<td></td>
<td>Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Bloom's Taxonomy

| Task | No. | Yes | | Task | No. | Yes | | Task | No. | Yes |
|------|-----|-----|---|------|-----|-----|---|------|-----|-----|---|------|-----|-----|
| Remembering | | | | Applying | | | | Evaluating | | | | Evaluating | | |
| Understanding | | | | Analyzing | | | | Creating | | | | Creating | | |
Grouping

- Heterogeneous grouping
- Individualized instruction
- Small group instruction
- Homogeneous grouping
- Large Group instruction
- Non-graded instructional grouping

Teaching Methods

- Cooperative learning
- Lecture
- Think Pair Share
- Direct Instruction
- Lab
- Experiential learning
- Team teaching
- Hands-on instruction

Gardner's Multiple Intelligences

- Bodily-Kinesthetic
- Linguistic
- Naturalist
- Interpersonal
- Logical-Mathematical
- Spatial
- Intrapersonal
- Musical

Idaho Core Teacher Network Unit Plan

<table>
<thead>
<tr>
<th>Unit Title: Pollution</th>
<th>Created By: Cassandra Spengler</th>
<th>Subject: Science &amp; ELA</th>
<th>Grade: 4</th>
<th>Estimated Length: 12 class periods</th>
</tr>
</thead>
</table>

Unit Overview:
- Overview of grade level science vocabulary (textbook, activity, nonfiction reading)
- Water Pollution experiment (lab, student research, writing, student led discussions)
- Water Cleaning Machine (writing, art work, student led discussions)
- Importance of healthy ecosystems and local ecosystems (short film, nonfiction reading, writing, student led discussions)
- Human impact on ecosystems (short film, nonfiction reading, writing, student led discussions)
- Creating a; video/brochure/news article/ letter to editor/cartoon strip/poster, expressing their views on human impact on their local ecosystems. This will aid in educating others in their community to be observant of the dangerous pollutants that can interrupt the enjoyment of their local ecosystem.

Unit Rationale:
Students will examine the delicate balance of ecosystems, and the components that play an equally important role in sustaining life. Students will understand that living things are dependent on other living and nonliving things for survival, and that they may need to compete to obtain essential resources. Students will compare abiotic and biotic factors that influence and affect an ecosystem. Students will connect that they are also an integral part of an
ecosystem and human actions can have both beneficial and harmful effects on the environment. They will connect these concepts to their own lives as they explore their local ecosystems and assess the effects of human impact. Through a project based assignment, students will justify their opinion of human impact on the environment. Students will be learning through all four ELA Core Key Shifts coupled with a variety of strategies that encourage ELL/ESL/ESOL/ and low students to flourish throughout this unit.

**Targeted Standards:**
- **Idaho Content Standards**
  4.S.1.1.1 Explain that a system consists of an organized group of related objects that form a whole.
- **Idaho Core Standards**
  CCSS.ELA-LITERACY.SL.4.4
  Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
  CCSS.ELA-LITERACY.W.4.2
  Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
  CCSS.ELA-LITERACY.RI.4.1
  Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
  CCSS.ELA-LITERACY.RI.4.3
  Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

**Essential Question:**
- To what extent do humans impact their environment?

**Enduring Understanding:**
- The balance between biotic and abiotic factors in ecosystems
- Whether negative or positive, humans have an impact on our ecosystem
- How these impacts shape and change ecosystems
- How to change negative impacts on our ecosystem
- How to educate others to be conscientious of their impacts on the environment
<table>
<thead>
<tr>
<th>Learning Objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Students will be able to justify their opinions by using evidence in texts</td>
</tr>
<tr>
<td>- Students will be able to understand the negative and positive impacts humans have on our ecosystem</td>
</tr>
<tr>
<td>- Students will be able to apply the concepts learned to their daily lives</td>
</tr>
<tr>
<td>- Students will be able to critique various informational texts to determine their stance on human impact on our ecosystems</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning Targets:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- I can describe human changes on the environment</td>
</tr>
<tr>
<td>- I can classify changes as beneficial or harmful to the environment</td>
</tr>
<tr>
<td>- I can predict what would happen in my environment given various scenarios</td>
</tr>
<tr>
<td>- I can use evidence from text to support my claims</td>
</tr>
<tr>
<td>- I can discuss ways to become involved in protecting my environment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Success Criteria:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- A stance/argument is made on human impact on our environment</td>
</tr>
<tr>
<td>- Information is directly cited from various texts to prove argument</td>
</tr>
<tr>
<td>- Information is presented in their proper forms</td>
</tr>
<tr>
<td>- Videos must have a script or storyboard, news articles look and read like a real news article, blog is appropriate for audiences, letter to the editor falls within parameters of local newspaper, comic strip must look and read like a real comic strip</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summative Assessment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will produce a piece that takes a stance on how humans impact the delicate cycle of our ecosystem. Students will have a choice to create a video, news article, brochure, poster, cartoon or letter to the editor. Students are encouraged to use their creativity to express their stance on the impact humans make on our environment.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DOK</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOK #1: students will need to understand the vocabulary and language of ecosystems and pollution</td>
</tr>
<tr>
<td>DOK #2: students will need to build on prior knowledge to determine and understand cause and effect within ecosystems</td>
</tr>
<tr>
<td>DOK#3: students will have to support their stance by directly quoting from the various informational articles they will be reading</td>
</tr>
<tr>
<td>DOK #4: students will have to analyze and research various educational articles to argue their stance on human impact</td>
</tr>
</tbody>
</table>

*See Appendix II for project rubric*
**Text Complexity Analysis:**
Houghton Mifflin Science Book  
- Qualitative: Meaning: This informational text is helping students determine and identify how delicate ecosystems are and how things directly and indirectly affect our environment.  
- Structure: Slightly complex ideas that correlate together in an easy to follow order. Activities and experiments are needed to fully connect ideas to real life.  
- Language Conventionality and Clarity: Students will need to explore different vocabulary words and phrases to fully understand the text and transfer that information to smaller nonfiction, informational articles that will be read later.  
- Knowledge Demands: This text has simple themes and concepts that will be easily carried over to more demanding work that will be asked of the students at a later time. General and prior knowledge is crucial in understanding these new concepts and vocabulary.  
- Reader Tasks: The complexity of the questions will be determined based on the student’s prior knowledge of the subject and their interactions with the vocabulary.

<table>
<thead>
<tr>
<th>Other Materials (UDL)</th>
<th>Fictional Literature:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YouTube Videos:</strong></td>
<td><em>Just a Dream</em> by: Chris Van Allsburg</td>
</tr>
</tbody>
</table>
| Bill Nye the Science Guy: Biodiversity  
[https://www.youtube.com/watch?v=TrtUHQ16Y_w](https://www.youtube.com/watch?v=TrtUHQ16Y_w)  
Adapting to the Changing Ecosystem  
[https://www.youtube.com/watch?v=tlp2RkDQBMs](https://www.youtube.com/watch?v=tlp2RkDQBMs) |
| **Informational Reading Articles: (Differentiated)** |
| Clean-air-kids.org.uk: *Air Quality* (below grade level) |
| EPA.gov: *Stop Pointless Personal Pollution* (above grade level) |
| Teaching Kids News: *The Environment-Land Pollution* (at grade level) |

**Mini Lesson: Rock N’ Roll Vocabulary**

**Materials:** student record sheet/student (see appendix IV for vocabulary paper), a die/group (big soft dice lessen noise), directions for each die roll (see appendix III for directions), vocabulary words  
*This mini lesson will occur before reading Houghton Mifflin Science textbook chapters*

**Procedure:** Students will be broken into 7 groups of 3, (there are many behavioral issues this year, smaller groups are more productive with less distractions) Each student will need a vocabulary paper to record their answers. Each student will roll the die to determine who will start the activity; highest roll goes first. Once the first player is selected, rotation will follow to the player’s right. Each player will roll the die when it’s their turn and they will follow the directions of the die roll on their vocabulary paper.

**Mini Assessment:**
Students are actively engaged in activity and turn in a completed Rock N’ Roll Vocabulary paper.
### Mini Lesson: Vocabulary Switch

**Materials:** computer paper/student, vocabulary word/student, timer

**Procedures:** Each student will be given a different key vocabulary word and write it in the middle of their paper. The teacher will start a timer for 30 seconds, and students will write something about their vocabulary word, this can be a picture, sentence, definition, antonym, synonym, etc. after 30 seconds students will pass their paper to the person to their left. This will give the student a new vocabulary word. The teacher will start the timer again for 30 seconds and the students will continue adding various elements to each other’s vocabulary paper. After 11 passes (number of passes is determined by the amount of vocabulary words), students will return vocabulary papers to its owner.

**Mini Assessment:**
- Students actively participating and completion of Vocabulary Switch paper

#### Key Vocabulary:
- From HM textbook
  - Pollution
  - Climate
  - Restoration
  - Environment
  - Organism
  - Biotic
  - Abiotic
- Diversity
- Habitat
- Ecosystem
- Population
- Community

#### Key Vocabulary
- Air Quality article:
  - Catastrophe
  - Hazardous
  - Exhaust
  - Chemicals
- Stop Pointless Personal Pollution article:
  - Fertilizer
  - Phosphates
  - Aquatic
  - Biodegradable
- Acutely
- Hazardous
- Pesticides
- The Environment-Land Pollution article:
  - Biodegradable
  - Hazardous
  - Contaminates
  - Adverse
  - Erosion
  - Regulations
  - Organic

### Close Reading Activity #1
**Text Excerpt:** HM Science
**Text Dependent Questions:**
- What Factors Influence Ecosystems?
  - How might a flood in an ecosystem affect a flock of robins?
  - What might be an effect on and ecosystem if there were a sudden increase in temperature?
  - Why would someone need to track a herd of elk in Yellowstone?
  - How would an ecosystem recover from being over logged?
  - Why will climate affect biotic factors?
- Chapter 4 Lesson 3: How Do Humans Affect Ecosystems?
  - How will soil pollution affect a natural ecosystem?

### Close Reading Activity #2
**Text Excerpt:** Stop Pointless Personal Pollution (at grade level)
**Text Dependent Questions:**
- Why would fertilizing your yard pollute the water?
- Why would someone practice pest management?
- How might storm drains affect streams and rivers?

**Text Excerpt:** The Environment: Land Pollution (above grade level)
**Text Dependent Questions:**
- How might farming affect the land?
- Why would land pollution affect your health?
- Why would you want to reduce land pollution?
- How might someone reduce land pollution?
- Why might humans change their attitude about pollution?
  - How might humans affect their local ecosystems in a positive way?
  - Why will using a weed killer on a potato crop pollute a lake miles away?

Text Excerpt: Air Quality (below grade level)
Text Dependent Questions:
- Why would you care about air quality?
- How might we reduce air pollution?
- Why would a newer, smaller car be better for the environment than a big, older truck?

Frontloading/Anticipatory Set
See-Think-Wonder
- Students will be shown an image of pollution (see appendix I for image that was used). Students will write what they see, think, and wonder about the given picture. Students will share with a partner and then discuss their ideas with the class. Students will turn in See-Think-Wonder paper.

Value Line up
- Teacher will ask probing comments to students and they will go to one side of the class or the other if they agree or disagree
  - Climate change is a myth
  - Climate change doesn’t affect me
  - Humans don’t have an impact on the environment
  - There is no way to reverse pollution
  - There is plenty of fresh water on Earth
  - Recycling is not important to the Earth
  - My daily actions do not affect the Earth

Daily Schedule:

<table>
<thead>
<tr>
<th>*Pollution</th>
<th>Activity/Strategy</th>
<th>Texts and</th>
<th>Sequencing/</th>
<th>Formative</th>
<th>Instructional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Activity</td>
<td>Resources</td>
<td>Scaffolding</td>
<td>Assessment</td>
<td>Notes</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Day 1 40:00 mins</td>
<td>Frontloading Activity: See-Think-Wonder 8:00mins</td>
<td>See-Think-Wonder image, Lined paper, Timer, <em>Just a Dream</em> by Chris Van Allsburg</td>
<td>Composing to Plan: Developing knowledge of purpose, Visual to Written, Current Knowledge to Need to Know</td>
<td>-Students turned in See-Think-Wonder paper **This activity highly benefits ESL/ELL/ESOL and low students -Students are activity engaged in <em>Just a Dream</em> and participating in discussion -Students are involved in creating definitions for vocabulary words, recording definitions on student record sheet eventually turning it in when completed.</td>
<td>-Put image on board -Pass out a piece of lined paper per student -Have students use paper vertically and draw two vertical lines to make three columns and label the columns -Draw the graphic organizer on the board to model what their paper should look like (this helps with low performing students and visual learners) -Model a ‘see’, ‘think’ and ‘wonder’ yourself and explain to the students to dig deep with their thinking and use complete fourth grade sentences and their NAMES! -Circulate through class, helping students dig deeper into image -If students are stuck, allow</td>
</tr>
</tbody>
</table>
them to free write
-For very low students, allow them to list phrases
-Set timer for 4 minutes
-Have elbow partners or complete a think-pair-share (set timer for 1 minute and have partners switch, reset timer 1 minute)
-Each pair will need to share something from their discussion
-Write vocabulary words on board (this will help ensure students write the word correctly so they can find the definitions later)
-Students will write vocabulary words on Student Record Sheet.
-Students will use science textbooks to find definitions
-To save time, as a class define the words
-Verbally use the words in a
<table>
<thead>
<tr>
<th>Day 2</th>
<th>40:00 mins</th>
<th>Mini Lesson: Rock N’ Roll Vocabulary 25:00 mins</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Close Reading #1: Chapter 1 15:00 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Copies of Rock N’ Roll Vocabulary directions and student record sheets and dice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HM textbook</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Composing to Plan: Developing knowledge of purpose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual to Written</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Model to Mentor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students actively working on Rock N’ Roll Vocab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Student participation in close reading of chapter one</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Student participation in answering text dependent questions and class discussion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Break students into groups (This can be random, by ability, behavior, etc. I used STAR testing results to ensure low, middle and high students working together mixed with their individual behaviors)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When students roll, encourage them to work fluidly throughout all the words, not be fixated on fully finishing one word, then sentence and see if students can use context clues to define the words -If they cannot define the words, or continue getting the definitions incorrect, have students use their textbook -Once this part is complete break students into their groups and give each group the materials needed</td>
</tr>
</tbody>
</table>
moving on.
- Have students turn in completed record sheet
- Have students identify vocabulary words within text
- Students will learn to pull information from text to answer text dependent questions
- Put text dependent questions on board (UDL, differentiation)
- Teacher may need to model answering text dependent questions and leading class discussion

<table>
<thead>
<tr>
<th><em>Pollution</em></th>
<th>Activity/Strategy</th>
<th>Texts and Resources</th>
<th>Sequencing/Scaffolding</th>
<th>Formative Assessment</th>
<th>Instructional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 3 40:00 mins</td>
<td>Video: <em>Adapting to Climate Change</em> 8:00 mins Free Write 2:00 mins</td>
<td>HM textbook Text Dependent Questions</td>
<td>Composing to Plan: Developing knowledge of purpose Visual to Written Current Knowledge to Need to Know</td>
<td>-Students answer question based on movie and turn in writing -Student</td>
<td>-Have students do a quick free write on &quot;How might the pollution in our state affect people in Africa?&quot; -Put text</td>
</tr>
<tr>
<td>Close Reading #1: Chapter 2</td>
<td>15:00 mins</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Close Reading #1: Chapter 3</td>
<td>15:00 mins</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model to Mentor to Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>participation in close reading of chapters</td>
</tr>
<tr>
<td>- Student participation in answering text dependent questions and class discussion</td>
</tr>
<tr>
<td>dependent questions on board (UDL, differentiation)</td>
</tr>
<tr>
<td>- Teacher may need to model answering text dependent questions and leading class discussion</td>
</tr>
<tr>
<td>- Allow students to think for a minute before they raise their hands to answer text dependent questions (this helps ELL/low students to catch up)</td>
</tr>
<tr>
<td>- Allow higher students to work in the hall as a group, with a copy of the text dependent questions, and they have to discuss the questions and write the answers to assure they are on task</td>
</tr>
<tr>
<td>Day 4</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>40:00 mins</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
and put a circle around the word
- Compile a list of what they can write about the vocabulary words; a definition, an antonym, a synonym, a picture, etc.
- Set a timer with 30 seconds to start with
- Students will have 30 seconds to write something about that vocabulary word
- After the 30 seconds, the paper will be passed to the right and the timer starts over
- Loop the vocabulary words through the students, so when passing papers rotates in the same direction so the students stop when
they get a paper with the same word they started with, not their paper!
- Encourage high students to dig deeper with the word, like using figurative language (extension)

<table>
<thead>
<tr>
<th>*Group Work</th>
<th>Activity/Strategy</th>
<th>Texts and Resources</th>
<th>Sequencing/Scaffolding</th>
<th>Formative Assessment</th>
<th>Instructional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 5 40:00 mins</td>
<td>Mini Lesson: Rock N’ Roll Vocabulary 25:00 mins Close Reading #2: Reading articles 15:00 mins</td>
<td>Copies of Rock N’ Roll Vocabulary directions, student record sheets, and dice Appendix XII: Differentiated reading articles</td>
<td>Composing to Plan: Developing knowledge of purpose Visual to Written Current Knowledge to Need to Know</td>
<td>Mini assessment completed and turned in Participation in close reading in small groups</td>
<td>- Vocabulary will take less time due to fewer words - Groups will be divided by ability levels, based on STAR results so the reading articles are appropriate for student’s reading levels (differentiation) - Give each group their reading articles and text dependent questions</td>
</tr>
<tr>
<td>Day 6 40:00 mins</td>
<td>Close Reading #2: Reading articles: Collecting evidence and developing group thesis based on article 25:00 mins</td>
<td>Group Presentations 15:00 mins</td>
<td>Reading articles 3 posters: 1 poster/group Appendix V: Job Duties paper/group Appendix IX: Group Projects Checklist</td>
<td>Composing to Plan: Developing knowledge of purpose Learning to Doing to Reflecting Easy to Hard Supported to Independent Whole to Part to Whole</td>
<td>Job Duties paper is filled out with names and turned in Each student completed their assigned job in group Group Checklist completed and turned in Presentatio</td>
</tr>
</tbody>
</table>
through groups, helping as needed - 3-4 minutes per group presentations - Students are given note catchers to record presentations

<table>
<thead>
<tr>
<th>*Lab Activity/Strategy</th>
<th>Texts and Resources</th>
<th>Sequencing/Scaffolding</th>
<th>Formative Assessment</th>
<th>Instructional Notes</th>
</tr>
</thead>
</table>
| Day 7 40:00 mins       | Video: Bill Nye the Science Guy: *Biodiversity* 20:00 mins Appendix VI: Water Pollution Lab 20:00 mins | Video Note Catcher Water pollution lab directions Water pollution Lab materials | Visual to Written Whole to Part to Whole Learning to Doing to Reflecting | Students filled out Note Catcher on video and turned in **This is very beneficial for ESL/ELL/ESOL/Low Students Student participation in group activity and in water lab - Each student needs a note catcher - Explain the concept of the note catcher and model one or two areas - Prepare Water Pollution Lab by following the instruction sheet - Divide class into groups with mixed abilities -- Students will do a think-pair-
| Day 8 | 40:00 mins | Appendix VI: Water Pollution Lab 5:00 minutes | Appendix VI: Water Pollution Lab directions and materials | Learning to Doing to Reflecting Easy to Hard Supported to Independent Whole to Part to Whole Concrete to Abstract Participation in Think-Pair-Share, and with groups **This is very beneficial for ESL/ELL/ESOL/Low Students Present their ideas with class and add their pollutant to our water container Writing and drawing of water cleaning machine Sharing their machine with a small group or the class | -Finish up any lingering questions about water cleaning system -Students will individually write and draw their ideas to clean dirty water and share with class -Give students 20 minutes to do this -Give students 5 minutes to present their water cleaning share with group on how their pollutant will affect groundwater -Groups will add their pollutant to water and tell class how it will affect groundwater |
After students have presented their clean water machines, show students the real water cleaning system.

- Rinse water cleaning between classes

<table>
<thead>
<tr>
<th>*Project days</th>
<th>Activity/Strategy</th>
<th>Texts and Resources</th>
<th>Sequencing/Scaffolding</th>
<th>Formative Assessment</th>
<th>Instructional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 9 40:00 mins</td>
<td>Projects: stage I: developing thesis and evidence to support 40:00 mins</td>
<td>HM textbook, Close reading articles, Appendix XI, Project guidelines, checklist, and rubric</td>
<td>Visual to Written, Easy to Hard, Supported to Independent, Short to Long</td>
<td>Students are actively working on final project, Students have thesis</td>
<td>- Give students guidelines of the project they chose - Give students a checklist and rubric - Write essential question on board - Model how to cite evidence - Encourage high students to pick a harder, more detailed</td>
</tr>
<tr>
<td>Day 10 40:00 mins</td>
<td>Projects: stage I: developing thesis and evidence to support 40:00 mins</td>
<td>HM textbook Close reading articles Appendix XI Project guidelines, checklist, and rubric</td>
<td>Visual to Written Easy to Hard Supported to Independent Short to Long</td>
<td>Students are actively working on final project Students have thesis and quotes from resources - Give students guidelines of the project they chose - Give students a checklist and rubric - Write essential question on board - Model how to cite evidence - Encourage high students to pick a harder, more detailed project like a movie, comic strip or power point and low students to do a brochure or news article (UDL, differentiation) - Students may work in pairs</td>
<td></td>
</tr>
</tbody>
</table>
Some students may need help developing a thesis.

<table>
<thead>
<tr>
<th>*Presentations</th>
<th>Activity/Strategy</th>
<th>Texts and Resources</th>
<th>Sequencing/ Scaffolding</th>
<th>Formative Assessment</th>
<th>Instructional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 11 40:00 mins</td>
<td>Phase II: Creating the project 40:00 mins</td>
<td>Computers</td>
<td>Easy to Hard Supported to Independent Short to Long</td>
<td>Students are actively working on final project</td>
<td>-Group students by the project they are working on, this makes it easier to help students who make have the same questions -Students may need help finding pictures for project -Encourage students to use their checklist and guidelines to develop project</td>
</tr>
<tr>
<td>Day 12 40:00 mins</td>
<td>Phase II: Creating the project 20:00 mins Gallery Walk 20:00 mins</td>
<td>Short to Long Easy to Hard Supported to Independent</td>
<td>Students turn in; final project, checklist and rubric Participate in Gallery walk</td>
<td>-Students place their desk/computer and the students slowly walk around the classroom looking at other’s work -Have students write down any questions they may have of other’s work</td>
<td></td>
</tr>
</tbody>
</table>

UDL Components

Below Grade Level

Above Grade Level
| Principle I: Provide Multiple Means of Representation  
- Textbooks, articles, videos, experiments and inquiry | Accommodations  
- Small Group/One-on-One instruction to aid in final project  
- Group work  
- Teacher support throughout unit  
- Reading articles that meet their reading levels | Accommodations  
- Higher level texts/materials  
- More difficult project  
- More refined thesis  
- Independent work |
|---|---|---|
| Principle II: Provide Multiple Means of Action and Expression  
- choices for final project | --- | --- |
| Principle III: Provide Multiple Means of Engagement  
- Choice in opinion, group/individual work, interactions with readings | --- | --- |

Appendix I: See-Think-Wonder: image
## Appendix II: Project Rubric

Name: ____________________________ Project: ____________________________

<table>
<thead>
<tr>
<th>Resources</th>
<th>Citations</th>
<th>Follow Guidelines</th>
<th>Ability to Convey Message</th>
<th>Final Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Compared and used 3 different educational resources</td>
<td>Used 4 appropriate and relevant direct quotes from the 3 different educational resources</td>
<td>90% - 100% of the guidelines and checklists were followed and checklist turned in</td>
<td>Audience was engaged, speaker spoke clearly and at an understandable pace, and was organized for presentation</td>
</tr>
<tr>
<td>4</td>
<td>Compared and used 2 different educational resources</td>
<td>Used 3 appropriate and relevant direct quotes from the 2 different educational resources</td>
<td>75% - 89% of the guidelines and checklists were followed and checklist turned in</td>
<td>Audience was engaged, speaker spoke clearly and at an understandable pace, but speaker was slightly disorganized in presentation</td>
</tr>
<tr>
<td>Points</td>
<td>Description</td>
<td>Percentage of Guidelines Followed</td>
<td>Audience</td>
<td>Project Outcome</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------</td>
<td>---------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Compared and used 1 educational resource and 1 unapproved resource</td>
<td></td>
<td>60% - 74% of the guidelines and checklists were followed and checklist turned in</td>
<td>Produced a finished but slightly disorganized project with frequent grammatical mistakes and a weak argument</td>
</tr>
<tr>
<td>3</td>
<td>Used 2 appropriate and relevant direct quotes from the 1 different educational resources</td>
<td></td>
<td>Audience was engaged, speaker spoke clearly, but was disorganized in presentation</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Used 1 educational resource</td>
<td>45% - 59% of the guidelines and checklists were followed and checklist turned in</td>
<td>Audience was slightly engaged, speaker spoke quickly, and speaker was not prepared or organized for presentation</td>
<td>Produced a finished, disorganized project with repetitive grammatical mistakes and a weak argument</td>
</tr>
<tr>
<td>1</td>
<td>Used 1 non creditable resource</td>
<td>30% - 44% of the guidelines and checklists were followed and checklist turned in</td>
<td>Audience was not engaged, speaker spoke quickly and speaker was not prepared for presentation</td>
<td>Produced an unfinished, disorganized project with repetitive and frequent grammatical mistakes and has no argument</td>
</tr>
<tr>
<td>0</td>
<td>Used 0 resources</td>
<td>Guidelines were not followed and checklist was not turned in</td>
<td>No Presentation or goofed around during presentation</td>
<td>Project was unfinished, sloppy, grammatical mistakes takes away from the project and has no argument</td>
</tr>
</tbody>
</table>

Total Points: ______ /25

Comments:

Appendix III: Rock N’ Roll Vocabulary Directions

**Rock N’ Roll Vocabulary**

Directions: Each student will need a vocabulary paper to record their answers. Each student will roll the die to determine who will start the activity; highest roll goes first. Once the first player is selected, rotation will follow to the player’s left. Each player will roll the die when it’s their turn and they will follow the directions of the die roll on their vocabulary paper. **The same numbers will be rolled, move between vocabulary words, so your group doesn’t get stuck!**
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1 | **Draw It**  
   Everyone draw a quick picture of the word | 4 | **Sentence**  
   Write the player’s sentence |
| 2 | **Rhyme It**  
   Everyone rhyme it, write all player’s rhymes | 5 | **Synonym**  
   Write the player’s synonym |
| 3 | **Antonym**  
   Write the player’s antonym | 6 | **Switch!!**  
   Switch Players |

Appendix IV: Rock N' Roll Vocabulary: student’s record sheet
Appendix V: Job Duties

**Job Duties**

*Remember*, when your group decides on jobs, pick the individuals who are comfortable speaking in front of the class, or someone who stays on task for the group leader, or someone who has good handwriting or draws well for the writers, and good readers for quote finders!

<table>
<thead>
<tr>
<th>Word:__________________</th>
<th>Word:__________________</th>
<th>Word:__________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyme it:________________</td>
<td>Rhyme it:________________</td>
<td>Rhyme it:________________</td>
</tr>
<tr>
<td>Synonym:________________</td>
<td>Synonym:________________</td>
<td>Synonym:________________</td>
</tr>
<tr>
<td>Antonym:________________</td>
<td>Antonym:________________</td>
<td>Antonym:________________</td>
</tr>
<tr>
<td>Sentence:________________</td>
<td>Sentence:________________</td>
<td>Sentence:________________</td>
</tr>
<tr>
<td>Definition:______________</td>
<td>Definition:______________</td>
<td>Definition:______________</td>
</tr>
<tr>
<td>Draw it:</td>
<td>Draw it:</td>
<td>Draw it:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group Leader</th>
<th>Writer #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:__________________</td>
<td>Name:__________________</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Water Pollution Lab

**Materials:** science notebooks, 1-2 liter clear water pitcher, 7 small containers, 8 labels, 7 fake pollutants

I used the following:
- Coffee grounds for animal waste
- Colored vegetable oil for spilled oil
- Green water for fertilizer
- Cornmeal for sewage
- Black water for factory waste
- Flour for pesticides/herbicides
- Sprinkles for trash/litter

**Procedure:** Label 2 liter water pitcher ‘Ground Water’ and fill with water. Label each container with the pollutant, fill with pollutant. Write “How would the pollutant, __________, affect local groundwater?” on the board. Divide class into 7 groups and give each group a pollutant. Groups will discuss and write the ideas for their pollutant. Each group will come up to the front of the class and add their pollutant to the water pitcher and discuss their ideas to the class.

Gravel

Sand

Charcoal

**Water Cleaning Machine Lab**

**Materials:** 4 clear bottles (I used 1 liter soda bottles), tape, gravel, sand, activated carbon, computer paper

**Procedure:** Cut tops off of bottles just above the label, remove all labels, cut holes in the bottom of the bottles, and place gravel in one bottle, sand in another and activated carbon in the third. Construct and tape the bottles like the diagram. Give students a piece of computer paper and have student come up with a machine that will clean water. They will
draw a picture of their machine and write about how the machine works. After students complete their machine, teacher will describe the simple way to clean water. Students will vote whether they think this will clean the water.

Pour water pollution pitcher into, have student discuss results.

Appendix VII: Note Catcher

### Note Catcher

Name: __________________________

<table>
<thead>
<tr>
<th>What I thought was the most interesting...</th>
<th>Something new I learned...</th>
<th>Something I already knew...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Questions I still have...</th>
<th>Main idea...</th>
<th>Makes me think about...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I thought this was awesome...</th>
<th>I wonder about...</th>
<th>I didn’t understand...</th>
</tr>
</thead>
</table>
## Project Guidelines

<table>
<thead>
<tr>
<th>Video</th>
<th>Brochure</th>
<th>News Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear argument is made</td>
<td>Clear argument is made</td>
<td>Clear argument is made</td>
</tr>
<tr>
<td>Compared 3 educational resources</td>
<td>Compared 3 educational resources</td>
<td>Compared 3 educational resources</td>
</tr>
<tr>
<td>Used 4 quotes to support argument</td>
<td>Used 4 quotes to support argument</td>
<td>Used 4 quotes to support argument</td>
</tr>
<tr>
<td>No spelling or grammar errors</td>
<td>No spelling or grammar errors</td>
<td>No spelling or grammar errors</td>
</tr>
<tr>
<td>Presentation organized</td>
<td>Brochure is organized</td>
<td>Presentation organized</td>
</tr>
<tr>
<td>Presentation practiced</td>
<td>Brochure looks nice</td>
<td>Presentation practiced</td>
</tr>
<tr>
<td>No more than 4 minutes</td>
<td>4 pictures used</td>
<td>3 pictures used</td>
</tr>
<tr>
<td>Script of video turned in</td>
<td>Pictures are relevant to argument</td>
<td>Pictures are relevant to argument</td>
</tr>
<tr>
<td>1 picture used</td>
<td></td>
<td>Minimum of 100 words</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Letter to Editor</th>
<th>Comic Strip</th>
<th>Powerpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear argument is made</td>
<td>Clear argument is made</td>
<td>Clear argument is made</td>
</tr>
<tr>
<td>Compared 3 educational resources</td>
<td>Compared 3 educational resources</td>
<td>Compared 3 educational resources</td>
</tr>
<tr>
<td>Used 4 quotes to support argument</td>
<td>Used 4 quotes to support argument</td>
<td>Used 4 quotes to support argument</td>
</tr>
<tr>
<td>No spelling or grammar errors</td>
<td>No spelling or grammar errors</td>
<td>No spelling or grammar errors</td>
</tr>
<tr>
<td>Presentation organized</td>
<td>Presentation organized</td>
<td>Presentation organized</td>
</tr>
<tr>
<td>Presentation practiced</td>
<td>Presentation organized</td>
<td>Presentation practiced</td>
</tr>
<tr>
<td>Must have title</td>
<td>Pictures colored</td>
<td>Presentation practiced</td>
</tr>
<tr>
<td>Minimum of 150 words, max of 250 words</td>
<td>Pictures relevant to cartoon</td>
<td>No more than 4 minutes</td>
</tr>
<tr>
<td>Must be typed</td>
<td>5 segment strip</td>
<td>4 pictures used</td>
</tr>
<tr>
<td></td>
<td>Minimum of 40 words</td>
<td>Pictures relevant to argument</td>
</tr>
<tr>
<td></td>
<td>Comic is educational</td>
<td>Minimum of 100 words</td>
</tr>
</tbody>
</table>

## Appendix IX: Group Project Checklist

### Group Project Checklist

<table>
<thead>
<tr>
<th>Checklist: All group members need to put their initials on the line provided</th>
<th>Group’s Comments</th>
<th>Teacher’s Comments</th>
</tr>
</thead>
</table>
- Filled out and turned in Job Duties paper
- Close read the article
- Discussed the article as a group
- Found the main idea of the article
- Found three direct quotes that support the main idea
- Properly cited three quotes
- Quotes are on poster
- Poster has our opinion about the article
- Pictures were drawn on poster
- Presenters are prepared to talk about poster

### Group Project Checklist

<table>
<thead>
<tr>
<th>Names:</th>
<th>Group’s Comments</th>
<th>Teacher’s Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checklist: All group members need to put their initials on the line provided</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Filled out and turned in Job Duties paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Close read the article</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Discussed the article as a group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Found the main idea of the article</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Found three direct quotes that support the main idea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Properly cited three quotes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Quotes are on poster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Poster has our opinion about the article</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Pictures were drawn on poster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Presenters are prepared to talk about poster</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Appendix X: Culminating Project Checklist

<table>
<thead>
<tr>
<th>Name:</th>
<th>Project:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Checklist: Opinion Project</th>
<th>Student’s</th>
<th>Teacher’s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix XI: Projects Phase One Graphic Organizer

Essential Question: To what extent do humans impact their environment?
My main idea/thesis (this is a statement that has your opinion in it that answers the essential question):

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

1. My first thought to support my main idea/thesis:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
2. A direct quote from one of our readings that agrees with/supports my first thought: * use "quotation marks” around this quote, punctuation goes inside the end quotation mark and use [brackets] around the title of the article the quote came from to properly cite the source. “Water becomes polluted by chemicals leaking into the ground.” [Groundwater Contamination]

3. Introduce your quote to your project: *this sentence will go before your quote and connects your first thought with your thesis and your quote

4. Explain why this quote agrees/supports your first thought: *this sentence will go after your quote

On a separate sheet of paper:
-Repeat this process by following numbers 1-4 three more times. Rewrite your sentences to be in the correct order
-Write an organized summary of your thoughts.
-Write a paragraph explaining why your opinion is important, why it matters to our local ecosystem, and why it matter to the world

Appendix XII: Differentiated Reading Articles

Below Grade Level:

Air Quality

You need to breathe to stay alive. But how clean is the air you breathe? If you breathe dirty air, you are more likely to develop health problems and become ill. Plants and animals need clean air too. A lot of the things that make our lives more comfortable such as cars, electricity and heating
can create bad gases which make the air dirty. The problem of air pollution started with the burning of coal in homes and factories. Dirty air is called 'polluted air'. 'Air pollution' is what we say to describe all bad gases in the air that we breathe and that are dangerous for us. But do not worry! Not all gases are bad!

**WHY IS BREATHING SO IMPORTANT?**

Take a few deep breaths. Can you feel your rib cage moving in and out? This opens up your lungs so that air is sucked in.

In the lungs, a gas called oxygen passes from the air into your blood. The oxygen is carried in the blood all round your body. You need oxygen so that you can use the energy in the food you eat. It is the oxygen in the air that helps keep you alive.

**BACK TO THE PAST**

500 years ago in Britain, the burning of coal was increasing in cities like London. Coal was used in factories and also used to heat homes. Coal, when burnt makes a lot of smoke, which makes the air very dirty.
About 200 years ago, the Industrial Revolution began in Britain. Factories were built, and even more coal was burnt. Air pollution was becoming a really big problem, especially when the weather was foggy. With foggy conditions and light winds the smoke or air pollution covered the whole city, and would not move.

Smoke and fog together create smog.
Smog was a big problem in the winter. Because of the cold weather, more coal was burnt to warm houses and this made more smoke.
When smog was stuck over a city, it became really hard to breathe and see clearly. In 1952, the Great London Smog occurred and more than 4000 people died because of the smog!
New laws were created from this catastrophe in 1956 and 1968, so that it would not happen again. These laws are called the 'Clean Air Acts'.
These laws were made so that air would become cleaner. The laws encouraged people to use less coal or use cleaner coal in their homes and switch to other fuels such as gas. Factories started using tall chimneys so that the smoke would go high up in the sky and would no longer cover cities, and new factories were built outside cities in the countryside. Smog occurred less often and the air became cleaner.

WHAT IS TODAY'S AIR POLLUTION LIKE?
Have you ever noticed that the air in a city smells different from air in the country? One of the reasons is that exhausts from vehicles give off fumes, or gases, which can poison you.
Today, when we think of air pollution, we should think of transport, especially cars. Today there are about 23 million vehicles on the road in Britain, and 20 million of them are cars! The fuel they use - petrol and diesel - releases a lot of pollution in the air.

The car exhausts eject a lot of bad gases, which create air pollution. These gases can be very dangerous for children. Although the fuels are becoming cleaner, it will not be making that much difference because there are more and more cars.

There is less pollution from coal, but today's modern world still creates air pollution. Today, air pollution has not really fallen, because new bad gases are released in the air, and there are a lot of them.

Transport is not the only reason why we have air pollution. Factories also release bad gases in the air, even with the 'Clean Air Acts', it still causes a lot of air pollution. This air pollution that they make is the main cause of acid rain (see Acid Rain).

**WHAT ARE THESE BAD GASES?**

**Gases from vehicles:**

*Carbon monoxide:* carbon monoxide is a gas that pollutes the air, and is mainly released by cars and other vehicles. It has no color or smell.

*Nitrogen oxides:* nitrogen oxides are emitted from vehicles, like cars and trucks. During rush hour periods, a lot more is released in the air. Nitrogen oxides are also emitted from power stations. These gases also make acid rain.

*Particulates:* particulates are very small particles, like soot, dust and fumes that are released in the air. They are caused by vehicles, factories and smoke from homes burning coal for heating.
Gases from factories:

*Nitrogen Oxides* (see above)

*Sulphur dioxide:* sulphur dioxide has no color. Most of it is released by power stations. In high amounts, it causes acid rain when mixing with water in the air.

Above Grade Level:

http://water.epa.gov/polwaste/nps/kids/middleschool/upload/stoppointless_article.pdf

At Grade Level:

The Environment
Land Pollution

What is land pollution?

When we first think of pollution we often think of trash by the side of the road. This type of pollution is called land pollution. Land pollution is anything that damages or contaminates the land.

Causes of Land Pollution

There are many causes of land pollution from the trash we throw away in our homes to waste produced at giant factories. Sometimes chemicals from the trash can contaminate the soil and eventually the groundwater we need for drinking.

- Garbage - The average person in the United States produces around 4 ½ pounds of trash every day! That's a lot of trash. Some of this trash gets recycled, but much of it ends up in a landfill or on the ground.

- Mining - Mining can directly destroy the land, producing large holes in the ground and causing erosion. It can also release toxic chemicals into the air and soil.

- Farming - We all need farms to eat, but agriculture has destroyed many ecosystems and animal habitats. Farming also produces a lot of pollution in the form of chemicals such as pesticides and herbicides. Animal waste from livestock can also pollute the soil and, eventually, the water supply.

- Factories - Many factories produce a significant amount of garbage and waste. Some of this waste is in the form of damaging chemicals. There are regulations in some countries to prevent harmful chemicals from getting dumped directly onto the land, but this is not the case in many countries.

Effects on the Environment

Land pollution can be one of the most visible types of pollution. You see trash outside of buildings or on the side of the road. You may see a large landfill or dump. This type of land pollution not only can hurt animals and their habitats, but also is ugly and destroys the beauty of nature.
Other types of land pollution like mining, farming, and factories can allow for harmful chemicals to enter into the soil and water. These chemicals can cause animals and plants to die, disrupting the food chain. Landfills release the greenhouse gas methane, which may lead to global warming.

**Effects on Health**

Different kinds of land pollution have been known to have adverse affects on the health of animals and humans. The harmful chemicals that can get into the soil and water can cause cancers, deformities, and skin problems.

**Landfills**

Landfills are areas where garbage is placed in the land. Modern landfills in developed countries are designed to keep harmful chemicals from polluting the water. Some of the newest landfills even try to capture methane gas from escaping and use it do produce energy. In the United States there are a lot of laws and regulations to try and keep landfills from harming the environment.

**What is biodegradable?**

Trash that is made of organic substances will eventually decay and become a part of the environment. This type of trash is called biodegradable. Different types of materials take different amounts of time to decay. Paper can decompose in around a month, but it takes a plastic bag over 20 years to decompose. Scientists predict that it could take a glass bottle about 1 million years to biodegrade and that some materials, like Styrofoam, will never biodegrade.

**Piles of garbage in a scrap heap**

**What can you do to help?**

Here are four things people can do to reduce land pollution:

1. Recycle - Around 33 percent of trash in the United States is recycled. When you recycle you add less land pollution.
2. Produce less trash - Some ways to reduce trash include not using a napkin or paper towel unless you absolutely need one, drinking water from a cup rather than a plastic bottle, and being sure to properly dispose of harmful trash like batteries and computer equipment.
3. Pick up trash - Don't be a litter bug! Also, you can help out by picking up trash when you see it lying around. Kids make sure to ask your parents for help before you pick up strange trash.
4. Composting - Get with your parents or school and start a compost heap. Composting is when you collect organic waste and store it so it breaks down to where it can be used for fertilizer.
Facts about Land Pollution

- In 2010, the United States generated about 250 million tons of trash. Around 85 million tons of trash was recycled.

- The amount of trash per person in the United States has dropped over the last 10 years. In the last five years, the total amount of trash has dropped. At the same time, recycling rates have risen. This is good news!

- One way to reduce the amount of trash is for companies to use less packaging on products. Things like smaller bottle caps, thinner plastic, and more compact packaging has played a major role in reducing the amount of trash.

- Certain types of litter can kill animals when they get tangled or caught in it.

- Around 40 percent of the lead in landfills is due to improper disposal of computers and other electronic equipment.