Got Gas? - Fourth and Fifth Grades

Purpose

Students will study the effect of greenhouse gases on plants and how they can best practice safe gardening when using a greenhouse to grow plants.

Subject Area(s)

English Language Arts, and Science

Common Core/Essential Standards

ELA

- **CCSS.ELA-LITERACY.RL.4.3**
  Describe in depth a character, setting, or event in a story or drama, drawing on specific details in the text (characters thoughts, words, or actions).
- **CCSS.ELA-LITERACY. RL. 5.3**
  Compare and contrast two or more characters, settings, or events in a story or drama drawing on specific details in the text.
- **CCSS.ELA-LITERACY.RL.5.4**
  Determine the meaning of words and phrases as they are used in a text, including figurative language such as metaphors and similies.

SCIENCE

- **4.PHYSICAL SCIENCE: ENERGY CONSERVATION**
  Recognize that energy takes various forms that may be group based on their interaction with matter.
  Recognize the basic forms of energy (light, sound, heat, electrical, and magnetic) as the ability to cause motion or create change.
- **5. E.11 EARTH SCIENCE: EARTH SYSTEMS, STRUCTURES AND PROCESSES**
  Understand weather patterns and phenomena, making connections to the weather in a particular place and time.

Agricultural Literacy Outcomes

Science, Technology, Engineering & Mathematics

- Describe how technology helps farmers/ranchers increase their outputs (crop and livestock yields) with fewer inputs (less water, fertilizer, and land) while using the same amount of space.

- Identify examples of how the knowledge of inherited traits is applied to farmed plants and animals in order to meet specific objectives (i.e., increased yields, better nutrition, etc.).

Plants and Animals for Food, Fiber and Energy Outcomes

- Distinguish between renewable and non-renewable resources used in the production of food, feed, fuel, fiber (fabric or clothing) and shelter.
- Explain how the availability of soil nutrients affects plant growth and development.

Essential Questions

1. What are greenhouses made of?
2. What function does a greenhouse serve?
3. Identify and explain the new vocabulary words.
4. How do farmers grow food in cold, wet months of the year?
5. What recycled materials can make a greenhouse?
6. What is greenhouse gas?
7. What is the greenhouse effect on plants?
8. How can you help plants grow in a greenhouse?
9. What does a greenhouse need in order to keep plants alive?
10. How would you best share what you learned today with someone who owns a greenhouse?

Vocabulary

Greenhouse Effect: warming of the Earth's atmosphere.
Energy: usable power.
Greenhouse Gases: carbon dioxide, methane, water vapor, nitrous oxide.
Longwave Radiation: infrared rays.
Shortwave Radiation: visible light, uv rays.
Electromagnetic Spectrum: all wavelengths from radio to visible light waves.
Infrared Heat: heat in the form of light.
Visible Light: the light we can see.
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Student Motivator

On chart paper, draw out a KWL chart with a"K" for what I know, "W" for what I want to know, and "L" for what I want to learn and hand out a copy to each student. The template can be found as an **Essential File**. Gather students to complete the chart with the teacher. Ask students what they know about greenhouses. Share out pictures of greenhouses with students who are unfamiliar. Then ask students what they would like to know about greenhouses, students should be encouraged to talk with a partner about what they want to learn more about.

At the end of the lessons, students will record what they learned about greenhouses to fill in the last column of the KWL chart. They will reflect on what was taught, experiments they conducted, and what they can take with them from the activities.

Background Knowledge

The *Greenhouse Kids* novel by Shelly Awad is a novel series that shares the stories of students who solve mysteries in their local greenhouse. Each character has a name and trait that represents some aspect of the greenhouse for example, Dan Delion. In the first book of the series, Dan Delion sets out hunting bugs and discovers a secret that is much too big to keep to himself. He shares his secret with the other Greenhouse Kids, Holly Hocks, Johnny Jump-Ups and Foxy Gloves. The Greenhouse Kids never imagined the mysterious adventure that was about to unfold. The mystery - educational series will surely please readers of ages 8 to 12, in 4^{th}, 5^{th}, and 6^{th} grades.

Greenhouses are major functions of the farming industry because they allow us to eat fruits and vegetables 365 days a year with regulated soil temperatures, plant food, and water. Greenhouses are making appearances on top of roof tops in major cities to teach students how to grow food too! As a result of plants being contained in a space, there are greenhouse gases that must be controlled in order to keep the plants healthy and safe for the consumer. Farmers are working on ways to use the greenhouse gases as energy to power other parts of the farm. An example of this is methane gas being used as a power source for electricity.

Climate changes affect how we grow our food by causing weather conditions to become less stable for farmers. As a result, scientists are studying ways to teach citizens how to reduce gases that get released into the atmosphere. Students are critical in helping become citizens who create ways to reduce the carbon footprint. The Reduce, Reuse, and Recycle campaign is a good, solid beginning for students to think about how their actions affect the environment around them.

Procedures

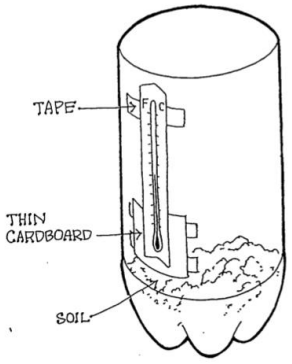
Activity 1

1. Divide students into even groups; 4, 6, 8 and give each group 16 3x5 index cards.
2. On 8 of the index cards, students will record the vocabulary words in bold presented in this lesson.
3. On the remaining 8 of the index cards, students will record the definitions of the vocabulary words presented in this lesson.
4. After cards are complete, students will choose a place in the classroom to post the vocabulary index cards with masking tape.

5. The 8 defintiion cards will be given to a student identified as the “caller”. This student will call out the definition as students try to compete for the correct answer.
6. Divide the students (without the caller) into two lines and hand two students flyswatters. As the caller shares out a definition, the two front students will use the swatter to choose the correct answer from the index cards posted in the classroom.
7. The student with the correct answer will remain in place, the student with the incorrect answer will retreat to the back of the line and let the person behind them have a turn.
8. Challenge: Have student winners from each small group compete against each other for a class winner.

Activity 2

1. Students will tape a thin piece of cardboard over the bulb of each thermometer to protect it from direct heat.
2. Students will add two centimeters of soil to each bottle
3. Tape a thermometer to the side of each bottle about 2 inches from the top and above the level of the soil.
4. Instruct students to place plastic wrap over the top of one of the bottles and tape (or rubberband) it shut. The other should remain uncovered.
5. Both bottles should be placed in direct sunlight or under a sun lamp.
6. Students will measure and record temperatures in each bottle every 15 minutes. The Data Table provided will serve as a template to record the information.
7. Have students journal what they are seeing, what changes they are seeing, and make predictions on what would happen next if; the covered bottle was hotter, more water was added to one bottle and not the other
8. Ask students to share out in pairs what would cause a climate change, water change, or environment change for the two plants.



DATA TABLE:

TIME (minutes)	BOX TEMPERATURES	
	COVERED (° C)	UNCOVERED (° C)
0		
1		
2		
3		
4		
5		
6		
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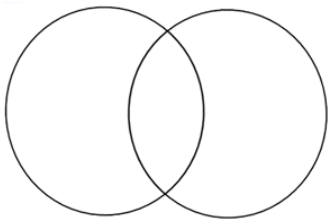
Activity 3

1. Have students save or collect an egg carton from their home.
2. With a pair of scissors punch a hole into the top of the egg carton (closed) and cut a rectangle to expose the inside of the egg carton bottom.
3. Fill each pocket of the egg carton bottom with soil and one mystery seed (your choice, students will not know the seed type).
4. Dampen the soil with a few drops of water using a medicine dropper; 10-12 drops of water
5. Close the egg carton and cover the hole (in the top) with a piece of plastic wrap taped over the hole
6. Place the greenhouse in a well lit area and observe the seed's growth over the next few days.
7. A detailed picture can be found here: http://www.instructables.com/id/Mini-greenhouse-with-plastic-egg-carton/
8. After planted, have students write what they think their seed will produce. Have them write why they believe the seed will turn into the fruit or flower, how it will look, and predict how long it will take for the seed to grow.

Activity 4

1. As the class is reading the novel, *The Greenhouse Kids* by Shelley Awad, have students create a character map of the main character, Dan Delion.
2. Give each student a character map worksheet and have them design what Dan Delion looks like with specific details described in the book.
3. Students should color, design, and create specific character traits on the worksheet to share their understanding of the character.
4. Have students complete the sentences to the side of the worksheet.
5. Students will answer the following questions on a separate sheet of paper; *How do we know Dan Delion is the main character? What makes him different than the other chracters? Does Dan Delion change his behavior in the novel?*
6. Students share out their answers with a partner or in whole group setting.

7. An additional Character Map Worksheet can be provided to have students outline a separate character in the novel.
8. Compare and Contrast the two characters with a Venn Diagram; what makes them different, similar?



Materials

- 3x5 index cards
- small plant
- medicine dropper
- 2 halved plastic soda bottles
- 2 thermometers (flexible)
- masking tape
- plastic wrap
- scissors
- colored pencils
- graph paper
- dark soil
- sunlamp or direct sunlight
- Egg Carton
- Soil
- Seeds (variety for mystery writing activity)
- plastic wrap
- sharpie
- clean fly swatters
- masking tape

Suggested Companion Resources

- School Greenhouse Guide
  http://www.kidsgardening.org/node/1004
- Greenhouse Gardner's Companion
  http://www.amazon.com/Greenhouse-Gardeners-Companion-Revised-Sunspace/dp/1555914500
- All about Greenhouse Gardening; Producing Food 365 days a year
  http://www.amazon.com/s/ref=sr_pg_2?rh=n%3A283155,k%3Akids+greenhouse&page=2&keywords=kids+greenhouse&ie=UTF8&qid=1438851223

- The Greenhouse Kids
  http://www.greenhousekids.com

Essential Files

- *Greenhouse Gas Data Chart*
- *KWL Chart*
- *Character Map Worksheet*

Essential Links

- Vocabulary Smack
  https://www.teachingenglish.org.uk/article/slap-board-a-vocabulary-revision-activity
- Teaching about Climate Change
  http://climatekids.nasa.gov/menu/teach/
- Egg Carton Greenhouse
  http://www.instructables.com/id/Mini-greenhouse-with-plastic-egg-carton/
- Teaching the Greenhouse Effect
  http://www.esrl.noaa.gov/gmd/outreach/lesson_plans/Modeling%20the%20Greenhouse%20Effect.pdf

Ag Facts

- The largest single site greenhouse is located in Huntersville, NC-Metrolina Greenhouse.
- Agriculture and Forestry are responsible for 1/3 of all greenhouse gases.
- A greenhouse size can range from a small container to a large heated, glass space to carry several plant varieties.
- Greenhouses serve the purpose to produce food in the colder months or help hearty, tropical plants survive in regulated temperatures.
- NC ranks 4th nationally in greenhouse sales with $832 million dollars reported annually.
- Nursery and Greenhouse crops are the 3rd leading source of farm income.
- Over 2,000 varieties of woody ornamental plants are grown in NC.
- 97 of NC's 100 counties reported income from a Nursery or Greenhouse.

Extension Activities

Have students create a greenhouse structure out of recycled materials in the classroom (paper, plastic, tape, glue, string). Students will create a structure that could let in sunlight as well as release built up gas within the greenhouse. After completion of the structure, have students write about their design and tell their idea for keeping plants healthy in the greenhouse. Ask students to consider these questions; *what*

type of plants would grow best in my greenhouse and why? How do I get sunlight in the greenhouse? How do I keep the plants watered? What could I add to my greenhouse that would make it better?

Sources & Credits

- http://www.wordcentral.com
- http://ncfieldfamily.org/farm/high-tech-horticulture-north-carolina-nurseries/
- http://www.ncipl.org/wp-content/uploads/2013/03/Thingsyoushouldknow.pdf
- http://www.encyclopedia.com/topic/greenhouse.aspx
- http://www.ncagr.gov/markets/commodit/horticul/ornment/
- http://www.borealispress.com/BookSeries/sid/5/Greenhouse
- http://greenhousekids.com/ecom.asp?pg=default
- https://s-media-cache-ak0.pinimg.com/736x/c3/67/0a/c3670aec1f9715e33dea7af1aeac2f87.jpg

Character: _____

Title: _____

Three character traits that describe this character are:

1. _____
2. _____
3. _____

Does:

I know that _____ is _____ because in the story he/she _____

_____

_____

_____

Says or thinks:

I know that _____ is _____ because in the story he/she _____

_____

_____

_____

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KNOWLEDGE REFLECTION CHART

Created by Natasha Hutchins at www.prodiviame.com

K	W	L
I already **KNOW** .... *Pre-Assessment*	I **WANT** to know .... *Pre-Assessment*	I have **LEARNED** .... *Summative Assessment*