



# Utility Exploration Center Unit Plan



## Powering Roseville: Creating Our Energy Future

### Grade

4th

### NGSS standards

[4-ESS3-1](#)

[4-PS3-4](#)

### Time

4.5 hours, spread over  
multiple days

**Knowing how energy is generated and the effects that different ways of generating energy have on the environment helps us make plans to ensure clean and reliable electricity into the future.**

### Description

Energy and electricity are vitally important to our lives, but are often taken for granted. Students will perform hands-on exploration of where energy comes from, how we harness it and what effects harnessing might have on the environment. Students will finish the lesson with an appreciation for energy and an understanding of the complexities of the world's energy future.

### Materials List

#### 1 per student:

- Pencil
- Poster board or slide presentation software
- Paper bag with 100 beads, beans, candies or goldfish in 2 colors
- Extra plastic bag or small container
- Calculator

#### Additional materials:

- Skewers
- Scissors and tape
- Paper clips
- Ingredients for S'mores
- 2 glass jars with lids
- Baking soda and vinegar
- 3 thermometers
- 2 glass jars without lids
- Small piece aluminum foil
- Matches or lighter and candle
- Piece of paper or tissue
- Ice cubes

#### Example materials for Explore section (suggested but not all required):

- Paper in different colors
- Tissue paper
- Foil and plastic wrap
- Plastic water bottle or other plastic
- Paper bag
- Foam of different thicknesses and colors
- String
- Leaves and sticks
- Corks
- Cardboard (i.e. sheets, boxes, paperboard, corrugated)



## Performance Expectation(s)

- Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- Apply scientific ideas to design, test and refine a device that converts energy from one form to another.

## Phenomena / Essential Question(s)

**Phenomena:** An egg frying in a hot car and a bicyclist generating enough electricity to power a blender

**Essential Question(s):** Where does energy come from? How do we use energy? How do we create electricity? In what forms can energy be found? What are the effects of harnessing energy to create electricity?

## Specific Learning Outcomes

After students:

- explore the different renewable and non-renewable sources used to generate energy,
- create their own device to generate usable energy and
- explore how electricity shapes their lives,

they will be able to describe the effects that different energy sources have on the environment and how to minimize those effects.

## NARRATIVE / BACKGROUND INFORMATION

### Prior Student Knowledge

- **K-ESS3-3.** Communicate solutions that will reduce the impact of humans on the land, water, air and/or other living things in the local environment.
- **K-2-ETS1-1.** Ask questions, make observations and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- **K-2-ETS1-2.** Develop a simple sketch, drawing or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- **2-PS1-2.** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- **3-5-ETS1-1.** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or cost.

### Life Experience

- Students have used electricity, such as turning on a light.
- Students have probably observed renewable sources of energy, such as feeling the heat of the sun on a hot day or even observing something melt from the heat of the sun.
- Students may have observed a pinwheel or wind chimes move on a windy day.
- Students may have solar panels on their own homes.



## Science & Engineering Practices (SEPs)

Obtaining, Evaluating and Communicating Information:

- Obtaining, evaluating and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods.
- Obtain and combine information from books and other reliable media to explain phenomena.

Constructing Explanations and Designing Solutions:

- Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.
- Apply scientific ideas to solve design problems.

## Disciplinary Core Ideas (DCIs)

ESS3.A: Natural Resources

- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

PS3.B: Conservation of Energy and Energy Transfer

- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.

PS3.D: Energy in Chemical Processes and Everyday Life

- The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use.

ETS1.A: Defining Engineering Problems

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary)

## Crosscutting Concepts (CCCs)

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change.

Connections to Engineering, Technology and Applications of Science

Interdependence of Science, Engineering, and Technology

- Knowledge of relevant scientific concepts and research findings is important in engineering.

Influence of Engineering, Technology and Science on Society and the Natural World

- Over time, people’s needs and wants change, as do their demands for new and improved technologies.

Energy and Matter

- Energy can be transferred in various ways and between objects.

Connections to Engineering, Technology and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Engineers improve existing technologies or develop new ones.

Connections to Nature of Science

Science is a Human Endeavor

- Most scientists and engineers work in teams.
- Science affects every day life.



## Teacher Background Information

[This document](#) provides background information about energy sources and the effects of electricity generation. There are links to additional resources to help you support your students on this journey.

## Possible Preconceptions/Misconceptions

**Misconception:** All energy is limitless.

**Truth:** There are two types of energy sources that humans can use to meet their needs: renewable and non-renewable. Renewable energy is a source that can be used to generate electricity repeatedly, such as solar, wind and hydroelectric power. Non-renewable sources, like coal, oil and gas, can only be used once, when they are incinerated.

**Misconception:** When we use electricity in our homes it just “appears” out of nowhere.

**Truth:** In Roseville, energy may come from a variety of sources including natural gas and solar panels at the Roseville Energy Park, hydroelectric power produced at Folsom Dam, and wind, residential solar or geothermal power.

**Misconception:** Renewable energy is always better.

**Truth:** Renewable and non-renewable energy both have positive and negative consequences.

## Distance Learning Variations

[This document](#) contains suggestions for providing this lesson when in a distance learning situation.

## LESSON PLAN – 5E MODEL

\* Refer to [Guiding Questions](#) to guide discussion of phenomena and compile a list of student questions.



## ENGAGE

Estimated time: 25 minutes

**Observe 2 types of energy we can harness (heat and movement). Students begin to think about energy sources.**

- What if we want to make breakfast but can't use our kitchen?
- Watch [“The Bike Blender” video](#) (1:21 minutes) showing someone making a smoothie with a bicycle.
- Watch [Cooking video](#) (0:34 minutes) showing someone cooking bacon and eggs in a hot car.

**Brainstorm ideas about energy based above phenomena.**



## Energy scavenger hunt: How do you experience energy every day?

- Students search their homes or school for evidence of energy using the [Scavenger Hunt Worksheet](#).
- Goal: To help students develop a greater understanding of energy in their everyday lives and begin considering what sources of energy we use to generate electricity.

**“Exit Ticket”:** Check students’ Scavenger Hunt Worksheet.



# EXPLORE

Estimated time: 45 minutes

**Discuss the results of their energy investigation.**

**Compile a list of energy sources without defining.**

- Lead a discussion toward a comprehensive list of energy sources that include: coal, oil and natural gas; wind, hydroelectric, wave and tidal, solar, biomass, nuclear and geothermal.

**Watch [“What is Energy” video](#) (1:41) that introduces energy and sources.**

**Assign the energy sources to student teams to research and create a poster they will present to the class.**

- Steps to create presentation:
  1. Read and watch resources [Student Research Resources](#) (videos and readings) related to specific energy source.
  2. [Student Energy Topics Index](#): Many of the videos linked in the Student Research Resources document above are sourced from this index. There is a lot of great information on energy sources from this website. Students may be encouraged to explore more if you provide this link to them as well.
  3. Fill out [Energy Source Poster Outline Worksheet](#) including a pros/cons list of their energy source using information gathered from research.
  4. Create poster using content from outline.
  5. Present poster (in class or using [Flip Grid](#)).

**“Exit Ticket”:** Check students’ Poster Outline Worksheet for understanding.



## EXPLAIN

Estimated time: 25 minutes

**Discuss discoveries from research, including renewable vs. non-renewable.**

**Distribute [Vocabulary List](#).**

**Watch [Energy 101: Energy Generation video](#) (by Energy Now).**

- Transition: As the video states near the end, access to electricity is vitally important, and energy resources are limited. In the next activity, we'll explore how to make the most out of our energy sources.

**Assign the [Renew-A Bead Worksheet](#).**

- Students observe the differences between renewable and non-renewable energy resources by modeling energy use with beads.

**“Exit Ticket”:** Check students’ [Renew-a-Bead Activity Worksheet](#).



## EXPLORE

Estimated time: 1 hour

**Explore energy sources by trying to generate your own energy.**

- Students design, test and refine a device to convert a renewable energy source (solar, wind or water) into usable energy in order to accomplish a task, using [Design Process Worksheet](#) to guide activity.

**Present a build challenge and ask students which energy source would be best to accomplish the challenge.**

- This section will help students know how to complete the “Ask” portion of the Design Process Worksheet.



## Determine what materials work best for the device of their choice:

### Solar Oven

- Students observe materials of their choice in the sun, and then make and record observations about how hot they got.
- Materials could include cardboard in different forms, foil, plastic wrap, paper or foam of different colors.
- Using these observations, students then design a device to melt the chocolate in a S'more.
- Teacher can show [Examples of Solar Ovens](#).

### Wind Turbine

- Students observe different materials moving in front of a fan and record observations.
- Materials could include string, paper, cardboard, tissue or tissue paper, foil, plastic, leaves, sticks.
- Students use these observations to help them design a device to capture wind energy to lift/raise paperclips.
- Teacher can show [Examples of Wind Turbines](#) and [Moving Wind Turbines video](#).

### Water-powered Turbine

- Students observe different materials moving under a stream of water from a faucet or hose and record observations.
- Materials could include plastic wrap, foil, paper, cardboard, plastic (like from a water bottle), leaves, sticks.
- These observations help students design a device to capture water energy to lift/raise paperclips.
- Teacher can show [Examples of Water Turbines](#) and [Water Turbines in Action video](#).

## Examples of devices

- Students have freedom to draw and test out their ideas, using the knowledge they gained from their previous observations. Check out Teacher Background information for example instructions for the three projects to help guide students.
- After testing, students brainstorm improvements they could make to their device and record in the appropriate section of the Design Process Worksheet.

**“Exit Ticket”:** Check students’ Design Process Worksheet for understanding and proper planning.



# EXPLAIN

Estimated time: 45 minutes

## Discuss the pros/cons of the different energy sources.

- Emphasize renewable versus non-renewable energy.

## Students combine the knowledge they’ve gained about different energy sources and apply it to a real world scenario.

- [Powering Roseville Activity](#) - Students decide how to best power parts of Roseville by considering how much power a source generates, the cost to produce the power and any emissions created by using that energy source. Activity can be done individually or in small groups.



- [Energy City Online Game](#) (requires Flash Player) - Power a city over a 10 year period while balancing a budget, local and global environmental effects and the wishes of local stakeholders. Game takes about 30 minutes (or more) to play. To get the most out of the experience, click on the “Learn More!” button before you start the game.

**“Exit Ticket”:** Check students’ [Powering Roseville Activity Worksheet](#) and discussions regarding what they learned. Or, after playing the [Energy City Online Game](#), discuss results of game.



## ELABORATE

Estimated time: 30 minutes over 2 days

### DAY 1:

#### What effect does electricity generation have on the environment?

##### Observe effects of burning fossil fuels on the environment.

- Conduct [3 Experiments](#) on greenhouse gas and burning fossil fuels.
- If you are unable to conduct experiments because of lack of materials or distance learning constraints, substitute the following videos:
  1. [Greenhouse Gas Experiment](#) (3:05 minutes)
  2. [Smog in Jar Experiment](#) (4:18 minutes)
  3. [Soot Experiment](#) (1:50 minutes)
- Watch [“Earth Minute” video](#) (1:42 minutes) from NASA on greenhouse gases to help explain what they observed.

**Brainstorm a list of effects based on experiments and research, including: climate change, air and water pollution, acid rain, generation of hazardous waste, habitat destruction.**

##### Watch videos to explain environmental effects of climate change:

- [“Climate Change: Earth’s Giant Game of Tetris”](#) (2:48 minutes)
- [“Carbon and Climate Change in 90 Seconds”](#) (2:20 minutes)

##### How can we minimize the negative effects of generating energy?

- Watch [“Can 100% Renewable Energy Power the World?” video](#) (5:54 minutes)



## DAY 2:

Explore this [Interactive Map](#) to see how different places around the world could be powered by 100% renewable sources in the future.

### Examine how California is planning its energy future.

- Explore where California gets its energy, [U.S. Energy Information Administration](#). Click on the tabs including consumption by sector, electricity and production.
- According to CA Senate Bill 100 (approved in September 2018), by 2045, California will be required to generate 100% of its electricity from renewable sources with zero carbon emissions. For more information, visit the [California Energy Commission](#).

### How is Roseville planning its energy future?

- Explore where Roseville gets its electricity, [Power Content Label](#).
- Learn about [Solar Energy and Roseville Electric Utility](#).
  1. Roseville Electric Utility has been one of the top ten cities in the country for most solar power per customer (2017).
  2. Roseville Electric Utility has also implemented a community solar project that produces enough electricity to power 200 homes. For more information, check out this short [Community Solar video](#) or visit the project's [website](#).
- Learn about the new biodigester at the [Pleasant Grove Wastewater Treatment Plant](#):
  1. The leftover sludge, called biosolids, that in the past were directly sent to the landfill, will instead be used to generate methane gas, which will be used to power a fleet of garbage trucks.
  2. Minute Earth's ["How to Turn Poop into Power" video](#) (3:07) helps to explain the process.

**"Exit Ticket":** Students answer the question, "What do you think our energy future, here in Roseville or in California, will look like in 25 years?" Students draw a picture answering this question based on everything they've learned.



## EVALUATE

Estimated time: completed during above sections/no additional time

### Formative Monitoring (Guiding Questions / Discussion):

- Checking worksheets: Energy Scavenger Hunt, Poster Outline, Renew-a-Bead Activity, Design Process, Powering Roseville Activity
- Discussions throughout unit: renewable vs. non-renewable, pros and cons of energy sources, effects of generating electricity, the future of energy (in the world, country, and state)



## Summative Assessment (Quiz / Project / Report):

- Energy source presentation
- Drawing of energy converting device on Design Process Worksheet
- Completed energy converting device
- Drawing forecast of our energy future in California/Roseville in 25 years

## Standardized Testing (CAST) Connection

- CAST test in 5th grade is likely to include a questions on how the design of an object or project affects its success (see page 24 of [CAST Scoring Guide](#)), a concept that is covered in the second Explore section by designing and building a renewable energy device.

## COMMON CORE STATE STANDARDS CONNECTIONS

### ELA

- W.4.7 - Conduct short research projects that build knowledge through investigation of different aspects of a topic.
- W.4.8 - Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
- W.4.9 - Draw evidence from literary or informational texts to support analysis, reflection, and research.
- SL.4.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
- L.4.6 - Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal precise actions, emotions, or states of being (e.g., quizzed, whined, stammered) and that are basic to a particular topic (e.g., wildlife, conservation, and endangered when discussing animal preservation).

### MATH

- 4.OA.A.3 - Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (Powering Roseville Activity)
- 4.NBT.B.4 - Fluently add and subtract multi-digit whole numbers using the standard algorithm. (Powering Roseville Activity)
- 4.NBT.A.1 - Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. For example, recognize that  $700 \div 70 = 10$  by applying concepts of place value and division. (Renew-A-Bead Activity)



## Resource Links:

In case hyperlinks above get broken, here is a detailed list of links.

**ESS3-1:** [www.nextgenscience.org/pe/4-ess3-1-earth-and-human-activity](http://www.nextgenscience.org/pe/4-ess3-1-earth-and-human-activity)

**PS3-4:** [www.nextgenscience.org/pe/4-ps3-4-energy](http://www.nextgenscience.org/pe/4-ps3-4-energy)

**K-ESS3-3:** [www.nextgenscience.org/pe/k-ess3-3-earth-and-human-activity](http://www.nextgenscience.org/pe/k-ess3-3-earth-and-human-activity)

**K-2-ETS1-1:** [www.nextgenscience.org/pe/k-2-ets1-1-engineering-design](http://www.nextgenscience.org/pe/k-2-ets1-1-engineering-design)

**K-2-ETS1-2:** [www.nextgenscience.org/pe/k-2-ets1-2-engineering-design](http://www.nextgenscience.org/pe/k-2-ets1-2-engineering-design)

**2-PS1-2:** [www.nextgenscience.org/pe/2-ps1-2-matter-and-its-interactions](http://www.nextgenscience.org/pe/2-ps1-2-matter-and-its-interactions)

**3-5-ETS1-1:** [www.nextgenscience.org/pe/3-5-ets1-1-engineering-design](http://www.nextgenscience.org/pe/3-5-ets1-1-engineering-design)

**Teacher Background Information:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**Distance Learning Variations:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**Bike Blender Video:** [www.youtube.com/watch?v=y-4bloOlw74&feature=emb\\_title](http://www.youtube.com/watch?v=y-4bloOlw74&feature=emb_title)

**Cooking Bacon and Eggs Video:** [www.youtube.com/watch?v=Wz-ozwrljbM&feature=emb\\_title](http://www.youtube.com/watch?v=Wz-ozwrljbM&feature=emb_title)

**Guiding Questions and Discussion Points:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**Energy Scavenger Hunt Worksheet:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**“What is Energy” Video:** [www.youtube.com/watch?v=wyVF6R9e6xE&feature=emb\\_title](http://www.youtube.com/watch?v=wyVF6R9e6xE&feature=emb_title)

**Student Research Resources (Readings and Videos):** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**Poster Outline Worksheet:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**FlipGrid:** [info.flipgrid.com](http://info.flipgrid.com)

**Vocabulary List:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**“Energy 101: Energy Generation” Video:** [www.youtube.com/watch?v=20Vb6hILQ5g](http://www.youtube.com/watch?v=20Vb6hILQ5g)

**Renew-a-Bead Activity Worksheet:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**Design Process Worksheet:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**Images of Project Examples:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**Wind Turbines Moving Video:** [www.youtube.com/watch?v=VXcTSTUPgQ&feature=emb\\_title](http://www.youtube.com/watch?v=VXcTSTUPgQ&feature=emb_title)

**Water Turbines Moving Video:** [www.youtube.com/watch?v=kA\\_zNhyN6Fw&feature=emb\\_title](http://www.youtube.com/watch?v=kA_zNhyN6Fw&feature=emb_title)

**Renewable Energy Video:** [www.youtube.com/watch?v=KEeH4EniM3E&feature=emb\\_title](http://www.youtube.com/watch?v=KEeH4EniM3E&feature=emb_title)

**Energy City Online Game:** [games4sustainability.org/gamepedia/energy-city/](http://games4sustainability.org/gamepedia/energy-city/)

**Powering Roseville Activity Worksheet:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**Air Pollution Experiments Handout:** [www.roseville.ca.us/grade4](http://www.roseville.ca.us/grade4)

**Greenhouse Gas Experiment Video:** [www.youtube.com/watch?v=f2qAd1sEsBA&feature=emb\\_title](http://www.youtube.com/watch?v=f2qAd1sEsBA&feature=emb_title)



**Smog in a Jar Experiment Video:** [www.youtube.com/watch?v=RoAjQA6KJSA&feature=emb\\_title](http://www.youtube.com/watch?v=RoAjQA6KJSA&feature=emb_title)

**Soot Experiment Video:** [www.youtube.com/watch?v=RU\\_Nobzk60o&feature=emb\\_title](http://www.youtube.com/watch?v=RU_Nobzk60o&feature=emb_title)

**NASA Earth Minute on Greenhouse Gases Video:** [www.youtube.com/watch?v=K9kga9c0u2l&feature=emb\\_title](http://www.youtube.com/watch?v=K9kga9c0u2l&feature=emb_title)

**“Climate Change: Earth’s Giant Game of Tetris” Video:** [www.youtube.com/watch?v=ztWHqUFJRTs&feature=emb\\_title](http://www.youtube.com/watch?v=ztWHqUFJRTs&feature=emb_title)

**“Carbon and Climate Change in 90 Seconds” Video:** [www.youtube.com/watch?v=uvfXYM6J4m4](http://www.youtube.com/watch?v=uvfXYM6J4m4)

**“Can 100% Renewable Energy Power the World?” Video:** [www.youtube.com/watch?v=RnvCbquYelM&feature=emb\\_title](http://www.youtube.com/watch?v=RnvCbquYelM&feature=emb_title)

**Thesolutionsproject.org interactive map:** [thesolutionsproject.org/why-clean-energy/#/map/countries/location/ALL](http://thesolutionsproject.org/why-clean-energy/#/map/countries/location/ALL)

**U.S. Energy Information Administration Website:** [www.eia.gov/state/?sid=CA#tabs-5](http://www.eia.gov/state/?sid=CA#tabs-5)

**Roseville Power Content Label:** [www.roseville.ca.us/UserFiles/Servers/Server\\_7964838/Image/Electric/2018%20City%20of%20Roseville%20Power%20Content%20Label.jpg](http://www.roseville.ca.us/UserFiles/Servers/Server_7964838/Image/Electric/2018%20City%20of%20Roseville%20Power%20Content%20Label.jpg)

**Article on Roseville and Solar Power:** [www.roseville.ca.us/cms/one.aspx?portalId=7964922&pageId=8945546](http://www.roseville.ca.us/cms/one.aspx?portalId=7964922&pageId=8945546)

**Roseville Community Solar Video:** [www.youtube.com/watch?v=H2Ye3Xw2mhM&feature=emb\\_title](http://www.youtube.com/watch?v=H2Ye3Xw2mhM&feature=emb_title)

**Roseville Community Solar Website:** [www.rosevillecommunitysolar.com/about](http://www.rosevillecommunitysolar.com/about)

**Information on Biodigester:** [www.roseville.ca.us/cms/One.aspx?portalId=7964922&pageId=16723418&fbclid=IwAR3x7rv\\_NjoYD7fzIAZZzvUavzxrUIWbOWYYPZfEH\\_lyjyn4WCb-jQE3dZg](http://www.roseville.ca.us/cms/One.aspx?portalId=7964922&pageId=16723418&fbclid=IwAR3x7rv_NjoYD7fzIAZZzvUavzxrUIWbOWYYPZfEH_lyjyn4WCb-jQE3dZg)

**“How to Turn Poop into Power” video:** [www.youtube.com/watch?v=JYda2v94dgc&feature=emb\\_title](http://www.youtube.com/watch?v=JYda2v94dgc&feature=emb_title)

**CAST Scoring Guide:** [www.caaspp.org/rsc/resources/CAST.practice-scoring-guide-gr5.2018-19.pdf](http://www.caaspp.org/rsc/resources/CAST.practice-scoring-guide-gr5.2018-19.pdf) W.4.7: <http://www.corestandards.org/ELA-Literacy/W/4/7/>

**W.4.8:** [www.corestandards.org/ELA-Literacy/W/4/8/](http://www.corestandards.org/ELA-Literacy/W/4/8/)

**W.4.9:** [www.corestandards.org/ELA-Literacy/W/4/9/](http://www.corestandards.org/ELA-Literacy/W/4/9/)

**SL.4.1:** [www.corestandards.org/ELA-Literacy/SL/4/1/](http://www.corestandards.org/ELA-Literacy/SL/4/1/)

**L.4.6:** [www.corestandards.org/ELA-Literacy/L/4/6/](http://www.corestandards.org/ELA-Literacy/L/4/6/)

**4.OA.A.4:** [www.corestandards.org/Math/Content/4/OA/A/3/](http://www.corestandards.org/Math/Content/4/OA/A/3/)

**4.NBT.B.4:** [www.corestandards.org/Math/Content/4/NBT/B/4/](http://www.corestandards.org/Math/Content/4/NBT/B/4/)

**4.NBT.A.1:** [www.corestandards.org/Math/Content/4/NBT/A/1/](http://www.corestandards.org/Math/Content/4/NBT/A/1/)