

Rural Electrification Resources Overview

Standards Covered

Science

2010 Standard

4.1.3 Construct a complete circuit through which an electrical current can pass as evidenced by the lighting of a bulb or ringing of a bell.

2016 Standard

4.PS.4 Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy.

Social Studies

4.1.11 Identify and describe important events and movements that changed life in Indiana in the early twentieth century.

Math

4.AT.2 Recognize and apply the relationships between addition and multiplication, between subtraction and division, and the inverse relationship between multiplication and division to solve real-world and other mathematical problems.

4.M.3 Use the four operations (addition, subtraction, multiplication, and division) to solve real-world problems involving distances, intervals of time, volumes, masses of objects, and money. Include addition and subtraction problems involving simple fractions and problems that require expressing measurements given in a larger unit in terms of a smaller unit.

ELA

4.RV.1 Build and use accurately general academic and content-specific words and phrases.

4.RN.1 Read and comprehend a variety of nonfiction within a range of complexity appropriate for grades 4-5. By the end of grade 4, students interact with texts proficiently and independently at the low end of the range and with scaffolding as needed at the high end.

4.RN.2.1 Refer to details and examples in a text when explaining what a text says explicitly and when drawing inferences from the text.

4.RN.2.2 Determine the main idea of a text and explain how it is supported by key details; summarize the text.

4.SL.4.2 Create oral presentations that maintain a clear focus, using multimedia to enhance the development of main ideas and themes that engage the audience.

Objectives

- *Students will be able to use and apply content specific vocabulary.
- *Students will be able to discuss and demonstrate, through visual representations, how a circuit works.
- *Students will be able to discuss the pros and cons of having/not having electricity in homes.
- *Students will be able to compare and contrast what life would have been like before electricity compared to modern times.
- *Students will be able to solve math problems, involving electricity, using different math operations.
- *Students will be able to read an informational piece about the history of electricity in rural areas and answer comprehension questions.
- *Students will be able to find the main idea of a non-fiction text.
- * Students will be able to use the text to infer answers to questions as well as find explicit information in a text.

In-Class Activities

Activity #1

Rural Electrification Vocabulary Development

Standards

ELA

4.RV.1 Build and use accurately general academic and content-specific words and phrases.

Objectives

*Students will be able to use and apply content specific vocabulary.

Lesson Ideas

Review with students the vocabulary words related to the Rural Electrification Exhibit. Students should copy down these words in their science notebooks while the teacher reviews the definitions.

Enrichment

Students could look up the words themselves to find the definitions and write them in their science notebooks.

Differentiation/Accommodation

Students could be given a copy of the Vocabulary List for Teachers to glue into their science notebooks while the teacher reviews the definitions.

Practice/Assessment

Students are given the Vocabulary Activities handout. This can be used as an assessment to gauge student understanding of the words or just as a practice to help students learn the definitions.

Rural Electrification Exhibit

Vocabulary List for Teachers:

<u>Word</u>	<u>Definition</u>
ampere	The rate at which a given amount of electricity flows through a circuit
circuit	Wires that provide a continuous path for the electrical current to travel from its source to what it is powering and back again
electrification	Bringing electricity to an area that hasn't had it
kilowatt	Watts multiplied by 1,000
volt	A unit used when measuring the electrical pressure causing the current to flow
watt	A unit of power (volts X amperes = watts)

Vocabulary Activities

Match the following vocabulary words with their definition.

_____ ampere	A.) Bringing electricity to an area that hasn't had it
_____ circuit	B.) The rate at which a given amount of electricity flows through a circuit
_____ electrification	C.) A unit of power (volts X amperes = watts)
_____ kilowatt	D.) Wires that provide a continuous path for the electrical current to travel from its source to what it is powering and back again
_____ volt	E.) A unit used when measuring the electrical pressure causing the current to flow
_____ watt	F.) Watts multiplied by 1,000

Activity #2

Rural Electrification Reading Comprehension

Standards

ELA

- 4.RN.1 Read and comprehend a variety of nonfiction within a range of complexity appropriate for grades 4-5. By the end of grade 4, students interact with texts proficiently and independently at the low end of the range and with scaffolding as needed at the high end.
- 4.RN.2.1 Refer to details and examples in a text when explaining what a text says explicitly and when drawing inferences from the text.
- 4.RN.2.2 Determine the main idea of a text and explain how it is supported by key details; summarize the text.

Social Studies

- 4.1.11 Identify and describe important events and movements that changed life in Indiana in the early twentieth century.

Objectives

- *Students will be able to read an informational piece about the history of electricity in rural areas and answer comprehension questions.
- *Students will be able to find the main idea of a non-fiction text.
- * Students will be able to use the text to infer answers to questions as well as find explicit information in a text.
- *Students will be able to compare and contrast what life would have been like before electricity compared to modern times.
- *Students will be able to discuss the pros and cons of having/not having electricity in homes.

Lesson Ideas

Have students read the Rural Electrification article and answer the comprehension questions about what they have read. Students should also fill out the chart showing what different items they use daily that would use electricity.

Enrichment

Have students research how families completed household chores before electricity. Have them make a book showing how tasks were completed pre-electricity and post-electricity.

Differentiation/Accommodation

Students can work in pairs to read the story and work together to answer the comprehension questions. They could have their Rural Electrification Vocabulary page with them also to help as they read through the text.

Rural Electrification Student Article

Imagine washing your clothes, cooking a meal, working in a barn, or repairing farm equipment without electric power or light. In the 1930s, most rural Americans lived, worked, and played without electricity. In 1935, the Rural Electrification Administration (REA) was set up by the federal government to bring electricity to rural areas. In 1936, Lebanon, Indiana, became one of the first places in the country to connect rural farms to centralized sources of electricity. Rural **electrification** quickly changed the way of life for many Hoosier farmers.

Before electrification, most families used candles or kerosene lamps for lighting. Some problems were that these gave off a dim yellow light and lots of soot, a black powder. They also had the potential to cause accidental fires. Kerosene lamps also emitted dangerous fumes, or odor. After electrification, electric lighting was the first big change on the farm. Electric lights were safer and much brighter than kerosene lamps. The house, barn, and any other buildings where work could be done were the first to be wired with electricity.

Before electrification, water for cooking, cleaning, drinking, watering animals, or any other use had to be pumped by hand. That water then had to be carried to wherever it was needed. This was often a job for younger members of the family. After electrification, electric water pumps pumped water straight from a well to where it was needed on the farm. Farm families no longer needed to haul water to the house, barns, fields, or gardens.

Rural families were eager to acquire new time-and-labor saving electrical devices including stoves, irons, lamps, and motorized farm equipment. Radios were also enjoyed by the entire family. Store owners, manufacturers, and associations were eager to provide these goods.

Rural families still had to pay for the electricity. They had to pay for each **kilowatt** of electricity used. These were measured at electric meters that were installed at each home.

Rural Electrification Article Questions

Answer the following questions using the article

1.) Why would farmers have decided to put electricity into their barns and homes first?

2.) Name 2 ways that electric lamps were superior to kerosene lamps? Use examples from the article to support your answer.

3.) What do you think is the main idea of this article? Give 2 details from the article that support your main idea.

4.) Fill in the chart listing some different items you use at home and school that use electricity. On the left side of the chart list the item that uses electricity and what you use it for. On the right tell what you may have used instead if you didn't have electricity to run the original item. The first one is done as an example.

<u>Item needing electricity and its use</u>	<u>Item not needing electricity and its use</u>
Ex.) Computer - Used to research as well as type papers	Paper - Would have to write out work using a pencil

Activity #3

Rural Electrification Science Connection

Standards

Science

2010 Standard

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2016 Standard

4.PS.4 Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy.

ELA

4.SL.4.2 Create oral presentations that maintain a clear focus, using multimedia to enhance the development of main ideas and themes that engage the audience.

Social Studies

4.1.11 Identify and describe important events and movements that changed life in Indiana in the early twentieth century.

Objectives

*Students will be able to discuss and demonstrate, through visual representations, how a circuit works.

Lesson Ideas

Students should have previously constructed a circuit through the Create. Connect Exhibit at Conner Prairie. Students should be able to draw the circuit they created. They should be able to label the parts of the circuit and tell why each part is connected the way it is connected and the steps they took to make the circuit work. They should also be able to discuss how electricity changed the lives of rural families.

Enrichment

Students will create a presentation showing how families' lives changed when electricity was brought out to the rural farms. Technology could be included by making the presentation through Prezi.

Differentiation/Accommodation

Students could look at models of circuits to help them explain what makes a circuit complete. They should notice what all circuits have in common in order to have a complete electrical circuit.

Resource for activity #3

Rural Electrification and Circuits

In the space below, draw the circuit that you created while at Create.Connect at Conner Prairie. Be sure to label all the parts of the circuit. Then answer the question that follows.



- 1.) Describe what you had to do to make your circuit work. What did you originally try that didn't work and what did you have to change to make it work?

Activity #4

Rural Electrification Math Activities

Standards

Math

- 4.AT.2 Recognize and apply the relationships between addition and multiplication, between subtraction and division, and the inverse relationship between multiplication and division to solve real-world and other mathematical problems.
- 4.M.3 Use the four operations (addition, subtraction, multiplication, and division) to solve real-world problems involving distances, intervals of time, volumes, masses of objects, and money. Include addition and subtraction problems involving simple fractions and problems that require expressing measurements given in a larger unit in terms of a smaller unit.

Objectives

*Students will be able to solve math problems, involving electricity, using different math operations.

Lesson Ideas

Students will be asked to solve some math problems using different mathematical operations. Students will also be asked to complete a chart after doing mathematical computations on volts, amps, and watts.

Enrichment

Have students research and learn how many kilowatts various electrical appliances use and then determine how much it would cost per year to run those appliances.

Differentiation/Accommodations

Students can work with partners on the math problems. Students could also be given the operation they would need to use to find the missing piece. Students could be given the formula filled in with just the missing variable for each part of the chart as well.

Resource for activity #4

Rural Electrification Mathematical Activities

Solve the following math problems

$\text{Volts} \times \text{Amps} = \text{Watts}$
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1.) Using the formula above, complete the table below.

<u>Volts</u>	<u>Amps</u>	<u>Watts</u>
	20	100
4	25	
6		180
9	45	

2.) A kilowatt in Indianapolis costs about 9 cents. In 1986 a refrigerator used about 1400 kilowatts per year. In 2014, a more modern energy-efficient refrigerator uses about 350 kilowatts per year.

a.) How much does it cost to run a 1986 refrigerator, per year?

Answer: _____

b.) How much does it cost to run a 2014 refrigerator, per year?

Answer: _____

C.) How much would you save every year if you replaced your 1986 refrigerator with a 2014 refrigerator?

Answer: _____

Additional Resources for Rural Electrification

<http://www.nps.gov/home/learn/historyculture/ruralelect.htm>

<http://newdeal.feri.org/tva/tva10.htm>