

Introduction to Electrical Contractors

Gateway to Electrical Planning and Technology

Teacher: Elizabeth Jasper, Castello Elementary - EGUSD

Subject Area: Mathematics, Special Education (to be co-taught with Science)

Grade Level: Sixth Grade

Date: Five Day Lesson Plan

Lesson Overview: Through pictures, PowerPoint, video, and worksheets students will be introduced to **concepts relate to electrical type problems**. Students will calculate voltage and gain understanding in how electricians play an integral part in renewable energy. Students will also make a foldable that will include electrical terminology and a poster showcasing desirable employee qualities.

Materials Included for this Lesson:

Precut Foldable and imagery

Worksheets

PowerPoint Presentation, Basics of Electrical Planning and Technology, This includes but is not limited to Solar and Wind Energy, along with electrical programming and planning.

Graph paper

*To access documents
related to Lesson Plan click
on blue hyperlinked text*

Materials FOR this Lesson:

Students will gain a general understanding of the need for Electrical Contractors in the workforce today with the rise of technology and the continuous depletion of fossil fuels.

Students will discuss the importance of Electricians in the fields dealing with renewable energy and how Electricians play an integral part in utilizing renewable energy.

Students will apply information gained to a math lesson.

Skills the Student will Learn:

Students will use real life scenarios about voltage to variables in mathematic fractions.

Students will learn the important impact that electricians have on renewable energy.

Student Deliverables:

Voltage Group Worksheets

Foldable vocabulary

PowerPoint presentation

A Model of a Timing Belt System for interactive use

A PowerPoint presentation

Presentation includes but is not limited to Solar and Wind Energy, along with electrical programing and planning.

Formal Assessments

Length of Lesson: 5 Days

Activity Day One

Introduction to Electrical Planning and Technology, PowerPoint and foldable

Activity Day Two

Alternative Energy and its conversion through Electrical Work Force, Video (to be taught with partner teacher)

Activity Day Three and Four

Group Activity Applied Mathematics: Handout, Worksheet, and Model Size Manipulative

Solar Solutions

Amperage and Voltage Comparison Ratios

Activity Day Five

Group Presentation and Student led Teaching on Material Learned

Enrichment Suggestions: Students will take a survey in their neighborhood to see how many of their neighbors use solar panels. Students will be given the choice to gain this information through an aerial map found via internet. An alternative option for students will be to discuss with their immediate families three types of renewable energy and how electricians impact the renewable energy field. Students will be expected to verbally report back to class their families' thoughts and input.

Student Resources

Worksheets

Models and Solar Grid Templates

Foldable

Pens, Pencils, and Color Pencils

Teacher Resources

PowerPoint

Video – Modern Marvels, Renewable Energy: <http://shop.history.com/modern-marvels-renewable-energy-dvd/detail.php?p=70366>

Other video resources:

[Modern Marvels — Light Energy: A Bright...](#)

[Modern Marvels — Farms Harvest Wind For...](#)

[Modern Marvels — Air Power |](#)

WECA, Western Electrical Contractors Association -- www.weca-iec.org/

State Standards:

CTE Standards

CTE Standard: 1.0 Academics

Students understand the academic content required for entry into postsecondary education and employment in the Energy and Utilities sector.

(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)

mathematics, Specific applications of Number Sense standards (grade seven):

1.2 Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

Mathematics, Specific applications of Mathematical Reasoning standards (grade seven):

2.1 Use estimation to verify the reasonableness of calculated results.

CTE Standard: Electromechanical Installation and Maintenance Pathway

The Electromechanical Installation and Maintenance Pathway prepares students for employment or advanced training in a variety of electromechanical installation and maintenance industries.

A1.1 Know the new and emerging energy resources in the industry.

A1.2 Know the advantages and disadvantages of energy resources used in the industry and the effects of those resources on the environment.

CTE Standard: 4.0 Energy and Environmental Technology Pathway

Students understand and apply specific career preparation and planning requirements for employment in the environmental technology industry and understand how these requirements apply across all standards for students planning to successfully enter and advance in the industry:

B4.1 Know the practical and theoretical applications of voltage, amperage, and resistance in electrical circuits and systems.

CCTC Standards

CCTC Standards: Ratios and Proportional Relationships, 6.RP3

6.RP3 **Understand ratio concepts and use ratio reasoning to solve problems.** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

CCTC Standards: The Number System, 6.NS1

6.NS1 **Apply and extend previous understandings of multiplication and division to divide fractions by fractions.** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions

CCTC Standards: Expressions and Equations

6.EE.1 **Apply and extend previous understandings of arithmetic to algebraic expressions.** Write and evaluate numerical expressions involving whole-number exponents.

Lesson Plan Relevance to Externship

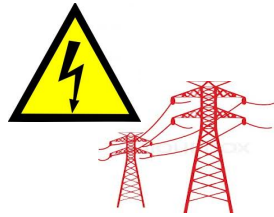
This lesson is directly related to WECA's (Western Electrical Contractors Association) goals for understanding the application of mathematical equations, primarily fractions and their variables, in correlation to energy efficiency and conservation of home and commercial building design. Students will gain knowledge in energy conservation methods and the need for electricians in this growing field. Students will apply knowledge mathematically through group worksheets based on finding the variable in fractions based on voltage.

Activity Day One

Introduction to Electrical Planning and Technology, PowerPoint and foldable

- [POWER POINT](#)
- [FOLDABLE](#)

Foldable



Voltage

electric potential or potential difference expressed in volts



Outlet

a receptacle for the plug of an electrical device

install

to set up for use or service



Amps

the strength of current of electricity

Solar

produced or operated by the action of sun's light or heat



Solar Panels

battery of solar cells



Windmill Power

power derived from wind



Activity Day Two

Alternative Energy and its conversion through Electrical Work Force, Video (to be taught with partner teacher)

➤ **VIDEO**

Modern Marvels, Renewable Energy:

<http://shop.history.com/modern-marvels-renewable-energy-dvd/detail.php?p=70366>

Activity Day Three and Four


Group Activity Applied Mathematics: Handout, Worksheet, and Model Size Manipulative

Solar Solutions


Amperage and Voltage Comparison Ratios

➤ **HANDOUT & WORKSHEET**

Electrical Contractors Mathematics



Planning & Technology with Jim and Sam



#1 Sam and Jim are best friends, they are installing (putting in) a new microwave oven in Jim's house.

There is a problem with the voltage matching the microwave and the outlet. The voltage for the microwave is 375 volts and the voltage for the wall outlet 150 volts.

These two numbers must be the same in order to install the microwave. (If the voltage is not the same the microwave will not work and the outlet will fry.)

If the ampage or amps for that outlet is currently 80 how many more amps do Sam and Jim need to install the microwave properly?

What do we have...

125 volts and 20 amp for the wall outlet

The microwave oven need a 375 volt or more outlet.



How many more amps do Sam and Jim need?

$$\frac{125 \text{ volts}}{375 \text{ volts}} = \frac{20 \text{ amps}}{\quad}$$

SIMPLIFY $\frac{125}{375} = \frac{\quad}{\quad}$

$$\frac{125 \text{ volts}}{375 \text{ volts}} = \frac{20 \text{ amps}}{\quad}$$

Simplified Fraction Answer x multiple of one = $\frac{20 \text{ amps}}{\quad}$

Solve:

$$\frac{125 \text{ volts}}{375 \text{ volts}} = \frac{20 \text{ amps}}{\quad}$$

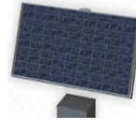
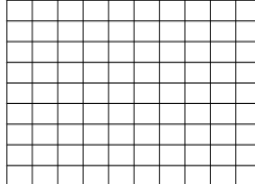
#2 By Jim's farm there is a speed limit sign that shows a solar panel, the drivers speed, and the speed limit.

Jim wants to know how many volts of electricity does the solar panel on top need in order to continuously operate 24 hours a day.

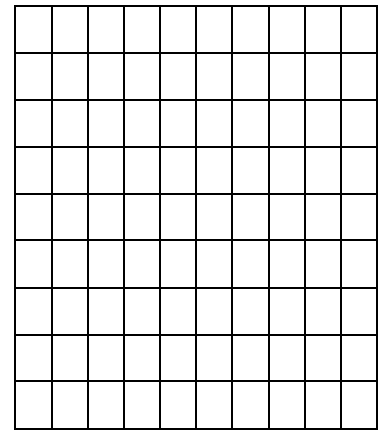
(This is includes when there is not a light)



The solar panel on the speed limit sign by Jim's farm has contains rectangular cells that are 8 volts of electricity each. (Here is a visual of the solar panel.)



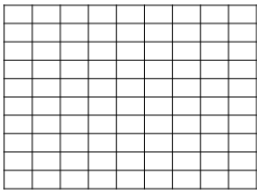
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Question #2
Solar Panel

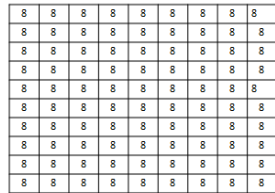
10

9



$9 \times 10 = \blacksquare$
___ panels

Question #2
Solar Panel



$9 \times 10 = \blacksquare$
___ panels
 $8 \times \blacksquare = \blacksquare$



Question #2
Solar Panel

panels x cells at 8 volts

$90 \times 8 = \blacksquare$

For 24 hours a day

$\blacksquare \times 24 = \text{_____}$ volts of electricity for 24 hours/one day

➤ LIFESIZE MANIPULATIVE

Activity Day Five

Group Presentation and Student led Teaching on Material Learned

➤ PRESENTATION