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| **Lesson Title : Energy Planning using Mathematics** | **Unit #:** | **Lesson #:** | **Activity #:1** |
| **Activity Title: Energy Planning using Mathematics** |

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| **Estimated Lesson Duration:** |  |
| **Estimated Activity Duration:** | **3 class periods** |

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| **Setting:** | **Classroom** |

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| **Activity Objectives:** |

After completing this activity, each student will be aware of:

1. Multiple sources of electrical power.
2. How to calculate population growth.
3. Devise formulae to calculate how much electricity is needed for increasing population.
4. Evaluate all sources of energy based on supplied criteria supplied
5. Use probability and statistics to estimate future occurrence of natural disasters
6. Apply ratios in measures
7. Use trigonometry to design a hydrodam
8. Basic design of wind turbine, hydrodam, nuclear power plant (basic structure).

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| **Activity Guiding Questions:** |

1. Name different sources of electricity?
2. What is the population of USA?
3. Why must we plan ahead for years to come?

| **Next Generation Science Standards (NGSS)** | |
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| **Science and Engineering Practices (Check all that apply)** | **Crosscutting Concepts (Check all that apply)** |
| ☒ Asking questions (for science) and defining problems (for engineering) | ☐ Patterns |
| ☒ Developing and using models | ☐ Cause and effect |
| ☒ Planning and carrying out investigations | ☒ Scale, proportion, and quantity |
| ☒ Analyzing and interpreting data | ☒ Systems and system models |
| ☒ Using mathematics and computational thinking | ☒ Energy and matter: Flows, cycles, and conservation |
| ☒ Constructing explanations (for science) and designing solutions (for engineering) | ☒ Structure and function. |
| ☐ Engaging in argument from evidence | ☒ Stability and change. |
| ☒ Obtaining, evaluating, and communicating information |  |

| **Ohio’s New Learning Standards for Science (ONLS)** |
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| **Expectations for Learning - Cognitive Demands (Check all that apply)** |
| ☒ Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| ☐ Demonstrating Science Knowledge **(D)** |
| ☐ Interpreting and Communicating Science Concepts **(C)** |
| ☐ Recalling Accurate Science **(R)** |

| **Common Core State Standards -- Mathematics (CCSS)** | |
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| **Standards for Mathematical Practice (Check all that apply)** | |
| ☒ Make sense of problems and persevere in solving them | ☒ Useappropriate tools strategically |
| ☒ Reason abstractly and quantitatively | ☒ Attendto precision |
| ☒ Construct viable arguments and critique the reasoning of others | ☒ Look for and make use of structure |
| ☒ Model with mathematics | ☒ Look for and express regularity in repeated reasoning |

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| **Unit Academic Standards (NGSS, ONLS and/or CCSS):** |

**Common Core Math Standards:**

**Geometric Measurement and Dimension:** explain volume formulas and use them to solve problems

**Similarity, Right Triangles, and Trigonometry:** Similarity, Right Triangles, and Trigonometry

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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies) |

(See attachment)

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| **Teacher Advance Preparation:** |

PowerPoint presentation and several handouts

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| **Activity Procedures:** |

Day 0: Pre-test

Day 1: Evaluating the different sources of energy

1. Show students first half of PowerPoint, showing various sources of electricity
2. Ask guiding questions.
3. Students will be choose their area and for homework, they must research that geo facts of area.

Day 2: Student will evaluate the population and the increasing need

1. Supply students with correct geo facts
2. Group must calculate population in 30 years
3. Group must calculate required electricity
4. Evaluate what sources of electricity your area qualifies for

Day 3: Calculate electricity

1. Group must “design” a combination of electricity sources that will suffice their need.
2. Present to class, cheapest combination will win a prize
3. Post-test

**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

Pre and Post tests (See attachment)

**Summative Assessments:** These are optional; there may be summative assessments at the end of a set of Activities or only at the end of the entire Unit.

See attachment

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| **Differentiation:** Describe how you modified parts of the Lesson to support the needs of different learners.  Refer to Activity Template for details. |

The biggest modification I made during the activity was slowing down the pace and explain the supplied equations has thoroughly as I could without supplying the answer to the groups or making it too easy. I did this by using the exam presented in the pre/post test.

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| **Reflection:** Reflect upon the successes and shortcomings of the lesson. |

Although the activity did not require in-depth math knowledge, it forced students to use all areas of math they’ve learned throughout high school, from probability and statistics, geometry to exponential growth functions. One student summarized this as a “long fun word problem”. One area I would have modified was in the structure, the activity did not start “flowing” till the second day. If I had grasped their attention better on the first day, I could have possible saved some time in the activity implementation. I also did not completely utilize my guiding questions. I would have allowed the students more time to come up with answers to these guiding questions so that they can better picture the activity without me explaining it.