Unit Title: Watts In Our Classroom?	**Grade Level:** Grade 6
Date Developed/Last Revised: Developed 03/04/13, Last Revised 05/20/13	**Time Frame:** 8 45-minute periods
Unit Author(s): Jeanine Nakakura	**Primary Content Area:** Science, Engineering, Math

UNIT DESCRIPTION:
Students will conduct an energy audit of their classroom's electricity load, research energy efficiency strategies, and develop an energy conservation plan for their classroom.

Big Ideas (Student Insights that Will Be Developed Over the Course of the Unit):

- Energy can change forms and is conserved
- The energy sustainability of Hawaii depends largely on reducing reliance on imported fossil fuels by increasing renewable energy sources
- The energy sustainability of Hawaii also depends upon increasing energy efficiency and reducing energy consumption

Essential Questions (Questions that Will Prompt Students to Connect to the Big Ideas):

- Where does energy come from and where does it go?
- What is the difference between energy conservation and energy efficiency?
- How can we reduce the energy used at school?

	BENCHMARKS/STANDARDS/LEARNING GOALS
Science	**SC.6.1.2** Use appropriate tools, equipment, and techniques safely to collect, display, and analyze data **SC.6.6.2** Describe the different types of energy transformations
Technology	**SC.6.2.1** Explain how technology has an impact on society and science **SC 6.2.2** Explain how the needs of society have influenced the development and use of technologies
Engineering	**CTE.6.1.1** Develop a process to invent a product or procedure to meet a need or improve upon an existing technology
Mathematics	**CCSS.Math.Content.6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set

English Language Arts and Literacy	**CCSS.ELA-Literacy.WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. **CCSS.ELA-Literacy.SL.6.4** Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation. **CCSS.ELA-Literacy.SL.6.5** Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
STEM Competencies	**Indicator 3.4** Evaluates the effectiveness and ethical considerations to a solution and makes adjustments as needed **Indicator 5** The ability to communicate effectively

LESSON SEQUENCE

	Lesson Title/Description	Learning Goals (What Students Will Know and Be Able to Do)	Assessments	Time Frame
1	Using Kill-a-Watt energy meters	• Describe the different types of energy transformations • Operate a Kill-a-Watt device to measure electricity consumption of electrical devices • Use appropriate tools, equipment, and techniques to safely collect, display, and analyze data • Calculate energy usage for three electrical devices in classroom	• Unit Pre-Assessment • Poster of "Where Does Energy Come From?" • Energy Load Data Collection Sheet • Answer "Engagement Questions" in Energy Journal (notebook or electronically via Edmodo, for example)	3 45-minute periods
2	Classroom energy audit	• Investigate and calculate energy usage of classroom • Calculate average monthly classroom energy usage	• Energy Load Data Collection Sheet • Energy Journal entries—write a summary of the class discussion (notebook or electronically via Edmodo, for example)	2 45-minute periods
3	Classroom energy conservation plan	• Differentiate between energy conservation and efficiency • Explain how energy strategies (conservation and efficiency) can reduce classroom energy consumption • Share classroom energy conservation (and efficiency) plan	• Worksheet: "Energy Conservation vs. Efficiency" • Student journal: "Compare and contrast energy conservation with energy efficiency. Give examples of each." • Presentation to class/audience (written or digital) • Unit Post-Assessment • Unit Reflection Sheet	3 45-minute periods

Energy Unit Pre and Post-Assessment

1) Match each letter with the correct answer:

_____ 1) Energy Conservation	A) Fastest growing energy technology today
_____ 2) Energy Efficiency	B) Use of technology that requires less energy to perform the same function.
_____ 3) Solar	C) Energy from the heat of the Earth
_____ 4) Wind	D) Reducing consumption (how much you use)
_____ 5) Geothermal	E) Sun

_____ **2) A kilowatt-hour is a unit that is used to measure energy.** True or False?

_____ **3) Energy Efficiency is the key to energy sustainability.** True or False?

4) Circle the choices below which are energy efficiency strategies.

Turning the lights off when no one is in the room	Using ENERGY STAR appliances
Leaving the computer on 24 hours a day	Using a motion sensor to turn off lights

_____ **5) Which task in the average home uses the most energy?**

a) Lighting
b) Keeping food cold
c) Washing and drying clothes
d) Heating and cooling rooms

_____ **6) Which type of light bulb is the most energy-efficient?**

a) Incandescent
b) Compact fluorescent
c) Halogen
d) All light bulbs are the same

_____ **7) On average, how much of the electricity used to power home electronics is consumed while electric products are turned off?**

a) 40%
b) 25%
c) 0%

Energy Unit Pre and Post-Assessment (Answer Key)

1) Match each letter with the correct answer:

___D___ 1) Energy Conservation	A) Fastest growing energy technology today
___B___ 2) Energy Efficiency	B) Use of technology that requires less energy to perform the same function.
___E___ 3) Solar	C) Energy from the heat of the Earth
___A___ 4) Wind	D) Reducing consumption (how much you use)
___C___ 5) Geothermal	E) Sun

_True__ **2) A kilowatt-hour is a unit that is used to measure energy.** True or False?

_True__ **3) Energy Efficiency is the key to energy sustainability.** True or False?

4) Circle the choices below which are energy efficiency strategies.

Turning the lights off when no one is in the room — **Using ENERGY STAR appliances**

Leaving the computer on 24 hours a day — **Using a motion sensor to turn off lights**

___d___ **5) Which task in the average home uses the most energy?**

a) Lighting
b) Keeping food cold
c) Washing and drying clothes
d) Heating and cooling rooms

___b___ **6) Which type of light bulb is the most energy-efficient?**

a) Incandescent
b) Compact fluorescent
c) Halogen
d) All light bulbs are the same

___a___ **7) On average, how much of the electricity used to power home electronics is consumed while electric products are turned off?**

a) 40%
b) 25%
c) 0%

Unit Title: Watts in Our Classroom?	**Lesson #:** 1
Lesson Title: Using Kill-a-Watt Energy Meters	**Grade Level:** 6
Date Developed/Last Revised: 05/24/13	**Primary Content Area:** Science, Math, ELA
Unit Author(s): Jeanine Nakakura	**Time Frame:** 3 45-minute periods

PLANNING (Steps 1, 2, & 3)

1. Standards/Benchmarks and Process Skills Assessed in this Lesson:

- **HCPS III SC.6.1.2** Use appropriate tools, equipment, and techniques safely to collect, display, and analyze data
- **HCPS III SC.6.6.2** Describe the different types of energy transformations
- **CCSS.Math.Content.6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set

2A. Criteria- What Students Should Know and Be Able to Do:

Students can-

- Describe the different types of energy transformations
- Operate a Kill-a-Watt meter to measure electricity consumption
- Use appropriate tools, equipment, and techniques to safely collect, display and analyze data

2B. Assessment Tools/Evidence:

Formative:

- Unit Pre-Assessment
- Engagement question responses in Energy Journal (paper or electronic)
- Construct a poster to show where energy comes from (electric plant to home)

Summative:

- Energy Load Data Collection Sheet

3. Learning Experiences (Lesson Plan)

Materials:

- Kill-a-Watt meter (one per group of 2-3 students)
- Various electrical appliances (Review safety with students—no liquids near devices/plugs, do not stick fingers or metal objects into electrical outlets)
- Calculators (one per group)
- Poster Board or Oaktag (one per group)
- Post-it Notes
- Chart Paper
- Markers for chart
- Student Energy Journals (computer or paper)

Handouts/Other Resources:

- Unit Pre-assessment (and answer key)
- Energy Load Data Collection Sheet (one per group) [and answer key]
- LiveBinder Resource: http://www.livebinders.com/edit/index/846657

Procedure:

1) What do students know?
   a) Engagement questions—write on board or post online. Have students write responses individually in Energy Journals. Next, in groups, have students discuss each question, then write responses to each question on Post-it notes. Compile answers on class chart.

      1) What is energy?
      2) What is the difference between energy conservation and energy efficiency?
      3) Why is reducing energy use important?
      4) What are some ways we use energy in the classroom?
      5) What are some ways we can reduce our energy use at school?

   b) Discuss responses on chart as a class.

   c) On chart/white board, make two columns—one for "Electricity/Energy" and one for "Saving Energy".

   d) Ask students what they know about each of these topics, then write their responses on the board. (Students can use some of their responses from the Engagement questions here.)

   e) "Background on Electricity" on page 1 (http://www.nwf.org/~/media/PDFs/Eco-schools/MeasuringElectricity_Final.pdf)

2) Where does electricity come from?
   a) Have students view the animation below (either as a class or individually).
      http://www.energyeducation.tx.gov/energy/section_3/topics/where_does_electricity_come_from/energy_pathway_image.html

      Have students, in groups, create a poster to show the sequence of events from coal to home using a flow chart, Thinking Map (Flow Map, Foldable, or other type of graphic organizer.) Have students label the energy transformations that occur (e.g., chemical to thermal energy).

   b) Background information on:
      -- "Where Does Electricity Come From?" (top of page 2 of link below) ;
      --"What is Energy?" (bottom of page 2);
      --"What are Sources of Energy?" (top of page 3).

(http://www.nwf.org/~/media/PDFs/Eco-schools/MeasuringElectricity_Final.pdf)

c) To find the fuel mix for Hawaii, go to:
http://www.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=047a5e658e0fc010VgnVCM1000008119fea9RCRD&cpsextcurrchannel=1

To see Hawaii's ranking for Average Electricity Price, go to:
http://www.neo.ne.gov/statshtml/204.htm

To see Hawaii's Energy Profile, go to:
http://www.eia.gov/state/?sid=HI

d) Discuss as a class:
1) How does our state's fuel mix compare to other states?
2) What differences do you see in the energy use of states?
3) Why do you think there is so much difference in energy use from state to state?

3) How to Measure Energy Usage—Kill-a-Watt Device

a) Background info ("What is a Watt", "What is this device used for", "How to use the Kill-a-Watt") on p. 4-5 using this link: http://www.nwf.org/~/media/PDFs/Eco-schools/MeasuringElectricity_Final.pdf

b) Video on how a Kill-a-Watt meter works:
http://videos.howstuffworks.com/discovery/437-green-gadgets-the-kill-a-watt-video.htm

c) In groups of 2-3, have students use the Kill-a-Watt to measure the energy usage of one classroom electrical device while turned on and turned off. Before students begin, have them make a hypothesis about the electrical device's use of energy while turned off. Write hypothesis and data on "Energy Load Data Collection Sheet".

d) Students should fill in column "A" on the data collection sheet for the one classroom electrical device.

4) Continue in Lesson #2.

Homework Activity (Optional):

- List the top three energy users at home and at school (Edmodo is a good venue for students to post responses). Discuss answers in groups the next day.

TEACHING & ASSESSMENT (Steps 4, 5, 6, &7) **Completed by teacher after instruction has taken place**
4. Teaching and Collecting of Evidence of Student Learning: Teacher Notes:
5. Analysis of Student Products/Performances - Formative: Teacher Notes:
6. Evaluation of Student Products/Performances – Summative (Not necessary for every lesson): Teacher Notes:
7. Teacher Reflection: Replanning, Reteaching, Next Steps: Teacher Notes:

Name(s)_____ Date_____ Period _____

Energy Load Data Collection Sheet

Choose one electrical device in the classroom. Use the Kill-a-Watt device to take the watt reading for the electrical device when turned on and off. Record your data in the table below. Use a calculator to determine the cost per month when the device is turned on and when the device is turned off.

Make a hypothesis about the electrical devices using energy while turned off. Do you think the energy usage will be more, less, or the same?

Lesson 1--Practice

	A	B	C	D	E	F
Device (on or off?)	**Watts**	**Kilowatts (A/1000)**	**Hours Used Per Day**	**Hours/Month (C x 30)**	**Kilowatt-hours/Month (BxD)**	**Cost Per Month (E x 0.3221 cents per kilowatt-hour*)**

***Cost per kilowatt-hour as of 04/12/13. For questions about current rates, please call Hawaiian Electric Company (HECO) Education & Consumer Affairs at 543-7511.**

Lesson 2--Classroom Energy Audit

	A	B	C	D	E	F
Device (on or off?)	**Watts**	**Kilowatts (A/1000)**	**Hours Used Per Day**	**Hours/Month (C x 30)**	**Kilowatt-hours/Month (B x D)**	**Cost Per Month (E x 0.3221 cents per kilowatt-hour*)**

Name(s)_____ Date_____ Period _____

Energy Load Data Collection Sheet (Answer Key)

Choose one electrical device in the classroom. Use the Kill-a-Watt device to take the watt reading for the electrical device when turned on and off. Record your data in the table below. Use a calculator to determine the cost per month when the device is turned on and when the device is turned off.

Make a hypothesis about the electrical devices using energy while turned off. Do you think the energy usage will be more, less, or the same?

Lesson 1--Practice

	A	B	C	D	E	F
Device (on or off?)	**Watts**	**Kilowatts (A/1000)**	**Hours Used Per Day**	**Hours/Month (C x 30)**	**Kilowatt-hours/Month (BxD)**	**Cost Per Month (E x 0.3221 cents per kilowatt-hour*)**
MacBook Pro Laptop Computer (on)	12	12/1000 = **0.012**	8	240	0.012 x 240 = **2.88**	**2.88 x 0.3221 = 0.93 cents per month**
MacBook Pro Laptop Computer (off and sleep)	0	0	16	480	0	0

***Cost per kilowatt-hour as of 04/12/13. For questions about current rates, please call Hawaiian Electric Company (HECO) Education & Consumer Affairs at 543-7511.**

Lesson 2--Classroom Energy Audit

	A	B	C	D	E	F
Device (on or off?)	**Watts**	**Kilowatts (A/1000)**	**Hours Used Per Day**	**Hours/Month (C x 30)**	**Kilowatt-hours/Month (B x D)**	**Cost Per Month (E x 0.3221 cents per kilowatt-hour*)**

Unit Title: Watts in Our Classroom?	**Lesson #:** 2
Lesson Title: Classroom Energy Audit	**Grade Level:** 6
Date Developed/Last Revised: 05/24/13	**Primary Content Area:** Science, Math, ELA
Unit Author(s): Jeanine Nakakura	**Time Frame:** 2 45-minute periods

PLANNING (Steps 1, 2, & 3)

1. Standards/Benchmarks and Process Skills Assessed in this Lesson:

- **HCPS III SC.6.1.2** Use appropriate tools, equipment, and techniques safely to collect, display, and analyze data
- **HCPS III SC.6.6.2** Describe the different types of energy transformations
- **CCSS.Math.Content.6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set

2A. Criteria- What Students Should Know and Be Able to Do:

Students can-

- Investigate and calculate energy usage of classroom
- Operate a Kill-a-Watt meter to measure electricity consumption
- Use appropriate tools, equipment, and techniques to safely collect, display and analyze data

2B. Assessment Tools/Evidence:

Formative:

- Energy Journal entries (paper or electronic)

Summative:

- Energy Load Data Collection Sheet (one per group) [and answer key]
- Group Bar Graphs

3. Learning Experiences (Lesson Plan)

Materials:

- Kill-a-Watt meter (one per group of 2-3 students***)—*available for loan at HECO*** (see website below for more info)
- Various electrical appliances (Review safety with students—no liquids near devices/plugs, do not stick fingers or metal objects into electrical outlets)
- Calculators (one per group)
- Poster Board or Oaktag (one per group)
- Post-it Notes
- Chart Paper
- Markers for chart
- Student Energy Journals (computer or paper)

Handouts/Other Resources:

- Energy Load Data Collection Sheet (one per group)
- LiveBinder Resource: http://www.livebinders.com/edit/index/846657
- *Hawaiian Electric Company (HECO) Teacher's Energy Resource Center: http://www.heco.com/portal/site/heco/menuitem.8e4610c1e23714340b4c0610c510b1ca/?vgnextoid=7600bcb8b9109310VgnVCM10000005041aacRCRD&vgnextfmt=default

Procedure:

0) Discuss homework from Lesson #1 in groups—top 3 energy users at home and school. On Post-it notes, have each group decide on their top three energy users for the classroom. Have students write a summary of the class discussion in their journals.

1) Calculating Energy Usage and Costs: (see page 5 of link: http://videos.howstuffworks.com/discovery/437-green-gadgets-the-kill-a-watt-video.htm)

a) Have students fill out columns B through F on page 2 of "Energy Load Data Collection Sheet".

(See answer key for sample calculations.) Assist students, as needed, or go over how to do calculations as a class.

b) To find the current cost of electricity per kilowatt-hour (kWh) for the area you live in Hawaii, go to: http://www.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=692e5e658e0fc010VgnVCM1000008119fea9RCRD&vgnextchannel=10629349798b4110VgnVCM1000005c011bacRCRD&vgnextfmt=default&vgnextrefresh=1&level=0&ct=article

Pricing for schools is different from residential cost. Cost per kilowatt-hour for classroom as of April 12, 2013 is 0.3221 cents per kilowatt-hour. For questions about current rates, please call Hawaiian Electric Company (HECO) Education & Consumer Affairs at 543-7511.

2) Divide class into groups of 2-3 students. Brainstorm all of the devices that use electricity in the room and assign an equal amount of devices to each group in the class. Have each group find the energy usage for each electrical device (while turned on and off) assigned to them and calculate the cost per year. Note: some items, such as fluorescent light fixtures, may not be accessible to students for use with the Kill-a-Watt. Students should research the energy usage of such items.

3) Each group should make a bar graph (Display on chart paper/oak tag/poster board) to compare the data for the energy each device (assigned to their group) uses in one year while turned on and off.

4) Discuss the bar graphs in class and ask what conclusions can be made.

Homework Activity (Optional):

- Brainstorm 3 ways you could reduce the energy used by your classroom. (Suggestion: post in Edmodo)

TEACHING & ASSESSMENT (Steps 4, 5, 6, &7)
Completed by teacher after instruction has taken place

4. Teaching and Collecting of Evidence of Student Learning:
Teacher Notes:

5. Analysis of Student Products/Performances - Formative:
Teacher Notes:

6. Evaluation of Student Products/Performances – Summative (Not necessary for every lesson):
Teacher Notes:

7. Teacher Reflection: Replanning, Reteaching, Next Steps:
Teacher Notes:

Unit Title: Watts in Our Classroom? **Lesson Title:** Classroom Energy Conservation Plan **Date Developed/Last Revised:** 05/24/13 **Unit Author(s):** Jeanine Nakakura	**Lesson #:** 3 **Grade Level:** 6 **Primary Content Area:** Science, Engineering, Math, ELA **Time Frame:** 5 45-minute periods

PLANNING (Steps 1, 2, & 3)

1. Standards/Benchmarks and Process Skills Assessed in this Lesson:

- **SC.6.2.1** Explain how technology has an impact on society and science
- **SC 6.2.2** Explain how the needs of society have influenced the development and use of technologies

- **CCSS.ELA-Literacy.WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- **CCSS.ELA-Literacy.SL.6.4** Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
- **CCSS.ELA-Literacy.SL.6.5** Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.

2A. Criteria- What Students Should Know and Be Able to Do:

Students can-

- Explain how energy strategies (conservation and efficiency) can reduce classroom energy consumption
- Differentiate between energy conservation and efficiency
- Develop and present a Classroom Energy Conservation Plan

2B. Assessment Tools/Evidence:

Formative:

- **Student Journal: "**Compare and contrast energy conservation with energy efficiency. Give examples of each."
- Presentation to class/audience (written or digital)

Summative:

- Unit Post-Assessment

3. Learning Experiences (Lesson Plan)

Materials:

- Poster Board or Oaktag (one per group)
- Post-it Notes

- Chart Paper
- Markers for chart

Handouts/Other Resources:

- Energy Audit Presentation Checklist
- Energy Conservation vs. Efficiency worksheet (and answer key)
- Student journal
- LiveBinder Resource: http://www.livebinders.com/edit/index/846657
- Post-Assessment handout and answer key
- Unit Reflection Handout

Procedure:

- Discuss homework from Lesson #2 in groups—top 3 ways to reduce energy usage in the classroom. On Post-it notes, have each group decide on their top three suggestions to reduce energy for the classroom

- Tell students that they will do research on reducing energy usage in the classroom. Pass out Worksheet: Energy Conservation vs. Energy Efficiency and have students fill out in groups. Give students 15 minutes to fill out worksheet in groups of 2 – 3. Discuss answers with class. (Tell students that notes from this worksheet will be used for their 5-minute presentation.)

  Background info on how to save energy (see "Energy Conservation vs. Efficiency" tab in LiveBinder: http://www.livebinders.com/edit/index/846657)

  (See page 4 of this link for info: http://www.nwf.org/~/media/PDFs/Eco-schools/MeasuringElectricity_Final.pdf)

- Check student understanding with Formative Assessment: "Compare and contrast energy conservation with energy efficiency. Give examples of each." (Write answers in student journal.)

- Compile data from lesson #2.

- Discuss data (use questions below for guidance and for students to use with presentations—taken from: http://www.northwoodscenter.org/pdfs/p4c_sample.pdf)

  --What can we do in the classroom to reduce energy consumption?
  --What electrical devices could you live without in the classroom?
  --What electrical devices do we need to have in the classroom?
  --How does technology affect the energy usage of the classroom?
  --How can we make our electrical devices work more efficiently?
  --What conservation steps can we take to reduce our consumption of electricity?

--Where does wasted energy go?
--What are "phantom loads", "vampire power" or "standby power"?

- Tell students that they will be engineers and will develop a Classroom Energy Conservation Plan. (**CTE.6.1.1** Develop a process to invent a product or procedure to meet a need or improve upon an existing technology)

***Note to teachers: Engineering does not always develop physical products. Process engineers, a subset of chemical engineers, "improve operations with respect to flexibility, reliability, energy efficiency and safety; and ensure quality control and address environmental impact." (Taken from: http://www.princeton.edu/cbe/research/process/)

- Prepare a 5-minute Classroom Energy Conservation Plan presentation (using some form of technology such as creating a webpage, PowerPoint presentation, public service announcement video, etc. . .) . Make sure to point out difference between the law of conservation of energy and energy conservation to students.

- The presentation should:

  1) explain why it is important to conserve energy,;
  2) explain the difference between energy conservation and efficiency;
  3) explain how technology affects the energy usage of the classroom;
  4) and provide at least 3 solutions for reducing energy usage in the classroom. (Give Energy Audit Presentation Checklist to students for more detail as to how they will be graded.) The audience will be the Principal or Vice-Principal (or some other adult in the school). Everyone in the group must speak to receive credit for this assignment.

- Take Unit Post-Assessment. Discuss answers and check for student understanding of learning targets.

Homework Activity (Optional):

- Unit Reflection

TEACHING & ASSESSMENT (Steps 4, 5, 6, &7)
Completed by teacher after instruction has taken place

4. Teaching and Collecting of Evidence of Student Learning:
Teacher Notes:

5. Analysis of Student Products/Performances - Formative:
Teacher Notes:

6. Evaluation of Student Products/Performances – Summative (Not necessary for every lesson):
Teacher Notes:

7. Teacher Reflection: Replanning, Reteaching, Next Steps:
Teacher Notes:

Energy Audit Presentation Checklist

	Completed (2)	Partially Completed (1)	Not Completed (0)	Student Self-Assessment	Teacher Assessment
CCSS.ELA-Literacy.WHST.6-8.8					
Gathered relevant info from multiple print and digital sources (at least 5 sources)					
Sources are credible and accurate					
Avoids plagiarism by quoting or paraphrasing from resources					
Follows a standard format for citation of resources					
CCSS.ELA-Literacy.SL.6.4					
Presents claims and findings in a logical sequence					
Uses pertinent descriptions, facts, and details to accentuate main ideas or themes					
All group members use eye contact, clear pronunciation, and audible volume while speaking					

CCSS.ELA-Literacy.SL.6.5					
Includes multimedia components (e.g., graphics, images, music, sound) and visual displays to clarify information					
SC.6.6.2					
Describes how energy changes from the electrical power plant to the classroom					
SC.6.2.1					
Explains how technology has impacted energy use in society and science					
SC 6.2.2					
Explains how the needs of society have influenced the development and use of technologies that use energy					
Explains how energy is wasted and the importance of conserving energy					
Explains the difference between energy conservation and efficiency					
CTE.6.1.1					
Provides at least 3 solutions for reducing energy usage in the classroom					

CCSS.ELA-Literacy.WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. **CCSS.ELA-Literacy.SL.6.4** Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation. **CCSS.ELA-Literacy.SL.6.5** Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
SC.6.6.2 Describe the different types of energy transformations
SC.6.2.1 Explain how technology has an impact on society and science **SC 6.2.2** Explain how the needs of society have influenced the development and use of technologies
CTE.6.1.1 Develop a process to invent a product or procedure to meet a need or improve upon an existing technology

Energy Conservation vs. Energy Efficiency

Energy Conservation Notes _____	**Definition** _____	**3 Examples** _____ 1) Turn off lights when not in the room 2) 3)
Energy Efficiency Notes _____	**Definition** _____	**3 Examples** _____ 1) Use ENERGY STAR appliances 2) 3)

Energy Conservation vs. Energy Efficiency (Answer Key)

Energy Conservation Notes _____ Involves a change in behavior to save energy. Cutting waste in energy.	**Definition** Using less energy or none at all. Any behavior that results in the use of less energy. Dictionary.com says conservation is "the careful utilization of a natural resource in order to prevent depletion".	**3 Examples** 1) Turn off lights by hand when leaving the room 2) Powering off computers and electronic equipment at night 3) Lowering the thermostat in winter and raising it in summer 4) Unplugging appliances when not in use 5) Using air conditioner only when at home and needed. 6) Hanging your laundry on a clothesline instead of using a dryer
Energy Efficiency Notes _____ You don't have to sacrifice comfort to save energy. Physical upgrades. Involves technology.	**Definition** Using energy wisely and limiting waste. Use of technology that requires less energy to perform the same function. Dictionary.com says efficiency means "the ratio of the work done or energy developed by a machine, engine, etc., to the energy supplied to it, usually expressed as a percentage."	**3 Examples** 1) Turning off the lights in the classroom by motion sensor 2) Use ENERGY STAR appliances 3) Replacing worn out weather stripping 4) Adding insulation 5) Replacing incandescent lighting (using CFLs or LEDs) 6) Driving a hybrid car

Name_____ Date_____ Period_____

Watts in Our Classroom?
Unit Reflection

Give an example or show evidence of how you met each of the benchmarks/competencies below.

Science

SC.6.1.2 Use appropriate tools, equipment, and techniques safely to collect, display, and analyze data

Benchmark SC.6.1.2	Use appropriate tools, equipment, and techniques safely to collect, display, and analyze data		
Sample Performance Assessment (SPA)	The student: Selects and safely uses appropriate tools, equipment, and techniques to collect, analyze, and display data.		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Consistently select and safely use appropriate tools, equipment, and techniques to collect, display, and analyze data	Usually select and safely use appropriate tools, equipment, and techniques to collect, display, and analyze data	Sometimes select and safely use appropriate tools, equipment, and techniques to collect, display, and analyze data	Rarely select and safely use appropriate tools, equipment, and techniques to collect, display, and analyze data

SC.6.6.2 Describe the different types of energy transformations

Benchmark SC.6.6.2	Describe the different types of energy transformations		
Sample Performance Assessment (SPA)	The student: Describes a variety of energy transformations (e.g., heat energy into mechanical energy; chemical energy into light energy; electrical energy into magnetic energy).		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Explain the different types of energy transformations and give examples of their application	Describe the different types of energy transformations	Identify, with assistance, different types of energy transformations	Recognize that energy can be transformed

Technology

SC.6.2.1 Explain how technology has an impact on society and science

Benchmark SC.6.2.1	Explain how technology has an impact on society and science		
Sample Performance Assessment (SPA)	The student: Explains ways in which technology has changed our society and science.		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Explain and provide examples of how technology has an impact on society and science	Explain how technology has an impact on society and science	Give a partial explanation of how technology has an impact on society and science	Recognize that technology has an impact on society and science

SC 6.2.2 Explain how the needs of society have influenced the development and use of technologies

Benchmark SC.6.2.2	Explain how the needs of society have influenced the development and use of technologies		
Sample Performance Assessment (SPA)	The student: Describes ways in which the development and use of a specific technology (e.g., wheel, pencil, email, cell phone, satellite) has been influenced by society.		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Explain and provide examples of how the needs of society have influenced the development and use of technologies and predict possible developments	Explain how the needs of society have influenced the development and use of technologies	Provide examples of how the needs of society have influenced the development and use of technologies	Recognize that the needs of society have influenced the development and use of technologies

Engineering

CTE.6.1.1 Develop a process to invent a product or procedure to meet a need or improve upon an existing technology

Benchmark CTE.6.1.1	Develop a process to invent a product or procedure to meet a need or improve upon an existing technology		
Sample Performance Assessment (SPA)	The student: Creates a simple invention or improvement to an existing technology and presents the results (e.g., describes the steps of the design process; lists materials selected and used; determines the adequacy of the result in meeting the design purpose; describes the modifications needed).		
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Develop a process, in great detail, to invent a product or procedure to meet a need or improve upon an existing technology	Develop a process, in detail, to invent a product or procedure to meet a need or improve upon an existing technology	Develop a process, in some detail, to invent a product or procedure to meet a need or improve upon an existing technology	Develop a process, in minimal detail, to invent a product or procedure to meet a need or improve upon an existing technology

Math

CCSS.Math.Content.6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set

Advanced	Proficient	Partially Proficient	Novice
Gives an example and explains how variables can be used to represent numbers and writes expressions when solving real-world or mathematical problems; understands that a variable can represent an unknown number	Gives an example of how to use variables to represent numbers and writes expressions when solving real-world or mathematical problems; understands that a variable can represent an unknown number	Gives an example that partially shows how to use variables to represent numbers and writes expressions when solving real-world or mathematical problems; understands that a variable can represent an unknown number	Does not give an example of how to use variables to represent numbers and writes expressions when solving real-world or mathematical problems; understands that a variable can represent an unknown number

STEM Competencies

Indicator 3.4 Evaluates the effectiveness and ethical considerations to a solution and makes adjustments as needed.

6-8	A Complex Thinker who is STEM literate: •determines possible positive and negative effects a solution might have on society and the environment and collaborates with others to create a better solution. •explains the importance to keep honest, clear and accurate records. •understands that different explanations can be given for the same evidence, and it is not always possible to tell which one is correct. •draws sound/reasonable conclusions based on data and evidence that lead to effective solutions.

Advanced	Proficient	Partially Proficient	Novice
Completes all four bullets above	Completes three out of four bullets above	Completes one to two bullets above	Does not complete any of the bullets above

Indicator 5 The ability to communicate effectively

6-8	An effective communicator who is STEM-literate: • uses graphic images, models, mathematics, and/or language with appropriate technologies to generate, organize, and share information and ideas for problem-solving • can explain and justify the optimal solution to an audience • can share ideas with teammates; and listen, offer, and accept feedback • can resolve differences with others through both written and oral communication

Advanced	Proficient	Partially Proficient	Novice
Completes all four bullets above	Completes three out of four bullets above	Completes one to two bullets above	Does not complete any of the bullets above