Grade 4 Physical Science Unit (4.P.3)

Decision 1: What will students learn in this unit?

Standards Addressed:
1. Science: 4.P.3 Recognize that energy takes various forms that may be grouped based on their interaction with matter.
2. Reading Informational Text: 4.RIT.6 and 4.RIT.2
3. Math
4. Writing: W.4.2d Use precise language and domain-specific vocabulary to inform about or explain the topic.
5. Technology: 4.TT.1.2 Use a variety of technology tools to organize data and information (e.g., word processor, graphic organizer, audio and visual recording, online collaboration tools, etc.).

What do I want my students to KNOW, UNDERSTAND and be able to DO at the end of this unit?

<table>
<thead>
<tr>
<th>Know</th>
<th>Understand</th>
<th>Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.P.3.1</td>
<td>Understand how electrical circuits work.</td>
<td>Create an electrical circuit that will produce light energy.</td>
</tr>
<tr>
<td>Basic forms of energy: light, heat, sound, electrical and energy of motion.</td>
<td>The different forms of energy produced by different objects.</td>
<td>Combine different household objects to produce new/different forms of energy.</td>
</tr>
<tr>
<td>Electricity flowing through an electric circuit produces magnetic effects.</td>
<td>Understand the differences between light being reflected, refracted, and absorbed.</td>
<td></td>
</tr>
<tr>
<td>Electric circuit with battery to bulb to bell transfers the energy to their surroundings as light, sound and heat.</td>
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<tr>
<td>4.P.3.2</td>
<td></td>
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<tr>
<td>Light travels in a straight line.</td>
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<td></td>
</tr>
<tr>
<td>Light can be refracted, reflected and/or absorbed.</td>
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<td></td>
</tr>
</tbody>
</table>
Decision 2: Assessment

4.P.3.1
Build a Circuit (Group Performance Task)
Given the following materials, build a circuit that will permit the light to turn on and off.
(Light bulb, knife switch, battery and wires)

Individual Written Response
Identify each form of energy that results when the circuit is complete and the light is on.

4.P.3.2 Individual Written Response
A pencil is placed in a glass of water appears broken because the light is _____________.

Draw a picture that shows your answer.
### Decision 2: Assessments – Rubric Reminders:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>4.P.3.1: Individual Written Response</td>
<td></td>
</tr>
<tr>
<td>Student was unable to identify either of the two forms of energy created in the complete circuit.</td>
<td></td>
</tr>
<tr>
<td>Student is able to identify one of the two forms of energy created in the complete circuit.</td>
<td></td>
</tr>
<tr>
<td>Student is able to identify both forms of energy created in the complete circuit.</td>
<td></td>
</tr>
<tr>
<td>Student is able to identify both forms of energy created in the complete circuit and explain why.</td>
<td></td>
</tr>
<tr>
<td>4.P.3.2: Individual Written Response</td>
<td></td>
</tr>
<tr>
<td>Student was unable to meet either of the proficient criteria.</td>
<td></td>
</tr>
<tr>
<td>Student is able to meet one out of two proficient criteria.</td>
<td></td>
</tr>
<tr>
<td>Student is able to identify why the pencil appeared broken, and draw an accurate picture.</td>
<td></td>
</tr>
<tr>
<td>Student is able to identify why the pencil appeared broken, draw an accurate picture, and further explain their answer.</td>
<td></td>
</tr>
</tbody>
</table>
## Decision 3: Student Learning Map

### Key Learning Targets:
- I can recognize the basic forms of energy as the ability to cause motion or create charge.

### Concepts:
- **Recognizing the basic forms of energy.**
- **Knowing how forms of energy can cause motion and create change.**
- **Recognizing that light travels in a straight line.**
- **Knowing that light can be changed by reflecting, refracting, and absorbing.**

### Lesson EQ(s):
- How can I describe the basic forms of energy?
- How can I compare and contrast the different forms of energy?
- What are everyday examples of energy causing motion or creating change?
- How does light travel?
- How can light interact with different media?

### Vocabulary:
- **energy**
- **light**
- **heat**
- **sound**
- **electrical**
- **magnetic**
- **thermal**
- **motion**
- **flow**
- **circuit (open/closed)**
- **transfer**
- **volt**
- **current**
- **watt**
- **discharge**
- **conductor/nonconductor**
- **electricity**
- **insulator**
- **power**
- **reflect**
- **refract**
- **absorb**
- **prism**
- **spectrum**
Decision 4: Launch Activities

Prior Knowledge Activator

Energy/Light Picture Walk

1. Teacher provides real life photographs of forms of energy (i.e., light, heat, sound, magnetic, and electrical).
2. Teacher distributes photographs throughout the room.
3. Students move around the room to observe each photograph.
4. Students share their observations with their classmates and teacher in order to activate their prior knowledge.
5. Teacher can then begin to introduce the key vocabulary.
Decision 5: Acquisition Lesson One

Language Objective(s), where appropriate:
Recognizing the basic forms of energy.

Lesson Essential Question(s) or “I Can” Statement(s):
How can I describe the basic forms of energy?  
(I can describe the basic forms of energy.)  
How can I compare and contrast the different forms of energy?  
(I can compare and contrast the different forms of energy.)

Activating Strategies: (Learners Mentally Active)
Students will watch “Forms of Energy” video segment on different forms of energy found around a campsite. (Found on Discover Education). Students will list three forms of energy seen in the video segment, and write a prediction of what they believe energy is.

Acceleration/Previewing:
Energy  Heat  Sound  Electrical  
Light  Magnetic  Thermal

Teaching Strategies: (Explain and Model; Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers)
Teacher will explain that they will be learning about the five different forms of energy. The teacher will provide graphic organizer (attached) for students to take notes on the 5 different forms of energy. The students will then be divided up into five “expert” groups in order to read from their text books or provided texts to take notes and decide what information is important in order to explain their form of energy to their classmates.

Give students approximately 20 minutes to read and discuss their form of energy (light, sound, electrical, magnetic, and thermal) and become an expert. Once students have their notes and feel comfortable with their information, have them get into their pre-assigned jigsaw groups. Each group should be made up of one student to represent the five different forms of energy.

Ask each student to present her or his segment to the group. Encourage others in the group to ask questions for clarification. As that student is presenting the other students should be filling in their jigsaw graphic organizer.

As an end result each student should have an understanding of all forms of energy.

Come back together as a whole class, and have students explain what they learned.

Summarizing Strategies: Learners Summarize and Answer Essential Questions
Students will complete a 3-2-1 ticket out.  
On a scrap piece of paper students will write three forms of energy, two facts about their expert form, and one fact that shocked them.

Lesson Resources
http://www.jigsaw.org/steps.htm
https://www108.studyisland.com/cfw/class/assignment-create-practice-instruction/bbe29396?CFID=4122343&CFTOKEN=55760996#
Decision 5: Acquisition Lesson Two

Language Objective(s), where appropriate:
Knowing how forms of energy can cause motion and create change.

Lesson Essential Question(s) or “I Can” Statement(s):
What are everyday examples of energy causing motion or creating change?
(I can explain everyday examples of energy causing motion or creating change.)

Activating Strategies: (Learners Mentally Active)
The teacher will share a bag with a variety of items and have students make a hypothesis in their science journals about each item, how they believe it relates to energy. Encourage students to come up with unusual ideas for the kind of energy the objects have. Students will then pair with a neighbor to share three of their predictions.

Teaching Strategies:
Teacher will prepare bags for each group with a variety of objects.
Allow students to create their own learning teams (3-4 students). Students will first examine the variety of items. Students will then take turns testing each item in their bag to discover what form of energy it has. Students will work as a team to combine items to create new forms of energy. Ask students to see if they can discover multiple forms of energy from each item. Student will create a T-Chart in their science journals. (Example below.)

<table>
<thead>
<tr>
<th>Item in your bag</th>
<th>Form of energy produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
</tbody>
</table>

Each bag will include:
- Plastic comb
- Drinking straw
- Popsicle stick
- Hand warming package
- Flashlight
- Battery
- 1 meter of string
- Christmas lights
- UV Beads
- Paper clip
- Pencil with eraser
- Ruler
- Styrofoam cup

**Caution students about the battery. If it starts feeling hot, disconnect it quickly.

Distributed Guided Practice/Summarizing Prompts: (prompts designed to Initiate Periodic Practice or Summarizing)

Summarizing Strategies: Learners Summarize and Answer Essential Questions
Students will answer the following comprehension follow-up questions in their science journals individually.
1. How many different forms of energy were you able to produce?
2. Where does the energy go?
3. Draw a picture of one of your inventions and explain what form of energy it produces.

Lesson Resources
http://rescu.rice.edu/scope/12/explore
Formative Assessment on 4.P.3.1

Students will read “Forms of Energy” Science Reading Passage, and answer the comprehension questions.

1. What is the main idea of this passage?
2. What type of energy is being used in this picture?

Expository Text:

Energy is everywhere. It is in the wind, the ground, and our bodies. Energy is in our motion and falling rain. Most of the energy on Earth can be traced back to our nearest star, the Sun. The Sun sends us energy we detect as light and other energy we do not see. When the Sun’s energy, called solar energy, reaches the Earth, it transforms into many different kinds of energy. Some of this energy is seen as light, used by plants to make food, warms the Earth and the oceans, and produces the water cycle.

Energy never stays the same. It is continually transforming into different kinds of energy. Sometimes it is hard to tell the difference between matter and energy. When an atomic bomb explodes, some of its matter turns into energy. The matter does not disappear, it just changes form.

If you are near when a bell rings, you can hear it clearly. If you are farther away, it sounds softer. If you are very far away, you do not hear it. What happens to the sound energy? Eventually, sound energy transforms into heat energy. The sound energy is not lost, it just changes form.

Electrical energy is transformed into light energy when it flows through the filament in a light bulb. The electrical energy makes the filament so hot (heat energy), that it glows (light energy). The light shines into a room and heats the air, along with nearby objects. Thus, the light energy transforms into heat energy. Electrical energy transforms into light energy which transforms into heat energy. Energy is not lost, it just changes form.

One of the most basic laws of science is called the conservation of energy law. The law states that energy, and matter too, is never lost, it just changes form. When you eat lunch, your food becomes energy for your body. How many ways do you transform the energy you get from your sandwich?
Decision 5: Acquisition Lesson Three: How Light Travels/Straight Line

Language Objective(s), where appropriate:
In this lesson, the students will be experimenting to show how light shines in a straight line. They will also be experimenting to see how light reflects using mirrors. The students will be working in cooperative learning groups to carry out these experiments. Technology will be used to introduce and extend the activity.

Lesson Essential Question(s) or “I Can” Statement(s):
How does light travel?
(I can explain how light travels.)

Activating Strategies: (Learners Mentally Active)
Introduce this lesson about light by talking about lighthouses. Students will quick write how do they predict lighthouses work and where are they located?

Acceleration/Previewing: (key vocabulary)

Teaching Strategies: (Explain and Model; Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers)

1. Divide class into groups of four. (Mix groups according to ability, gender, and personality.)
2. Model before students begin: Have three cards already cut with the holes in the middle of each card. Place an X on the wall with masking tape at eye level. The teacher will hold a flashlight while three students will hold the precut cards in a straight line. The holes in each card will let the ray of light shine through the holes in the cards. The light should be shining through all of the cards onto the X on the wall. This shows that light travels in a straight line.
3. Each group will then use a tracing circle to trace a circle in the middle of the three index cards per group. Cut out the middle of each circle.
4. Distribute one flashlight to each group.
5. Have one member of each group tape an X on the wall at eye level. (Tape may also be placed on desk for students with kinesthetic weaknesses or for limited space.) Let students experiment to see if they can get their light to shine through all cards. Students can switch places holding the flashlight until everyone in the group has had a chance to hold the light.
6. Students should document what they have noticed on Venn diagram in one circle. Students decide what to label this circle.
7. Give each group three mirrors. Demonstrate how to make the light reflect from one mirror onto the other mirrors to the X on the wall. This shows how light reflects.
8. Let each group try to see if they can line up their mirrors to shine the light on their X's on the wall. Rotate again letting each group member have a chance to hold the flashlight.

Summarizing Strategies: Learners Summarize and Answer Essential Questions
Observe the students as they participate in cooperative learning groups. Assess Double Loop Venn Diagram. Have students write in their science notebooks about their group's experiments.
Decision 5: Acquisition Lesson Four

Language Objective(s), where appropriate:
Knowing that light can be changed by reflecting, refracting, and absorbing.

Lesson Essential Question(s) or “I Can” Statement(s):
What happens when light comes into contact with another object?
(I can explain how light interacts with another object.)

Activating Strategies: (Learners Mentally Active)
Review prior knowledge about the lesson regarding how light travels in a straight line. Show this with a laser light or flashlight.
Have students partner up and share their thoughts with a neighbor.

Acceleration/Previewing: (key vocabulary)

Teaching Strategies: (Explain and Model; Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers)
1. Have the students make predictions at table groups (2-4 students per group) about what happens when light contacts an object.
2. Question what happens when it comes into contact with a mirror.
3. Give each group a mirror (substitute with aluminum foil if needed) and a small flashlight (ask teachers to lend you flashlights if your school does not have any).
4. Give students a few minutes to experiment.
5. Demonstrate that light bounces, or reflects off of the surface (if you already taught rocks and minerals you can re-introduce the term opaque). Then show them the diagram below so that they can see what happens visually.
6. Task: Have students draw a light bulb on an index card and set it up at the end of the desk cluster. See if they can use two mirrors to reflect light so that it “lights” up the bulb on the index card.

Distributed Guided Practice/Summarizing Prompts: (prompts designed to Initiate Periodic Practice or Summarizing)

Summarizing Strategies: Learners Summarize and Answer Essential Questions
Students will write a paragraph explaining what reflection is and illustrate the concept with a diagram.
**Decision 5: Acquisition Lesson Five**

**Language Objective(s), where appropriate:**
Knowing that light can be changed by reflecting, refracting, and absorbing.

<table>
<thead>
<tr>
<th>Lesson Essential Question(s) or “I Can” Statement(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>What happens when light comes into contact with another object?</td>
</tr>
<tr>
<td>(I can explain how light interacts with another object.)</td>
</tr>
</tbody>
</table>

**Activating Strategies: (Learners Mentally Active)**

| Review all prior knowledge: light can travel in a straight line and can reflect. |
| Have them fold a piece of paper into four equal rectangles. |
| Illustrate and label the two previously learned concepts. |

**Teaching Strategies: (Explain and Model; Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers)**

- Now have them write the word refraction in a third box and ask them what word they see in the word refraction. See if they can identify the prefix and its meaning.
- Underline the root “fract” and discuss how it means a part of, or broken into pieces. Re means again.
- Pass out the glass and the flashlight. Let the students come up with a list of ways that they can try to refract light. Let them try and have them orally explain their thinking.
- Now add water to the glass. Let them test and see if they can show you refraction with the glass, water, and flashlight.

**Summarizing Strategies: Learners Summarize and Answer Essential Questions**

| Have students discuss with a partner the difference between their first tests and the one that included the water. See if they can draw the conclusion that it takes two substances for light to refract. |
Decision 5: Acquisition Lesson Six

**Language Objective(s), where appropriate:**

| Knowing that light can be changed by reflecting, refracting, and absorbing. |

**Lesson Essential Question(s) or “I Can” Statement(s):**

| What happens when light comes into contact with another object?  |
| (I can explain how light interacts with another object.) |

**Activating Strategies: (Learners Mentally Active)**

- Pull out the foldable and review all the previously learned concepts.
- Then give each student a sponge. Get them to squeeze the sponge and see what comes out.
- Now give them some water and have them soak the sponge and repeat.

**Teaching Strategies: (Explain and Model; Collaborative Pairs; Distributed Guided Practice; Distributed Summarizing; Graphic Organizers)**

- Allow students to come up with the term absorb and then have them look it up in a dictionary.
- Write the term in the final block of their chart.
- Give students the supplies.
- Have them stand ten feet away from the whiteboard and shine the flashlight at the whiteboard. One student can trace the size of the circle that is on the board. Have them repeat the process with each cloth and each color of tissue paper. The tracer will trace the circle size each time with a matching color dry erase marker.

**Distributed Guided Practice/Summarizing Prompts: (prompts designed to Initiate Periodic Practice or Summarizing)**

**Summarizing Strategies: Learners Summarize and Answer Essential Questions**

| Students can experiment with other items in the classroom. |
| Students can come up with one item that reflects and absorbs. |
| Students can set up an experiment that allows light to begin traveling in a straight line, then reflect, refract and ultimately be absorbed. |
Decision 6: Extending Thinking Activities

Include extending activities for several lessons in the essential units.

1. Compare and contrast the different forms of energy using graphic organizer below.

<table>
<thead>
<tr>
<th>How are they different?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light vs. Sound</td>
</tr>
<tr>
<td>Sound vs. Heat</td>
</tr>
<tr>
<td>Etc.</td>
</tr>
</tbody>
</table>

2. Student will explain the best way to conserve energy using the graphic organizer below to guide your persuasive writing.

<table>
<thead>
<tr>
<th>Position Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason #1</td>
</tr>
<tr>
<td>Reason #2</td>
</tr>
<tr>
<td>Reason #3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facts listed to support your Reason #1</th>
<th>Facts listed to support your Reason #2</th>
<th>Facts listed to support your Reason #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1.</td>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
<td>2.</td>
<td>2.</td>
</tr>
</tbody>
</table>
Decision 7: Differentiating the Unit

The following accommodations will be used at the teacher’s discretion throughout the unit’s lessons:

- Seating
- Real World Applications
- Visual, auditory, kinesthetic activities
- Groups for activities
- Teacher Modeling
- Use different on level texts for assessments
- Guided notes
**Decision 8: Unit Calendar**

Determine the most viable sequence for the experiences, activities, and lesson and create a timeline.

<table>
<thead>
<tr>
<th>Lesson One 4.P.3.1</th>
<th>2 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Two 4.P.3.1</td>
<td>2 days</td>
</tr>
<tr>
<td>Formative Assessment on 4.P.3.1</td>
<td>1 day</td>
</tr>
<tr>
<td>Lesson Three 4.P.3.2</td>
<td>1 day</td>
</tr>
<tr>
<td>Lesson Four 4.P.3.2</td>
<td>1 day</td>
</tr>
<tr>
<td>Lesson Five 4.P.3.2</td>
<td>1 day</td>
</tr>
<tr>
<td>Lesson Six 4.P.3.2</td>
<td>1 day</td>
</tr>
<tr>
<td>End of Unit Assessment on 4.P.3.1 and 4.P.3.2</td>
<td>1 day</td>
</tr>
</tbody>
</table>
Decision 9: Resources

Lesson One: Jigsaw Graphic Organizer

<table>
<thead>
<tr>
<th>Light Energy</th>
<th>Electrical Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Sound Energy</td>
<td>Heat/Thermal Energy</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnetic Energy</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Other resources listed below each lesson.
**Unit Designers:**

**Date:** January 22, 2013

<table>
<thead>
<tr>
<th>Name</th>
<th>School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melissa Roberts</td>
<td>Clear Creek</td>
</tr>
<tr>
<td>Rachel Rogala</td>
<td>Upward</td>
</tr>
<tr>
<td>Geoff Kinsey</td>
<td>Marlow</td>
</tr>
<tr>
<td>Holly Brookshire</td>
<td>Hillandale</td>
</tr>
<tr>
<td>Renee Compton</td>
<td>Hillandale</td>
</tr>
</tbody>
</table>