2013 Summer Curriculum Institute for TAT Alumni

Team:
Jen Brown (Science Teacher), Patricia Brown (Math Coach), Chris Brown (5th Grade Teacher)

General Info:
We will be working on science curriculum for grade 4 focusing on a unit on static electricity, current, circuits, and uses of electricity.

Work Week:

1. Analyze electricity lessons as part of the 4th grade curriculum to address modification concerns to enable ELLs to connect to real life applications through science.

2. Identify the strategies needed to make these lessons comprehensible for ELLs on varying levels to ensure their understanding of electricity, circuits, and the importance in real life.

3. Modify the original five lessons for ELLs with visuals, word banks, and graphic organizers and worksheets appropriate to differing language levels.

4. Write lessons that build background connections and provide opportunities to negotiate meaning through speaking and writing.

5. Create and utilize modified hands-on activities for successful comprehension of vocabulary and to provide more opportunities for more comprehensible talk through strategic teacher questioning.

Meetings:
The team will meet at locations in New Haven (Westville) and East Haven (Library)
Tuesday, July 9, 10-2
Wednesday, July 10, 9-4
Sunday, July 14, 9-4
Monday, July 15, 9-4
Tuesday, July 16, 9-12
Unit will be handed in upon completion of the 27 minimal hours.

Potential Lesson Plan
Day One: What is static electricity?
Day Two: What is current?
Day Three: What conducts?
Day Four: Where does electric current come from?
Day Five: How do we use electricity?

**Vocabulary**
- Electricity
- Energy
- Charge
- Static
- Current
- Circuit
- Source
- Conduct
- Cell
- Repel
- Attract
- Friction
- Fluorescent
<table>
<thead>
<tr>
<th>SHELTERED FEATURES</th>
<th>ON PAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.A. Build and Activate Background Knowledge</td>
<td>6,18,28,41,53</td>
</tr>
<tr>
<td>1. B. Develop Vocabulary</td>
<td>6,18,28,41,51,53</td>
</tr>
<tr>
<td>1. C. Use Visuals, Gestures and Realia</td>
<td>16,19,20,51,60-61</td>
</tr>
<tr>
<td>1. D. Create Opportunities to negotiate meaning</td>
<td>8-16,21-26,30-37,43-51,58-67</td>
</tr>
<tr>
<td>2. A. Use Graphic Organizers Intentionally</td>
<td>30-34,39,58-61</td>
</tr>
<tr>
<td>2.B. Modify Written Text</td>
<td>19-20</td>
</tr>
<tr>
<td>2.C. Amplify Number of Activities per Text</td>
<td>8-16,21-26,31-37,43-51</td>
</tr>
<tr>
<td>3. A. Pace Teacher’s Speech</td>
<td>6,19,28</td>
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<tr>
<td>3. B. Use Listening Guides</td>
<td>19</td>
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<td>3. C. Use Word Walls</td>
<td>2,18,29</td>
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<td>3. D. Frame Main Ideas</td>
<td>6,18,27,41,54</td>
</tr>
<tr>
<td>3. E. Check for Understanding</td>
<td>7,28-29,41,54</td>
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<tr>
<td>4. A. Practice Instructional Conversations</td>
<td>7,28-29,29,54</td>
</tr>
<tr>
<td>4. B. Ask Big Questions and Signal “Listening” in Responses</td>
<td>18,28-29,41,53</td>
</tr>
<tr>
<td>5.A. Vary Questions Techniques Based on Students; Proficiency Levels</td>
<td>7,19,28-29,41,42,54</td>
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<tr>
<td>5.B. Challenge Students to Produce Extended Academic Talk</td>
<td>7,18-19,41,54</td>
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<tr>
<td>6. A. Model Language for Oral and Written Production</td>
<td>6,7,18,53</td>
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<tr>
<td>6. B. Use Small Group/Pair Work to Elicit Student Talk: Students as Researchers</td>
<td>20, 28-29,41,42,43,54</td>
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<tr>
<td>6. C. Respond to Student’s Voice-Writing and Error Correction</td>
<td>28,29,54</td>
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Our performance indicator charts will focus on the three main stages of production: Pre-production, Speech Emergent and Bridging.

**Pre-Production:** Students are totally new to English, generally lasts 1-3 months. Teaching behaviors include: Gestures, meaning and vocabulary development, repetition, does not force students to speak (any “b” worksheets)

**Speech Emergent:** Students are beginners. Teachers will focus on key concepts, provide frequent comprehension checks and use expanded vocabulary and performance-based assessments (any “a” worksheets)

**Bridging:** Students are intermediate to advanced. (Native-like proficiency takes 5-9 years). Teachers will foster concept development and expanded literacy, make lessons comprehensible and interactive and teach thinking skills. (Numerical worksheet 1’s, 2’s, 3’s, etc)
<table>
<thead>
<tr>
<th>Content Objectives:</th>
<th>Language Objectives:</th>
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<tbody>
<tr>
<td>1. Students will be able to define static electricity.</td>
<td>1. Students will be able to define static electricity in written words.</td>
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<tr>
<td>2. Students will be able to demonstrate and write down how static electricity can attract or repel.</td>
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<th>Level 3 Speech Emergent</th>
<th>Level 1 Pre-Production</th>
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<tbody>
<tr>
<td><strong>WRITING:</strong> Students will be able to define static electricity in written words.</td>
<td>Students will be able to define static electricity in written words.</td>
<td>Students will be able to define static electricity in written words with sentence frames provided by the teacher.</td>
<td>Students will be able to define static electricity in written words by writing in the word to the definition provided by the teacher.</td>
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<tr>
<td><strong>WRITING:</strong> Students will be able to demonstrate and write down how static electricity can attract and repel.</td>
<td>Students will be able to demonstrate and write down how static electricity can attract and repel by using words like attract, repel, friction, atoms.</td>
<td>Students will be able to demonstrate and write down how static electricity can attract and repel by using minimal vocabulary and drawing what happens.</td>
<td>Students will be able to demonstrate and write down how static electricity can attract and repel by using visuals and circling one-word answers.</td>
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Day One: What is Static Electricity?

**Introduction:** (Notes for Teacher: As a refresher for what static electricity is): Static electricity is electrons that are transferred from one place to another without flowing in a current. If some of the electrons are transferred from one object to another by, for example, vigorous rubbing and separation, the other object becomes negatively charged while the object that loses electrons becomes positively charged. Remember, electrons are negatively charged particles. Unlike charges—one negative and one positive—always attract each other, and like charges—either negative or positive—always repel each other. Rubbing or brushing objects transfers electrons, creating a charge and, therefore, an electric field. The field affects objects nearby, producing an unlike charge in them, and the unlike charges are drawn together.

Electrons that have been knocked out of the outer shell of an atom are known as free electrons. These free electrons can exist by themselves outside of the atom, and it is these electrons which are responsible for most electrical phenomena. The movement of free electrons constitutes an **electric current**. When an electromotive force is applied, such as that provided by a battery or electric power plant generator, the free electrons in the conductor (wire) are guided in an orderly fashion, atom to atom. Electric current then is the transport of electric charge (electrons).

**Building Connections:**

Teacher will begin class by asking discussion questions to the class like, “Have you ever walked across a carpet with your socks on? What did you feel?” and “Has your hair ever stood on end?” “Have you ever felt a shock or spark from this?” Teacher will pose some ways static electricity is demonstrated in every day life. Each student will be asked to write down their own definition using sentence starters to write a class definition of Static Electricity. (See Definition ELL modifications for sentence frames). Teacher will lead class into two discover activities to model attraction and repelling because of static electricity.

**Objectives:** Students will be able to define static electricity and demonstrate how static electricity can repel and attract.

**Materials**

**Activity 1: Stick UP**
- balloon
- piece of fur or wool
- a blank space on a nearby wall

**Procedure**
1. Blow up a balloon and tie the end so that the balloon stays inflated. Without doing anything else, hold the balloon against the wall and see if it will stick. Observe what happens.
2. Next, briskly rub the balloon across a piece of wool; you can use a sweater, sock, scarf, or rug.
3. Hold the balloon against the wall and see if it will stick. Does the balloon stay?
4. What conclusions can you make about the activity?

Activity 2: Static Balloon Activity

Materials

- 2 balloons
- 2 pieces of thread or lightweight string about 3 feet long (exact length is not critical)
- wool

Procedure

1. Blow up 2 balloons and tie each one closed so that the balloons stay inflated. Tie an 18 inch long thread or string onto the end of each balloon.
2. Give each balloon a static charge by rubbing it with fur, wool, or your hair.
3. Hold each balloon by the end of the thread and try to bring the balloons close to each other. Observe what happens.
4. What conclusions can you make about the activity? Again, think about what is happening inside the balloons.

Wrap Up: Students will answer questions on worksheets provided to help with comprehension of why the balloons attracted or repelled other objects. (Lower level ELLs should be able to circle or draw arrows as to what happened.) Teacher will walk around and check work and pose questions for understanding to students to try to elicit more talk among the partners.

Assessment: Teacher will assess through the extended talk and worksheets given to students. Teacher will listen for words being used like static, electricity, friction, (possibly excited gases in the balloon) from higher level students. Also, assessment will be based on how well the students were able to do the experiment (Blowing up the balloons, tying strings, rubbing quickly enough to produce a charge).

Modifications: Sentence starters and worksheets (1.1, 1.1a, 1.1b, 1.2, 1.2a, 1.2b) have been modified for three levels of ELLs using visuals, circle answers, and sentence starters.
1.1

Definition Sheet for Your Vocabulary Journal!

Static Electricity is electricity that is caused

------------------------------------------------------------------------------------------------------------
1.1a

Definition Sheet for Your Vocabulary Journal!

Static Electricity is electricity that is caused by______________, or one object 

______________________________________________________________________.

-------------------------------------------------------------------------
1.1b

Definition Sheet for Your Vocabulary Journal!

______________________________ is electricity that is caused by friction, or one object rubbing against another object
1.2

BALLOON PARTNER ACTIVITIES!!

STICK UP! AND STATIC!!

Name __________________________________________ Date ____________

**Stick Up!**

Discuss what happens with your partner, then answer the questions.

**Questions!**
1. Does the balloon stick to the wall at first?

2. After rubbing the balloon with wool, does it stick to the wall?

3. Why do you think this happens? What conclusions can you write?

**Static!**

Discuss what happens with your partner, then answer the questions.

**Questions!**
1. What happens when you try to bring the two balloons together?
2. What do you think is happening here?

3. What do you think is happening inside the balloons?
1.2a

BALLOON PARTNER ACTIVITIES!!

STICK UP! AND STATIC!!

Name ___________________________ Date ____________

**Stick Up!**

Discuss what happens with your partner, then answer the questions.

Questions!
1. Does the balloon stick?

2. After rubbing the balloon with wool, does it stick?

3. Why does it stick?

**Static!**

Discuss what happens with your partner, then answer the questions.
Questions!
1. Why can’t the balloons touch?

2. Draw a picture of what is happening.
1.2b

BALLOON PARTNER ACTIVITIES!!

STICK UP! AND STATIC!!

Name _________________________________________________ Date ____________

Stick Up!

Discuss what happens with your partner, then answer the questions.

Questions!

1. Draw an arrow where the balloon goes.

2. Why is there STATIC? Circle.

   RUBBING or WALL
Static!
Discuss what happens with your partner, then answer the questions.

Questions!
1. Draw what happens when you try to touch the balloons together.

2. The balloons do not touch because: Circle

   BOTH RUBBED   ONE RUBBED   STRING
### Content Objectives:
1. Student will be able to create an electric current from static electricity.
2. Students will be able to discuss how different types of materials cause different levels of glow in the light bulb.

### Language Objectives:
1. Students will be able to create an electric current from static electricity by listening to teacher demonstration.
2. Students will be able to orally discuss how different types of materials cause different levels of glow in the light bulb.

<table>
<thead>
<tr>
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<th>Level 3 Speech Emergent</th>
<th>Level 1 Pre-Production</th>
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</thead>
<tbody>
<tr>
<td>LISTENING:</td>
<td>Students will be able to create an electric current from static electricity by listening to teacher demonstration by actively participating in the hands on experiment to utilize listening skills</td>
<td>Students will be able to create an electric current from static electricity by listening to teacher demonstration by watching the demonstration and participating in experiment</td>
<td>Students will be able to create an electric current from static electricity by listening to teacher demonstration by watching the demonstration and touching the hands and bulbs used in both activities.</td>
</tr>
<tr>
<td>SPEAKING:</td>
<td>Students will be able to orally discuss how different types of materials cause different levels of glow in the light bulb.</td>
<td>Students will be able to orally discuss how different types of materials cause different levels of glow in the light bulb by using some vocabulary for some explanation of the amount of glow in the light bulb, utilizing the word wall and sentence starters</td>
<td>Students will be able to orally discuss how different types of materials cause different levels of glow in the light bulb by drawing and pointing to the amount of glow of the bulb and trying to use one or two words to explain their worksheet to their partner</td>
</tr>
</tbody>
</table>
Day Two: What is Current?

Introduction:

Have you ever experienced static electricity? Today you will learn how static electricity can be used to create a current. Teacher will draw a reminder of yesterday’s activity on static charge for a visual and ask students to review with a classmate through discussion. Teacher will have some students share from their groups with sentence starters for support written on the board, such as “Yesterday I learned…” and “One way to make static electricity is…” to produce academic talk.

Building Connections:

Teacher information:

A current is the flow of electricity through conductive materials.

Static electricity creates enough of an electrical current to make the fluorescent bulb glow, and different materials will create different amounts of static electricity, causing different levels of glow in the light bulb. Teacher will lead vocabulary discussion of essential words, having students repeat and provide definitions for current, conductor, static and add these to word wall.

The following activity will be used to simulate a traveling current.

Teacher will have all students stand in a circle with one palm facing up, and the other facing down, above the palm of the adjacent student. Each upper palm, one student at a time, will rub the next student’s hand. Teacher will explain how this action changes physical energy (rubbing) into heat energy (warmth) felt by next student. Today’s activity will be using rubbing to change physical energy (rubbing) into light energy (light).

Objectives:

Student will create an electric current from static electricity and discuss how different types of materials cause different levels of glow in the light bulb.

Materials:

Fluorescent light bulb

Piece of plastic wrap

Pieces of wool, cotton, fake fur, and other types of cloth
Recording sheets

**Procedure:**

Teacher will turn off lights in classroom.

Teacher will explain steps that will be used for today’s activity, questioning students to help provide definitions and to check for understanding. Teacher will note the main idea is to show how rubbing will produce usable energy, now to be used as electrical current for light.

Teacher will demonstrate using one material, plastic wrap. Teacher rubs plastic wrap along length of light bulb.

Teacher questions students as to what they think is happening, challenging students to use academic talk in their verbal explanations.

Teacher reviews safety procedures for handling light bulbs, then distributes supplies to partners, including ELL students paired with stronger language students.

Students then make their predictions on the level of glow to be produced for each material.

Students will follow these steps to conduct experiment, recording findings.

Hold bulb in one hand and rub it up and down with plastic wrap.

Repeat with each different type of material.

**Wrap-up:** Teacher will hand out three modified text pieces to differing level of ELLs and students to ensure the summation of the lesson. Each text has different readability. Each student will read this over now, to ensure understanding.

**HANDOUT FOR LEVEL 5 ELL**

In today’s lesson, static electricity is the use of physical motion and rubbing to produce light. The light is produced because the rubbing excites the gas that is in the fluorescent bulb. Various materials cause different levels of excitement in the bulb, resulting in different amounts of glow.

**HANDOUT FOR LEVEL 3 ELL**

Static electricity comes from rubbing.

Rubbing the light bulb with some materials makes it glow.
Rubbing with different materials makes different amounts of glow.

**HANDOUT FOR LEVEL 1 ELL**

RUBBING = STATIC = LIGHT

In a whole group, discuss with students the idea that the static electricity created by rubbing the various materials up and down on the fluorescent bulb created electric currents of different strengths.

In pairs, students will discuss what a current is, how static electricity was created, and how the different materials affected the level of glow in the light bulb.

**Assessment:**

Student will complete worksheet and share the answers with a partner or small group.

Teacher will check for understanding by visiting different pairs of students and spot-checking the students’ answers.

**Modifications:**

Sentence starters on the board to scaffold responses

Text handout with different level readability (pages 19-20)

Modified worksheets (2.1, 2.1a, 2.1b, 2.2, 2.2a, 2.2b)
Day 2: What is a Current?

Recording Sheet

Name______________________________________________ Date________________

<table>
<thead>
<tr>
<th>Materials</th>
<th>Predictions</th>
<th>Levels of Glow</th>
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<tbody>
<tr>
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</table>
2.1a

Day 2: What is a Current?

Recording Sheet

Name______________________________________________ Date________________

<table>
<thead>
<tr>
<th>Materials</th>
<th>Predictions</th>
<th>Levels of Glow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic Wrap</td>
<td>LOW MEDIUM HIGH</td>
<td>LOW MEDIUM HIGH</td>
</tr>
<tr>
<td>Wool</td>
<td>LOW MEDIUM HIGH</td>
<td>LOW MEDIUM HIGH</td>
</tr>
<tr>
<td>Cotton</td>
<td>LOW MEDIUM HIGH</td>
<td>LOW MEDIUM HIGH</td>
</tr>
<tr>
<td>Fake Fur</td>
<td>LOW MEDIUM HIGH</td>
<td>LOW MEDIUM HIGH</td>
</tr>
<tr>
<td>Felt</td>
<td>LOW MEDIUM HIGH</td>
<td>LOW MEDIUM HIGH</td>
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</tbody>
</table>
### 2.1b

**Day 2: What is a Current?**

**Recording Sheet**

| Name ________________________________ | Date __________________ |

<table>
<thead>
<tr>
<th><strong>Materials</strong></th>
<th><strong>Predictions</strong></th>
<th><strong>Levels of Glow</strong></th>
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<tbody>
<tr>
<td>Plastic Wrap</td>
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<tr>
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<td>LOW  MEDIUM  HIGH</td>
</tr>
<tr>
<td>Fake Fur</td>
<td>LOW  MEDIUM  HIGH</td>
<td>LOW  MEDIUM  HIGH</td>
</tr>
<tr>
<td>Felt</td>
<td>LOW  MEDIUM  HIGH</td>
<td>LOW  MEDIUM  HIGH</td>
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</tbody>
</table>
2.2

Name ______________________________________________ Date__________

1. What is a current?

2. How can static electricity be used to create a current?

3. Which material/fabric did you predict to cause the light bulb to glow the most? Were you correct?

4. Can you draw any conclusions about which types of fabrics caused the light bulb to glow more than others?
1. Did your bulb glow for each material?

2. How can static electricity be used to make the bulb glow?

3. Which material made the bulb glow most?

4. Draw two pictures showing the material and the glow it made.
1. A current is the flow of ________________.
   
   Electricity       Material

2. Static electricity makes a current.
   
   Yes               No

3. Did the plastic wrap make the bulb glow high or low?
   
   High            Low
<table>
<thead>
<tr>
<th>Content Objectives:</th>
<th>Language Objectives:</th>
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<tbody>
<tr>
<td>1. Students will be able to make predictions about materials that conduct or insulate.</td>
<td>1. Students will be able to write predictions about materials that conduct or insulate.</td>
</tr>
<tr>
<td>2. Students will be able to explain how a conductor works.</td>
<td>2. Students will be able to write an explanation of how a conductor works.</td>
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<tr>
<td>WRITING: Students will be able to write predictions about materials that conduct or insulate.</td>
<td>Students will be able to write predictions about materials that conduct or insulate using a chart provided to fill in with key words already filled in.</td>
<td>Students will be able to write predictions about materials that conduct or insulate using a chart provided to fill in with visuals of each material and key corresponding words.</td>
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<tr>
<td>WRITING: Students will be able to write an explanation of how a conductor works.</td>
<td>Students will be able to write an explanation of how a conductor works with modified questioning to highlight main ideas.</td>
<td>Students will be able to write answers to questions and draw answers to questions using an informational sheet and visuals sheet to help depict conductivity.</td>
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</table>
Day Three: What Conducts?

Introduction:

Teacher discusses current, electricity that flows from one point to another. Vocabulary is used, current, conductor, and insulator. Students are asked to define these as a group, and say them out loud to be sure on pronunciation. Teacher should also create an opportunity to negotiate meaning: how are the three words for vocabulary for today’s lesson related to each other?

Building Connections:

Do all objects allow electricity to flow through them? Brainstorming all objects that your team thinks will allow electricity to flow through them, then all objects that won’t. Teacher leads discussion to see if there are categories where these objects fit into, such as metals, plastics, wood (material qualities).

Objective:

Students will be able to experiment to find out which objects are conductors and which are insulators.

Materials:

D battery, light bulb in holder, three insulated copper wires, ends stripped of insulation, cardboard, copper wire, penny, clothespin, straw, paper clip, aluminum foils strip, rubber band

Procedure:

Use a wire to connect the one battery end to the light bulb in the holder. Use another wire to connect to other end of battery, but not touching light bulb holder. Use the third wire to come off light bulb holder, but not touching second wire, leaving a gap between. Predict what will happen if the wire ends are touched to each other. Make a prediction on the prediction chart for each of the objects given. An object that allows electricity to flow through is called a conductor. Are your wires conductors? A material that does not allow current to flow through is an insulator. Predict which of your given objects are insulators and which are conductors Place one item at a time between the ends of the copper wires (in the loop between battery and light bulb holder). Record findings on chart after predictions.

Wrap Up:

Teacher should verbally recap the lesson, going back over the definitions of insulator and conductor; solicit responses with time given for responses. Vary questions asked based on students’ proficiency levels with content and language.
Sample questions to ask:
• Did the light bulb have times when it was bright or dim? Why?
• Explain what might happen if two batteries were used?

Assessment:

Completed worksheet to demonstrate understanding of topic and vocabulary. Responses to teacher questions. Exit slip where student show one thing they have learned (verbal as a modification, picture or written)
Teacher asks open ended higher cognitive level questions, such as “why is this important to know what conducts? And expands on student responses with follow up questions. Teacher links student responses to previous or other student responses.

Modifications:
Grouping of students for brainstorming; worksheets at different access points (3.2, 3.2a, 3.2b, 3.3, 3.3a, 3.3b) and level of complexity. Teacher will also add the new vocabulary to the word wall based on student supplied definitions. Potential groupings of students to complete worksheets to encourage student talk.
For linguistic strengthening, students who need to increase performance in a written format could be asked to turn predictions into full sentences, such as “I predict that the _____ will be a ________ because…”
### 3.1
Brainstorming Chart
Things We Know About Electricity

<table>
<thead>
<tr>
<th>What Conducts?</th>
<th>What Does Not Conduct?</th>
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</table>
Worksheet 3.2
Name: ____________________________ Date: ____________________________

On this Chart, Fill in your prediction either Conductor or Insulator. Then put an “x” under actual category.

<table>
<thead>
<tr>
<th>Object:</th>
<th>Prediction</th>
<th>Conductor</th>
<th>Insulator</th>
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</tbody>
</table>
On this Chart, Fill in your prediction either Conductor or Insulator. Then put an “x” under actual category.

<table>
<thead>
<tr>
<th>Object</th>
<th>Prediction</th>
<th>Conductor</th>
<th>Insulator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Clip</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straw</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Penny</td>
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<tr>
<td>Cardboard</td>
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<td></td>
<td></td>
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<tr>
<td>Aluminum Foil</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rubber Band</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Clothespin</td>
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<tr>
<td>Rubber Band</td>
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<td>-------------</td>
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<td></td>
</tr>
<tr>
<td><img src="image1.jpg" alt="Rubber Band" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clothespin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image2.jpg" alt="Clothespin" /></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Questions:

What is a conductor?

What is an insulator?

Can you name a conductor not used in today’s experiment? How about an insulator?

Why are some materials better conductors than others?
Questions:
What is a conductor?

Draw a picture that shows one working conductor.
Questions:

Draw a picture of one **conductor**, including battery, bulb, wire, and conductor. Color the bulb.

Draw a picture of one **insulator**, including battery, bulb, wire, and insulator. Color the bulb.
3.4
Informational page for support/scaffolding (Given where Appropriate)

Conductors or Insulators

Part One: Conductors

CONDUCTORS are things that electricity easily passes through; things that do not resist the flow of electricity

Examples of Conductors:
- copper
- silver
- aluminum
- gold
- steel
- thick, short wires . . . . . . . . . why?

Memory trick: Think about a train conductor. Train conductors keep the trains moving as electric conductors keep the current moving.

Part Two: Insulators

INSULATORS resist the flow of electricity; things that electricity does not easily pass through

- plastic
- wood
- rubber
- cloth
- air
- glass
- thin, long wires . . . . . . . . . why?

Memory trick: Think of an insulated jacket, it keeps the heat in.
3.5
Extension activity:
Name: __________________________________ Date: ______________________

Directions: Read the list of materials and objects below. Put them under the conductors list or under the insulators list.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ceramic tiles</td>
<td>plastic bags</td>
<td>wooden boxes</td>
</tr>
<tr>
<td>metal shoes</td>
<td>salt water</td>
<td>a chain fence</td>
</tr>
<tr>
<td>asbestos tiles</td>
<td>wool blankets</td>
<td>a jump rope</td>
</tr>
<tr>
<td>an aluminum can</td>
<td>water</td>
<td>lemon juice</td>
</tr>
</tbody>
</table>

**Conductors**

**Insulators**

<table>
<thead>
<tr>
<th>Content Objectives:</th>
<th>Language Objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Students will be able to demonstrate where electric currents come from</td>
<td>1. Students will be able to write answers that demonstrate where electric current comes from</td>
</tr>
<tr>
<td>2. Students will be able to design an electric cell that produces a current out of a lemon</td>
<td>2. Students will be able to orally discuss how to design an electric cell that produces current out of a lemon</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain/Topic</th>
<th>Level 5 Bridging</th>
<th>Level 3 Speech Emergent</th>
<th>Level 1 Pre-Production</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WRITING:</strong> Students will be able to write answers that demonstrate where electric currents come from</td>
<td>Students will be able to write answers that demonstrate where electric currents come from with sentence starters and the use of the key class notes taken prior to the procedure</td>
<td>Students will be able to write answers that demonstrate where electric currents come by using key visuals that student will add arrows to for explanation and use a fill in the blank and circle answer strategy</td>
<td></td>
</tr>
</tbody>
</table>

| **SPEAKING:** Students will be able to orally discuss how to design an electric cell that produces a current out of a lemon and | Students will be able to design an electric cell that produces a current out of a lemon and orally discuss it | Students will be able to design an electric cell that produces a current out of a lemon and orally discuss it by pointing to pictures and arrows that show the relationship of the closed circuit |

Day Four: Where Does Electric Current Come From?

Introduction:

You can turn on a television and a picture appears. Where does the electricity come from to make this happen? What produces this electricity? Electric Current is produced in generators, electric cells and solar cells. (Cells, here, are something that stores energy, add this key word to your word wall.)

Building Connections:

Teacher will ask students to make a list of all the ways they communicate with each other. Teacher will ask students to put an “E” next to any of the methods that use electricity. (Teacher will make sure a level 1 ELL will be partnered with at the least a level 5 ELL for this list). Teacher will then give a few notes on where electricity comes from, like batteries, static electricity and today they will be observing electricity from an electric cell. Electric cells are devices that deliver an electric current (because of a chemical reaction, teacher can go into that or not, depending on the class level).

Objectives:

Students will be able to demonstrate where electric current comes from and students will be able to design an electric cell that produces a current out of a lemon.

Materials:

Lemon with two slits cut into it, paper towel, zinc strip with hole at one end, copper strip with hole at one end, current detector (compass wrapped wire)

Procedure: Teacher will give a lemon to each set of students (pairs, preferably). Place the lemon on a paper towel on your desk. Push a zinc strip into one slit in the lemon. Push a copper strip into the other slit. Make sure that the two metal strips do not touch and that the holes are still showing. Set the current detector on your desk. Connect one end of the detector wire to your hole in the zinc strip. Talk with your group and predict what will happen if you connect the current detector to the copper strip. Record your prediction. Connect the free end of the current detector wire to the hole in the copper strip. Check again to be sure that the two metal strips don’t touch. Record your observations. (Record your answers on the recording sheet provided for you, and draw or answer any questions).

Wrap Up:

Teacher will guide the procedure and ask guiding questions like, “How do you use electric cells in your daily life?” (Responses may include battery-operated toys, games, calculators, flashlights, etc. Or, “Are there lemons in these batteries?” Most students will know there are no lemons in batteries. As students finish, teacher should have two
students on clean-up crew and additional students who may have finished early to help with groups who need help to stay on time.

**Assessment:**

Teacher will assess students by asking probing questions about the procedure and electric cells. Also, the leveled worksheets provided will help teacher assess what students are comprehending. It is important here for teachers to question every student to elicit a response, as they are working in groups and it would be hard to tell what every student knows.

**Modifications:**

Modifications include leveled worksheets for the questioning (4.1, 4.1a, 4.1b, 4.2, 4.2a, 4.2b), as well as sentence starters and pictures that can be used to tell a story of how the lemon circuit is connected appropriately to function.

**Extension Activity:**

Students can make an electric cell at home with a folded paper towel soaked in salt water instead of lemon. Use a penny and a nickel instead of zinc and copper. What other parts will you need? Plan a way to connect these parts in a circuit similar to the one in the activity with the lemon. Draw your setup. After your teacher has reviewed your plan, test it.
With a partner, make a list of all the ways you communicate with each other. Then, put an “E” next to the methods that use electricity.

_____ 1.

_____ 2.

_____ 3.

_____ 4.

_____ 5.

_____ 6.

_____ 7.

_____ 8.

_____ 9.
With a partner, make a list of all the ways you communicate with each other. Then, put an “E” next to the methods that use electricity.

_____ 1. Cell Phone

_____ 2. Text

_____ 3. High Fives

_____ 4.

_____ 5.

_____ 6.
With a partner, discuss the list below to see what activities use electricity. Then, put an “E” next to the methods that use electricity.

_____ 1. Cell Phone

_____ 2. Email

_____ 3. Hand Shake

_____ 4. Text

_____ 5. Twitter

_____ 6. Hug
7. Speaking

8. Playing Video Games

9. Instagram

10. Yelling
Think About It Questions!

1. Trace the path of the electric current in the wires starting with one of the metal strips. How do you know this is a closed circuit?

2. Zinc and copper metal strips stuck into a lemon and connected into a closed circuit make an electric cell. Explain what an electric cell is.

3. Was your prediction correct about the connection to the current detector? Why or Why not?
Think About It Questions!

1. How do you know this set up is a “CLOSED” circuit?

2. Zinc and copper metal strips stuck into a lemon and connected into a closed circuit make an electric cell.

An electric cell is ___________________________________________
___________________________________________.

(Use your class notes).
Think About It Questions!

1. Use these pictures to DRAW a CLOSED CIRCUIT.

This is called an ___________________ Cell.

Circle: Lemon           Electric           Compass
**J. Brown, C. Brown, P. Brown** Lesson Five: How Do We Use Electricity?
7.10.13

<table>
<thead>
<tr>
<th>Content Objectives:</th>
<th>Language Objectives:</th>
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</table>
| 1. Students will be able to compare various objects that use electricity to conclude which use more electricity.  
2. Students will be able to use place value understanding and properties of operations to perform multi-digit arithmetic. | 1. Students will be able to orally compare various objects that use electricity to conclude which use more electricity.  
2. Students will be able to use place value understanding and properties of operations to perform written multi-digit arithmetic. |

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<td><strong>SPEAKING:</strong></td>
<td>Students will be able to orally compare various objects that use electricity to conclude which use more electricity.</td>
<td>Students will be able to orally compare various objects that use electricity to conclude which use more electricity with visuals to help create more conversation about the objects.</td>
<td>Students will be able to orally compare various objects that use electricity to conclude which use more electricity with visuals, key words provided and given example reasons for an object to lead them.</td>
</tr>
</tbody>
</table>

| **WRITING:** | Students will be able to use place value understanding and properties of operations to perform written multi-digit arithmetic. | Students will be able to use place value understanding and properties of operations to perform four written multi-digit arithmetic with formula provided with modified directions. | Students will be able to use place value understanding and properties of operations to perform one written multi-digit arithmetic with formula provided and bolded and enlarged with modified directions and limited choices. |
Day Five: How Do We Use Electricity?

Introduction:

Teacher begins by having shades pulled and lights off at start of class. What do you do when you walk into a dark room? Turn the light on of course! Today we will look at how people use electricity and how much electricity is used. In partners, brainstorm things that we use electricity for, and what are some activities that can be accomplished without electricity, record brainstorming ideas on worksheet 5.1. Teacher leads discussion of electricity and where electricity is used. Teacher reviews previous vocabulary, current, electricity, and introduces kilowatt and watt. A watt is a measure of power used, and a kilowatt is 1000 watts used. Students are asked to define these as a group, and say them out loud to be sure on pronunciation. Teacher should also create an opportunity to negotiate meaning: how are watt and kilowatt related to each other? Teacher should then add definitions as stated by students for both watt and kilowatt to word wall.

Building Connections:

Do all objects that are plugged in use electricity? Do different objects use different amounts of electricity as measured in watts? Today’s lesson will look at some electrical objects and compare how we use electricity and the amount of electricity use by them? Have you ever had an electrical object that is still plugged in stop working? Was it a toaster or a hair dryer? That is because these objects use a large amount of electricity, sometimes so much, that they shut off because they are trying to use so much. Teacher leads discussion briefly about objects using different amounts of electricity, then puts partners or groups to work on worksheet 5.2 about amount of electricity used as perceived by students to allow for instructional conversations. Teacher then brings group back together to share out responses recorded. Allow student to discuss or comment on shares from one another. Teacher can also expand the topic with one student by direct questioning, or follow up question for depth and understanding. Teacher asks the big question: how much electricity do people use? Discussion about amounts of individual use, like a phone or ipod device, compared to shared usage, like a room air conditioner. Teacher must explain that energy use is tracked in two ways: watts or kWh (the number of kilowatts 1000 watts used by the object in one hour). Illustrate this with an example of a toaster oven, which could use either 1200 watts in one hour, or 1.2 kwh. A few examples using the calculator on the board would be helpful.

Objectives:

Students will be able to conclude that electricity is used to accomplish a goal (lighting, cooling, etc.). Students will be able to compare various objects that use electricity to one another to conclude which use more electricity, and suggest why. Students will be able to use place value understanding and properties of operations to
perform multi-digit arithmetic.

**Materials:**

Chart on energy usage, calculator, graph paper, computer access for extension.

**Procedure:**

Working with a partner, predict which of the listed items uses the most electricity and record your predictions on chart 5.3. Number the items from greatest amount of electricity used as a number 4, to the least amount of electricity used as a number one. Discuss your reasons with partners to come to a conclusion. Include reasons why you ranked one highest, and the lowest one lowest. Teacher distributes page on what the actual uses are, and then compare this to the predictions made by students. Questions to answer are located at bottom of each of the three worksheets 5.3.

How much energy do you use? There are additional sources that tell you how much each item uses, especially with regard to household items used. Teacher should lead discussion and chart responses for electrical items that have a shared usage, such as a furnace or air conditioner, or personal use, such as a clock radio. Teacher must also explain that the cost of one kilowatt hour, or 1000 watts of usage, costs about 12 cents in Connecticut on average.

**Wrap Up:**

Teacher should verbally recap the lesson, going back over the definitions of current, watt, kilowatt and usage; solicit responses with time given for responses. Vary questions asked based on students’ proficiency levels with content and language.

Sample questions to ask:
1. Does the type of function relate to the amount of energy an item uses? Why?
2. Explain what you might think about before buying a fan or an air conditioner.

**Assessment:**

Completed worksheets to demonstrate understanding of topic and vocabulary. Responses to teacher questions. Exit slip where student show one thing they have learned (verbal as a modification, picture or written).

Teacher asks open ended higher cognitive level questions, such as “Why is it important to know how much electricity is used by an item?” “And expands on student responses with follow up questions. Teacher links student responses to previous or other student responses. Teacher lists some sentence starters, such as “Electricity is used in different amounts because…” and “I leaned that…” and “It surprised me that…” to scaffold responses.
Modifications:

Grouping of students for brainstorming; worksheets at different access points and level of complexity (5.3, 5.3a, 5.3b, 5.4, 5.4a, 5.4b, 5.5, 5.5a, 5.5b). Teacher will also add the new vocabulary to the word wall based on student supplied definitions. Potential groupings of students to complete worksheets to encourage student talk. Selected students will be asked to paraphrase at various times during the lesson for understanding and reinforcement of vocabulary.
Worksheet 5.1
Name: ___________________________ Date: __________

Brainstorming chart

What are some activities that we use electricity for?

What are some activities that do not require electricity?
Worksheet 5.2
Name: ________________________________________ Date: __________________

Predictions chart:

Here are some objects that we think **DO NOT** use a lot of electricity:

Here are some objects that we think **DO** use a lot of electricity:
Worksheet 5.3
Name: ________________________________ Date: __________________

Chart

Air conditioner, pencil sharpener, fluorescent light bulb, computer

<table>
<thead>
<tr>
<th>Object</th>
<th>Prediction(4 is most, one is least)</th>
<th>Reason for choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conditioner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pencil Sharpener</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent Light Bulb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Worksheet 5.3a
Name: ____________________________ Date: __________________

Chart

Air conditioner, pencil sharpener, fluorescent light bulb, computer

<table>
<thead>
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<th>Object:</th>
<th>Prediction(4 is most, one is least)</th>
<th>Reason for choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conditioner</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Pencil Sharpener</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent Light Bulb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Worksheet 5.3b
Name: __________________________ Date: _____________________

Chart

Air conditioner, pencil sharpener, fluorescent light bulb, computer

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<tr>
<th>Object:</th>
<th>Prediction(4 is most, one is least)</th>
<th>Reason for choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conditioner</td>
<td>4</td>
<td>Works the Hardest</td>
</tr>
<tr>
<td>Pencil Sharpener</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent Light Bulb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Worksheet 5.4
Name: ____________________________ Date: __________________

Average kWh for Classroom Items:
Computer: 0.258 kWh
Air conditioner: 1 kWh
Standard - fluorescent bulb in ceiling lights: 0.5 kWh
Pencil sharpener: 0.08 kWh

How accurate were your predictions on which used the most?

Explain why your predictions were accurate or not.
Worksheet 5.4a
Name: ___________________________ Date: ___________________

Average kWh for Classroom Items:

Computer: 0.258 kWh
Air conditioner: 1 kWh
Standard -fluorescent bulb in ceiling lights: 0.5 kWh
Pencil sharpener: 0.08 kWh

Draw the four items in order from most electricity used to least electricity used.

Draw one additional item, and draw an arrow to where it would fit in your row of four pictures.
Worksheet 5.4b
Name: ___________________________________ Date: __________________

Average kWh for Classroom Items:

Computer: 0.258 kWh
Air conditioner: 1 kWh
Standard fluorescent bulb in ceiling lights: 0.5 kWh

Draw the three items in order from greatest electricity to least.
Worksheet 5.5
Extension Activity:
Name: ___________________________________________ Date: ____________________

Calculate the amount of watts of energy that your house uses for a year. Typical items are listed below, and for others that may be specific to your house, you would need to look up the watts used through a website for an average.

Average Energy use of household items per hour (in watts) based on product label

• Aquarium = 50–1210 Watts
• Clock radio = 10
• Coffee maker = 900–1200
• Clothes washer = 350–500
• Clothes dryer = 1800–5000
• Dishwasher = 1200–2400 (using the drying feature greatly increases energy consumption)
• Electric blanket (Single/Double) = 60 / 100
• Fans, Ceiling = 65–175, Window = 55–250, Furnace = 750
• Hair dryer = 1200–1875
• Heater (portable) = 750–1500
• Clothes iron = 1000–1800
• Microwave oven = 750–1100
• Radio (stereo) = 70–400
• Refrigerator (frost-free, 16 cubic feet) = 725
• Televisions (color), 19" = 110, 36" Flat screen = 120
• Toaster oven = 1225
5.5a
Extension Activity:
Name: __________________________________________ Date: _________________

Choose 4 items from the list below. Calculate the amount of watts of energy that your items use for a one year period.

The formula for finding watts total is:

Watts X 24 hours X 365 days

- Clock radio = 10 Watts
- Dehumidifier = 785
- Electric blanket (Single) = 60
- Fans, Ceiling = 65
- Window = 55
- Furnace = 750
- Hair dryer = 1200
- Heater (portable) = 750
- Clothes iron = 1000
- Microwave oven = 750
- Laptop = 50
- Refrigerator (frost-free, 16 cubic feet) = 725
- Toaster = 800
- Toaster oven = 1225
- VCR = 17
Extension Activity:
Name: ___________________________________________ Date: __________________

Choose one item to find out how much electricity it uses in one year.
Use Formula:

\textbf{Watts} \times 24 \times 365

• Clock radio = 10 Watts
• Fans, Ceiling = 65 Watts
• Window = 55 Watts
• Hair dryer = 1200 Watts
• Microwave oven = 750 Watts
• Laptop = 50 Watts
• Refrigerator (frost-free, 16 cubic feet) = 725 Watts