Electricity Program of Study Daily Plan

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Project Co-Directors:

Annemarie Sullivan Palincsar, Ph.D
Literacy and Special Education

Shirley Magnusson, Ph.D
Science Education

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STATIC ELECTRICITY DAILY PLAN

ENGAGE

Phenomena and ideas associated with static electricity

TEACHER Activity	STUDENT Activity
"We are beginning a new program of study about electricity. To begin with, we are going to focus on what scientists call static electricity." "What comes to your mind with the words 'static electricity?'"	Ss state ideas about static electricity.
If Ss have not mentioned "static cling" ask whether or to what extent they think it is associated with static electricity. Elicit Ss' ideas about the nature of static cling: • where/when do we notice it? • what do you think it is? How/why does it occur?	Ss state ideas.
Tell Ss that "static cling" means that a material has become electrically charged. Ask Ss what they think that means.	Ss state ideas.
If Ss have not already mentioned getting shocked or seeing sparks associated with static phenomena, ask to what extent Ss think they are related to static electricity. If Ss have not already mentioned lightning, ask to what extent they think lightning is related to static electricity. Then, ask Ss to name what aspects of lightning would be evidence that it is like static electricity and what aspects seem to suggest it is not like static electricity.	Ss state ideas. Ss state ideas and evidence.
If it has not already been brought up, ask Ss to state their ideas about how static cling is related to phenomena like lightning or getting an electric shock touching a door handle after walking across carpet.	Ss state ideas.

NOTE: Record Ss ideas, statements about phenomena and evidence, in order to provide documentation and a visual record of ideas that can act as a springboard or trigger for other ideas

STATIC ELECTRICITY DAILY PLAN

CYCLE 1 Determining What Materials Can Become Electrically Charged

Prepare to INVESTIGATE

How can we tell whether a material has become charged

TEACHER Activity	STUDENT Activity
Return to topic of static cling by rubbing a balloon and placing it on your sweater or a wall – something vertical that clearly shows the presence of an attractive force. Introduce question for investigation – What can become electrically charged? Show Ss the materials (rods/tubes and sheets/cloths) and ask for their ideas about how to investigate the question using these materials. • What should they do? How should they work? • How will they tell whether a material is charged? • What should they record? Indicate that it would be helpful if they collaborated to do the testing, meaning that the materials can be split up so that each group is testing some of the materials. That way they can help one another and focus their activities. Tell Ss that the materials have been divided into groups so that the class will have data from several groups for each combination, but no group will have the same set of materials.	Ss state ideas about how to use the materials to investigate.
Suggest that the group can complete one large data table, and asks how that can be done well • "How shall we mark when something is charged? Not charged?" • "How shall we organize the table?" Shape discussion regarding norms for tables – it should be easy to tell what data were collected, and it should be easy to see if there are relationships	Ss state ideas about how to represent and organize the data they will collect.

STATIC ELECTRICITY DAILY PLAN

CYCLE 1 Determining What Materials Can Become Electrically Charged

INVESTIGATE [1st-HAND]

What materials become charged

TEACHER Activity	**STUDENT Activity**
Monitor for correspondence between what class decided about how to investigate and record, and what Ss actually do – provide corrective feedback selectively, allowing Ss to "err" because it may be instructive for the class to have to wrestle with unexpected differences in the data. Signal issues of reliability in the data by asking Ss about their confidence in their data; if Ss indicate a lack of confidence, encourage Ss to repeat testing so that they can share their data with confidence *Note how data differ across groups; types of issues that may cause differences.*	Ss conduct investigation.
Prepare data table for Ss to fill out; e.g., rods in rows and the sheets in columns, large enough so that each cell has room for data to be entered from multiple groups *Note extent to which Ss use similar representations; enter data in table correctly* Provide corrective feedback selectively, allowing Ss to "err" when it will be instructive for the class to have to wrestle with differences in how groups entered the data.	Ss record observations on common data table provided for the class

REPORT (community-level only)

Claims about types of material that become charged

TEACHER Activity	**STUDENT Activity**
Ask Ss about patterns in the table of Ss' data: • how to look for patterns • what patterns are evident Record Ss' ideas about patterns, pressing for evidence in each case and recording the evidence as well – these should be posted. If needed, focus Ss on looking for patterns by columns, by rows, then by types of combinations (e.g., like with like such as metal rod and metal sheet, "plastic" rods with "plastic" sheets.	Ss venture ideas about how to find patterns and what they are. Ss discuss evidence among groups' data.
Ask class to examine the groups' ideas about patterns and shapes conversation to develop class claims about charging objects. Ask what Ss' ideas are about what happens something becomes charged to help us explain why some materials become charged and others do not.	Ss suggest general conclusions. Ss share hypotheses about charging matter.

STATIC ELECTRICITY DAILY PLAN

CYCLE 2 Theory and Evidence about How Materials Become Charged

Prepare to INVESTIGATE [2nd-HAND]

Scientist's notebook text: ***investigation and theory about how materials become charged***

TEACHER Activity	STUDENT Activity
Inform Ss about the existence of the notebook of a scientist who has been investigating the same kinds of questions that they have been thinking about. "For what purpose do you think scientists keep notebooks?" "What would we expect to see in a scientist's notebook?" "What might be challenging for us to understand in the notebook?"	Ss state their ideas.
If this is the first time Ss have read a notebook text, make sure Ss know that it will be read interactively, focusing on small sections of the text at a time. "We will stop frequently as we read to compare our thinking with the thinking of the scientist."	
Hand out copies of notebook text. If necessary, point out the header, telling Ss that it appears on each page, and ask Ss what kind of information it provides.	Ss state their ideas.

STATIC ELECTRICITY DAILY PLAN

CYCLE 2 Theory and Evidence about How Materials Become Charged

INVESTIGATE / REPORT [2ND-hand] (community-level only)

Why do materials become charged

TEACHER Activity	STUDENT Activity
[*See teachers guide to notebook text*] The overarching purpose is to promote intertextuality; i.e., having Ss draw relationships across various "texts" that have been present in classroom (e.g., notebook text, classroom conversations, claims/evidence on Ss' posters). Monitor Ss' understanding and support the clarification of Ss ideas and the ideas/information in the text.	Ss build connections between the ideas in the notebook text and their own experiences and thinking. Ss monitor their own understanding of the ideas/information in the text, and the relationship between their own ideas and the ideas in the text.
Encourage Ss to NOT take [any] text at face value. Monitor for Ss' recognition of the reason for Lesley's questions/procedures/data/analyses/claims, and similarities and differences between their own and Lesley's questions/procedures/data/analyses/claims.	Ss use the same practices in engaging with the notebook text that they use in 1st hand investigations; i.e., what's the question, how does the method used help to answer the question, what are the data, how should the data be interpreted and what claims can be made.
Support and evaluate the development of Ss' understanding of scientific reasoning represented in the notebook text; i.e., how Lesley's actions lead to a persuasive argument about the nature of charged materials and the mechanism by which they become charged. • record Ss' ideas about the information in the notebook text • record Ss' ideas about the argument that Lesley is making in the notebook text about how static electricity works • record Ss' ideas about the evidence for the argument that Lesley is making about how static electricity works	Ss trace the nature of Lesley's argument about the nature of charged materials and the mechanism by which they become charged, and evaluate its merits.

CURRENT ELECTRICITY DAILY PLAN

ENGAGE

Make the link between static and current electricity

TEACHER Activity	STUDENT Activity
"With static electricity, we used the idea of charged particles to explain how an object can become charged by having those particles moved to or from them. Once charged, an object can attract another. When we saw the balloon "sticking" to the wall, or the bits of paper being held to the plastic rod, we knew there was energy involved to hold those materials together." "We also mentioned phenomena like getting shocked from walking across a carpet and touching a metal handle, or lightning. In those cases, charge that has built up in one place is discharged, it is *transferred* in one burst of energy from the charged object to another place." <u>*Transparency*</u>: "This is what we might have seen in Lesley's notebook about this, in response to some of her questions at the end of the part of the notebook that we read. What do you think these drawings show?" • *leftmost* - rubber rod has excess of negative charge compared to neutral, glass rod has deficit of negative compared to neutral • *middle* – discharge occurs because excess negative charge on the rubber rod is attracted to the positively charged glass rod, arrow shows negatively charged particles moving as the rubber rod discharges • *rightmost* – rods shown in neutral state after discharge, the rubber rod having lost its excess negative charge, the glass rod having gained negative charges to balance its excess of positive charge Emphasize that the transfer of electricity via charged particles is called an electrical **discharge**.	Ss state ideas.
"In scientists' work with electrical discharges, there were often sparks, which they recognized as a visible sign of energy transfer." "If a discharge is transfer of energy from the *movement* of *charged* particles, then it raises the question of how we can control that movement so that we can use that energy as we would like." "What would we need to have to create this type of energy transfer?" • guide Ss to think about needing oppositely charged materials that are close enough to cause the flow of particles from one place to another	Ss state ideas.
"What do you think would have happen with this flow of energy to make it useful to us?" Guide Ss to think about: • the need to *control* the flow; i.e., be able to make the flow start and stop as we want • the flow of energy needs to be *continuous*, not in just a burst	Ss state ideas.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 1 Making a circuit with a wire and battery

PREPARE TO Investigate

Using Batteries

TEACHER Activity	STUDENT Activity
"A battery provides a source of oppositely-charged particles. It is constructed so that the oppositely charged particles are separated and not able to 'feel' their attraction for one another; thus, particles don't move and energy doesn't flow." "The separation of charged particle is shown on the battery with signs – a positive sign indicates the connection with positive charges and a negative sign shows the connection with negative charges. These are called the positive and negative poles of the battery." "If energy doesn't flow internally in the battery because the oppositely charged particles are separated so that they don't experience an attractive force, what do you think we can do externally to bring these opposites into contact so that they will attract one another and energy will flow?"[1] • "Think about your experience with batteries making something work to give you some ideas about how we can get energy to flow."	Ss state ideas.

Investigate [1st-hand]

How do we get the energy in a battery out?

TEACHER Activity	STUDENT Activity
Hand each pair of Ss a bag with two batteries, two insulated wires, and two light bulbs, one #48 and one #41. Have each student take a battery and wire from the bag. "Using just one wire, find out where you can put the wire on the battery to get energy to flow. Think about what you know about charges to cause a flow." • "What are the places that don't work?" (*e.g., side of battery, the insulated part of the wire*) • "What is the evidence that energy is flowing?"	Ss use materials to determine how to get energy from the battery to go through the wire.

[1] NOTE: Batteries have potential energy until they are placed in a circuit. Voltage is a unit of potential difference. The batteries that we commonly use in a flashlight are actually single electrochemical cells with a 1.5 volt potential difference. Scientifically, a battery is a combination of cells arranged in series, which makes their total voltage the sum of their individual voltages.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 1 Making a circuit with a wire and battery

REPORT (community-level only)

Claims about where a battery has to be touched to create a flow of electrical energy (current).

TEACHER Activity	STUDENT Activity
"Where does the battery have to be touched to get its energy to flow through the wire?" • encourage Ss to use the language "poles" • check for the understanding that both poles of the battery need to be in contact with the wire "What was the evidence of the flow of energy? that the flow was continuous?" "What is the evidence that we can control the flow?"[2] Check for understanding of the required points of contact, and the determination of the areas that do not provide the required contact (e.g., insulated part of wire, sides of battery – unless outer plastic covering is removed).	Ss state ideas and observations.

PREPARE TO Investigate

Making a light bulb part of a circuit - using only <u>one</u> wire

TEACHER Activity	STUDENT Activity
Tell Ss that the arrangement of materials that allows electricity to continuously flow is called a **circuit**, and the continuous flow of electricity is called **current**. "Our next task is to figure out how to make the circuit so that the current from the battery flows through a light bulb and lights the bulb." • "Where could we place the bulb to have current flowing through it, given what we did to get current flowing from the battery?"	Ss state ideas.
"Where should a light bulb be placed so that electricity flows through the wire and the bulb?" • have Ss draw the combinations that work • if Ss have difficulty finding a way that works, encourage them to draw what doesn't work, and use that information to see what combinations they haven't tried.	Ss work with one battery, one wire, and one light bulb to get light, and draw the combinations that work.

[2] NOTE: The contact between the opposite poles sets up an attractive force that causes particles to flow; as long as the connection is maintained, and there are charged particles to flow, there will be electrical energy.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 2 Modeling the interior of a light bulb

INVESTIGATE [1st-HAND]

Where does a light bulb need to be touched to light?

TEACHER Activity	STUDENT Activity
Tell Ss there are four ways to get a light bulb to light with <u>one</u> wire. Indicate that they should be able to find at least three ways, which they will need to document so that their observations can be shared with the class. Check for drawings. Monitor for accuracy of drawings. Encourage Ss to pay attention to what doesn't work to light the bulb (e.g., black ceramic ring, glass bulb).	Ss work to make a circuit. Ss use record of observations of what works to determine when they have three different ways.

REPORT (community-level only)

Claims about the contact points required to light a bulb

TEACHER Activity	STUDENT Activity
Select individual Ss to record on posters <u>one</u> of the ways they found that worked: • have individuals determine which of their drawings to share, but encourage them to share one that they think is unique from the others that are drawn	Individual Ss put drawings on poster, large enough for class to see.
Have the class evaluate Ss' drawings for accuracy: • do they think the bulb would light as shown in the drawing? • in each case is the battery being touched in two places? (have Ss show how it is the case in each drawing) Have the class evaluate the drawings for patterns in where the light bulb is being touched: • in each drawing, have a student show/describe where the light bulb is being touched After all drawings are described, have class describe/state the pattern of where a light bulb needs to be touched to produce light.	Ss examine accuracy of drawings. Ss mark where battery is being touched. Ss mark where light bulb is being touched. Ss state where light bulb needs to be touched.
Encourage sharing about the parts of the light bulb that did not function to allow electricity to flow (e.g., black ring on bottom of base of bulb).	Ss share observations – draw on posters?

NOTE: Ss (within their pairs) will likely notice that their light bulbs do not produce the same amount of light; recognize them for this observation and tell them that the difference is a question that will be examined shortly, but that the class must first address other questions.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 2 Modeling the interior of a light bulb

Prepare to INVESTIGATE

Making a light bulb part of a circuit - using <u>two</u> wires

TEACHER Activity	STUDENT Activity
"Most circuits don't have light bulbs in contact with the battery (the energy source). So, we need to determine where we would place <u>two</u> wires so that they create a circuit with the battery and the light bulb – to have current flow through it to light the bulb." Tell Ss there are two ways to get a light bulb to light with <u>two</u> wires. Indicate that they should be able to find at least one way, and it does <u>not</u> count as a way if: - one wire can be taken away and the light still lights - the two wires are connected to one another	
Ask Ss: • How can we use our previous data to determine what to try? • How should we document our work to help us find both ways? • How should we document our work to share our findings with others?	Ss state their ideas.

INVESTIGATE [1st-HAND]

Where does a light bulb need to be touched to light?

TEACHER Activity	STUDENT Activity
Check for drawings of successful circuits with two wires – encourage Ss to draw what <u>doesn't</u> work if needed to help determine what new combinations to try. Monitor for accuracy of drawings	Ss work to make a circuit.

REPORT (community-level only)

Claims about where a light bulb needs to be touched to have current flow through it.

TEACHER Activity	STUDENT Activity
Select individual students to record on poster <u>one</u> way they found that worked or did not work.	Individual Ss put drawings on poster
Have the class evaluate Ss' drawings for accuracy • would bulb light as shown in the drawing? • where are the battery and light bulbs being touched?	 Ss evaluate drawings Ss mark contacts for battery and bulb
Guide Ss in determining the state of class knowledge claims about electricity, especially examining current data in light of previous investigations.	Ss draw conclusions.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 3 Flashlights [notebook text]

Prepare to INVESTIGATE [2nd-HAND]

Scientist's notebook text: ***Investigating Changing Light from a Flashlight***

TEACHER Activity	STUDENT Activity
Hand out copies of the notebook.	

INVESTIGATING/ REPORTING

The water flow model explanation and its test

TEACHER Activity	STUDENT Activity
[*See teachers guide to notebook text*] The overarching purpose is to promote intertextuality; i.e., having Ss draw relationships across various "texts" that have been present in classroom (e.g., notebook text, classroom conversations, claims/evidence on Ss' posters). Monitor Ss' understanding and support the clarification of Ss ideas and the ideas/information in the text.	Ss build connections between the ideas in the notebook text and their own experiences and thinking. Ss monitor their own understanding
Encourage Ss to NOT take [any] text at face value. Monitor for Ss' recognition of the reason for Lesley's questions/procedures/data/analyses/<u>models</u>/claims, and similarities and differences between them and their own questions/procedures/data/analyses/claims.	Ss use the same practices in engaging with the notebook text that they use in 1st hand investigations
Support and evaluate the development of Ss' understanding of scientific reasoning represented in the notebook text.	
Guide Ss in evaluating and revising class claims.	Ss state ideas.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 4 Controlling the Flow of Electricity

Prepare to INVESTIGATE

Creating a model

TEACHER Activity	STUDENT Activity
Elicit Ss' ideas about what in a light bulb makes light, and what could account for the differences in brightness . Provide Ss with a hand lens to examine their light bulbs; encourage student pairs to trade bulbs with one another to examine whether there are any differences between them (e.g., filament, number stamped in metal on side of base). Record observations from the class, prompting for ideas about the function of the features that students notice.	State ideas about what it is inside a light bulb that lights. Ss examine light bulbs with a hand lens. Ss suggestion functions for observed structures.
Tell Ss that the filament emits light when current flows through it and heats it up. Ask Ss to consider how current gets to the filament, considering where the light bulb is touched by wires from the battery. Show transparency of a light bulb (with base covered) to point out the support wires. Elicit Ss' ideas about what the support wires are for; then inform them (if needed) that the support wires hold the filament and allow electricity to reach the filament. Introduce question for investigation – Where do the guide wires go? Introduce the notion of modeling – that we can develop a model of what the physical world is like and how it works, and then test that model. Tell Ss their task is to develop a model of where the guide wires go in the base of the bulb, where we cannot see them. Tell Ss the attributes of a good model: • simple • compatible with and accounts for all relevant data Ask Ss what data they should use to inform their model.	Ss suggest ideas about the guide wires. Ss suggest what observations they have made that will help them form a model. Ss state ideas
Tell Ss that they will be working in groups to share their ideas with group members, and that groups will be determining the best model from among the models members have developed, and that they will be documenting their reasons for deciding upon the best model. Tell Ss that they will first draw their own individual models before sharing.	Ss monitor understanding of task.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 4 Controlling the Flow of Electricity

INVESTIGATE [1st-HAND]

Designing a model

TEACHER Activity	STUDENT Activity
Provide worksheet for documenting individual models (it provides outlines of light bulbs – indicating that it is fine to draw multiple models), but make it clear that they want to draw the best model they can considering their data. Encourage Ss to use their data to work from.	Ss draw models of the interior of a bulb.
Encourage Ss to share with group members their reasoning behind the construction of their model, especially the data that they used to inform their model. Support Ss in combining their ideas into a single model to come up with their best model.	Ss determine model and document reasoning.

Prepare to REPORT

TEACHER Activity	STUDENT Activity
Tell groups to present their best model, and write out their reasoning for that model. Encourage Ss to examine the models that are posted and look for their similarities and differences.	Ss create representation of model and reasoning for presentation. Ss examine others' models

REPORT (community-level only)

Evaluating models

TEACHER Activity	STUDENT Activity
Ask Ss how many different models they see, and to state the similarities and differences. Ask Ss to group models by type – using the similarities and differences they stated. Have Ss reorganize models into groups (moving posters together to form groups).	Ss compare the different representations Ss suggest groups for models
Remind Ss of the characteristics of a good model Ask Ss to order the models from best to worst, considering the criteria for a good model.	Ss discuss the strengths and weaknesses of each model type.
Bring out "dissected" light bulbs for comparison with Ss' models. Lead discussion of how models compare with actual light bulb. Discuss what it was like to develop a model, which in this case, could be directly tested. Ask Ss what they think would be different in the case of a model that cannot be directly tested. Guide Ss in determining the state of class knowledge claims about electricity.	Ss describe how models compare light bulb. Ss share reflections. Ss share ideas. Ss share ideas.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 5 Modeling the Direction of the Flow of Electricity

Prepare to INVESTIGATE

Controlling the flow of electricity

TEACHER Activity	STUDENT Activity
Introduce battery and light bulb holders. Have each student make a simple circuit with one battery and one bulb. • as Ss construct circuit, have them show how the light bulb is being touched in two places	Ss make circuit and show how the light bulb is being touched in two places.
Show Ss a switch (transparency?). Elicit Ss' ideas about how a switch works in a circuit. • encourage Ss to link function to structure, examining the given switch and comparing it to switches with which they are familiar (e.g., on walls, lamps, etc.)	Ss share ideas.
Have students add the switch into their circuits • Does it make a difference which side of the light bulb the switch is placed? How can you find out? • When a switch is closed, what material is it introducing to the path of the circuit? (metal) • when a switch is open, what material is it introducing to the path of the circuit? (air)	Ss add a switch to their circuit and determine how it functions.
Tell Ss that we can think of a switch as giving us control over whether electricity will flow in a circuit because it is constructed so that material that allows electricity to flow (conductor) can become part of the circuit or kept out of the circuit. If needed, introduce the notion of conductors and insulators: materials that allow electricity to flow versus materials that do not allow electricity to flow. Have Ss describe a switch in terms of how it uses conducting material and insulating material (air) to control the flow of electricity. Monitor for the notion of a complete circuit – a complete path of conducting material that includes the light bulb and is connected to both ends of the battery.	Ss describe/draw ideas
Show packet of materials to test (includes wire) and tell Ss they need to figure out how to investigate to determine which materials conduct electricity. • What should they do? How should they work? • What should they record?	Ss discuss different possibilities/options for testing materials and recording data.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 5 Modeling the Direction of the Flow of Electricity

INVESTIGATE [1ts-HAND]

Determining what enables electricity to flow

TEACHER Activity	STUDENT Activity
Post chart for Ss to share data. Monitor for correspondence between what class decided about how to investigate, record, and organize data and what Ss actually do; provide corrective feedback selectively, depending upon whether it will be more instructive for the class to have differences. Signal issues of reliability in the data by asking Ss about their confidence in their data, and if Ss indicate a lack of confidence, encourage a repeat of testing so that the Ss can share their data with confidence; encourage the use of materials around the room to further check out the validity of emerging patterns in the data. Note the extent to which the data across the groups are in agreement; note types of issues that may cause differences. *This information will be useful in guiding the conversation during reporting.*	Ss collect and record data.

Prepare to REPORT

TEACHER Activity	STUDENT Activity
Press students to make general claims about what enables electricity to flow. Prompt students to consider how to organize their data to most easily show their classmates what they found (e.g., good versus poor conductors). Note extent to which Ss use similar representations. *This information will be useful in guiding the conversation during reporting.*	Ss prepare claims and evidence to share with the class.

REPORT (community-level only)

Characterizing materials as conductors and insulators

TEACHER Activity	STUDENT Activity
Press students to determine patterns and inconsistencies in the data. Press students to compare the methods to resolve any differences in claims; encourage Ss to engage in re-testing on the spot, if needed. Monitor for understanding of conductors, insulators, complete circuit.	Ss state ideas Ss evaluate methods; retest as needed.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 6 Lightbulbs [notebook text]

Prepare to INVESTIGATE [2nd-HAND]

Scientist's notebook text: ***Modeling Current in Light Bulbs***

TEACHER Activity	STUDENT Activity
Hand out copies of the notebook.	

INVESTIGATING/ REPORTING

The water flow model explanation and its test

TEACHER Activity	STUDENT Activity
[*See teachers guide to notebook text*] The overarching purpose is to promote intertextuality; i.e., having Ss draw relationships across various "texts" that have been present in classroom (e.g., notebook text, classroom conversations, claims/evidence on Ss' posters). Monitor Ss' understanding and support the clarification of Ss ideas and the ideas/information in the text.	Ss build connections between the ideas in the notebook text and their own experiences and thinking. Ss monitor their own understanding
Encourage Ss to NOT take [any] text at face value. Monitor for Ss' recognition of the reason for Lesley's questions/procedures/data/analyses/models/claims, and similarities and differences between them and their own questions/procedures/data/analyses/claims.	Ss use the same practices in engaging with the notebook text that they use in 1st hand investigations
Support and evaluate the development of Ss' understanding of scientific reasoning represented in the notebook text; i.e., how Lesley develops and tests a model of current in a circuit with different types of light bulbs. • record Ss' ideas about the information in the notebook text • record Ss' ideas about the model of current that Lesley develops in the notebook text • record Ss' ideas about the evidence that supports Lesley's model as well as the evidence that is not accounted for by the model	Ss trace the nature of Lesley's developing model of current in a circuit with different types of light bulbs.
Guide Ss in evaluating and revising class claims.	Ss state ideas.

CURRENT ELECTRICITY DAILY PLAN

CYCLE 7 Explaining Brightness Differences When Light Bulbs of the Same Type are Added to a Circuit

Prepare to INVESTIGATE

What happens to the amount of flow of electricity (current)?

TEACHER Activity	STUDENT Activity
Elicit Ss' ideas about differences in the amount of current (flow of electricity) in circuits as more bulbs are added. Elicit Ss' ideas about how the amount of current compares in the #41 and #48 bulbs. Elicits Ss' ideas about how to test their ideas about the hypothesized differences in current. Show Ss the brightness meter and how it can be used to measure the brightness of light bulbs. Ask Ss how the use of this instrument can be used to indirectly test ideas about the amount of current in circuits. Show Ss materials for making series circuits with multiple bulbs (limit circuits to three or four bulbs, have students use two batteries). Recommend that they begin with using bulbs of the same type in the circuit, but indicate that after that they can move on to circuits in which both types of bulbs are included.	Ss state ideas. Ss state ideas. Ss build a series circuit with multiple bulbs: #41 and/or #48 bulbs
Make questions for investigation explicit– what happens to the amount of current in circuits with multiple light bulbs? Possible investigations include testing • Brightness changes in series (all 41 or all 48 bulbs) • Brightness difference between bulbs (in series or simple circuit) • Brightness difference between bulbs in a series circuit with 41 and 48 bulbs Ask Ss to state what they should think about to conduct investigations well. Make recommendations as needed to encourage students to: • consistent procedures using the brightness meters • examining bulbs separately before putting them together in a circuit Ask Ss to state what they should document during investigation. • indicate Ss should use circuit diagrams	Ss state ideas. Ss state ideas