EXPEDITIONARY LEARNING

Grade 4: Module 3A: Unit 2: Lesson 2

Reading a Scientific Experiment: The Inclined Plane

Long-Term Targets Addressed (Based on NYSP12 ELA CCLS)	
I can explain the main points in a scientific text, using specific details in the text. (RI.4.3) I can describe the organizational structure in an informational text (chronology). (RI.4.5) I can write informative/explanatory texts that convey ideas and information clearly. (W.4.2) I can use a variety of strategies to determine the meaning of words and phrases. (L.4.4)	
Supporting Learning Targets	**Ongoing Assessment**
• I can explain what happens before, during, and after a scientific experiment. • I can explain how the directions in a scientific experiment are a form of informational text that involves a procedure. • I can document what I observe during a scientific experiment. • I can construct a conclusion statement that describes what I learned about inclined planes.	• Simple Machines Science journal: Science Experiment note-catcher (page 11)

Agenda	Teaching Notes
1. Opening A. Engaging Readers and Writers (5 minutes) B. Reviewing Learning Targets (5 minutes) 2. Work Time A. Explaining Procedures: Reading a Science Experiment (20 minutes) B. Rereading Scientific Text while Conducting an Experiment (15 minutes) C. Writing a Conclusion (10 minutes) 3. Closing and Assessment A. Read-aloud of Pages 6 and 7 of *Simple Machines: Forces in Action*: Learning More about the Inclined Plane (5 minutes) 4. Homework A. On a sticky note, write a gist statement for pages 6–7 of your *Simple Machines: Forces in Action* text. Write legibly and put your name on it because you'll be sharing this with the class tomorrow, and it will be posted on the class Inclined Plane anchor chart. B. Continue reading in your independent reading book for this unit at home.	• This is an ELA lesson, not a science one. The purpose is to practice reading and applying understanding of scientific text. • This lesson is intended to align with science standards, but not to fully address them. Students will need more extensive experiences and instruction with simple machines, such as experiments and discovery, during other parts of the school day. • In Standard 4, Key Idea 5 of the NY State Science Standards, it's important for the students to know the role that gravity and friction play in the movement of objects. Each time the students conduct experiments in this unit, consider revisiting the scientific concepts of this standard. • For the first read, do NOT distribute the full text to students. Instead, use a document projector to show the text. This is important because the goal is for students to use inquiry to come to a conclusion of how an inclined plane works rather than simply reading about it. After conducting the experiment, students then write about their findings, and reread to verify their findings. • Before distributing the experiment to students, cover up the "How Does It Work?" on the bottom of page 9. • Create a chart to describe the steps of the Scientific Method described (see the supporting materials for examples). • Students will read *Simple Machines: Forces in Action* (pages 6–7) in depth in Lesson 3. • During this unit, students will often be working with a science partner. Consider assigning different partnerships for each simple machine so students experience working with different peers. Keep in mind the needs of your students, especially those who struggle with language and processing skills. • Post: Learning targets.

Lesson Vocabulary	Materials
experiment, observe, synthesize, findings, conclusion, procedure, hypothesis, corresponding	• Simple Machines Science journals (page 11: Inclined Plane Experiment Notes) • Sticky notes (one per student) • Simple Machines KWL anchor chart (from Lesson 1) • *Simple Machines: Forces in Action* pages 8–9 (cover up the text box "How Does It Work?" on the bottom of page 9; see Teaching Note above, and also at the end of Lesson 1) • Document camera • Equity sticks • Vocabulary Strategies anchor chart (reviewed in Unit 1, Lesson 1) • Scientific Method anchor chart

Opening	Meeting Students' Needs
A. Engaging Readers and Writers (5 minutes) • Remind students that in Lesson 1 they used a KWL chart to list what they already know about simple machines and what they want to learn about them. Explain that scientists ask questions about their field of study and conduct different kinds of research to find the answers to their questions. • Distribute the **Simple Machines Science journals** Ask students to choose one question about simple machines they most want to learn about and then write that question on a **sticky note**. Ask students to read their questions one at a time as they add them to the class **Simple Machines KWL anchor chart**. Categorize students' questions as you post them, so repeating or similar questions are clustered together.	
B. Reviewing Learning Targets (5 minutes) • Invite the students to read the learning targets. Ask them to turn and tell a partner what they think they'll learn today. Listen for things such as: "We're going to do an experiment," or "I think we're going to do a science experiment with simple machines." • Ask the students if there are any words or phrases that are confusing. Clarify as needed.	

Work Time	Meeting Students' Needs
A. Explaining Procedures: Reading a Science Experiment (20 minutes) • Project ***Simple Machines: Forces in Action*** **pages 8–9** with a **document camera**. Note: Be sure to cover up the text box "How Does It Work?" on the bottom of page 9; see Teaching Note above. Do not distribute the texts to the students at this point. • Ask students to notice the way this informational text is organized versus other informational texts they've read this year. Use **equity sticks** to cold call two to three students to share out whole group what they noticed. They may say things such as: "It's not written in paragraphs. It's written like a list that's numbered," or "It has different steps to follow like directions to a game." • Explain that they will conduct a scientific experiment today. Before they actually do the experiment, students need to read the directions to understand the *procedure*. Explain that a *procedure* is a series of steps someone takes to do something, such as a cook following a recipe. • Ask the students if any of them ever helped someone cook something new and had to follow a recipe. A cook has to read the recipe to know what she or he will need to cook with (the ingredients) and then go all the way through it to find out how to put it all together (steps) before beginning. Tell them they will do something similar: they will read about the scientific experiment and then do it. • Distribute *Simple Machines: Forces in Action* pages 8–9 to each student. Be sure that the bottom of page 9 is hidden. • Ask students to notice the yellow box on page 8. Explain this is a list of the materials they will need to conduct this experiment. Ask them to read this list with a partner and make sure they know what the materials are (they may not know "twist tie" and "gravel"). • If students don't understand the metric conversions, point out the standard units of measure also listed. • Tell students you'll read the text aloud as they follow along. Instruct them to try to visualize what is being described, asking them: "What is it going to look like when you conduct this experiment?" Tell them that visualizing the steps they'll take is a good way to understand the procedure and can explain what occurs in each step. • Read the first four steps aloud. Ask the students: "What are we supposed to do with the rubber band? Put your fingers on the step number(s) that tell us what to do."	• The experiment groups can be predetermined based on student readiness, learning styles, or groups can be heterogeneous. • For discussion of complex content, consider partnering an ELL student with a student who speaks the same L1. • Consider providing visual clues for the materials and steps in the experiment for ELLs and other students who struggle with language.

Work Time (continued)	Meeting Students' Needs
• Ask one or two students to share what step they're pointing to and why. Listen for: "Step 2. We need to cut the rubber band in half," and "Step 3. We need to tie one end to a paper clip," and "Step 4. We need to hang rubber band from the top of a ruler until the bottom of the paper clip reaches nine centimeters." • Ask students to continue the process of reading silently, visualizing, and explaining each step in the procedure in the next six steps of the experiment as you read aloud. Read Steps 5 through 10. • Focus on the word *corresponding* (Step 10). Ask: "What might the word *corresponding* mean?" Review the **Vocabulary Strategies anchor chart**. Encourage students to use the first strategy: "reading on in the text and infer" to figure out the meaning of *corresponding*. Ask one or two students to share their definitions. Listen for responses similar to: "next to." Acknowledge that is a great inference. Explain that the root word of corresponding is *correspond*, which means "be equivalent or parallel." Knowing this, the adjective *corresponding* describes something that is the "equivalent (the same) or parallel (similar) to another thing." In the context of Step 10, the word *corresponding* describes the location of the tip of the paper clip and numbers on the ruler. • Ask students to reread Step 10 to themselves, substituting the words "next to" for "corresponding" to see if they better understand what the text says. Encourage students to add this word to the Vocabulary section of their Simple Machines Science journal if it helps them remember it. (They can do this when they finish the experiment or for homework.) • Ask students to turn and tell a partner to discuss: * "How does the bag of gravel move? Where in the text are we given this information?" • Listen for answers such as: "Straight up and along an inclined plane." • Ask students to reread all 10 steps silently so that they have a solid understanding of the steps they will take during the experiment. • Ask the students to describe to a partner, in their own words, how the experiment will be conducted. The partner should listen for accuracy and clarity in the explanation. Note: This oral rehearsal will help them think through the process of the experiment and support them when they document what happens during the experiment.	

Work Time (continued)	Meeting Students' Needs
B. Rereading Scientific Text while Conducting an Experiment (15 minutes) • For the experiment, group students in groups of four to five. Ask them to turn to page 11 in their Science journal. Explain that scientists often use the Scientific Method to guide them through experiments. Draw students' attention to the **Scientific Method anchor chart**. Explain that the first thing they need to do as scientists is create a question that must be answered by conducting the experiment. Tell them that the question for this experiment is: "How can the inclined plane help make work easier?" • Explain that according to the Scientific Method, the next thing they need to do as scientists is form a *hypothesis* for what they think will happen. Remind them that a *hypothesis* is an educated guess about what will happen in an experiment based on research. Remind them they have already conducted some research about simple machines when they read pages 4 and 5 in *Simple Machines: Forces in Action*, in Unit 1. Encourage students to think about the reading they have already done that would help them form a hypothesis. Ask the small experiment groups to discuss what a possible hypothesis might be and to write it in their Science journal. • Invite the students to document the materials needed for the experiment in the Science journals and then begin the experiment. Tell them to make sure they record their observations after Steps 8 and 10. • Remind students to keep the bottom of page 9 covered. • Give students 10 minutes to conduct the experiment. • Circulate and assist as needed. When students have procedural questions, push them back into the text to see if they can answer their own question: * "Where might you look for that answer?" * "What does the text tell you?" • Listen for students talking about the amount of effort it takes to lift the bag of gravel. Give students specific positive feedback when you hear them using scientific vocabulary in their discussions, and encourage them to use this vocabulary as they write down their observations. They may make observations such as: "It takes less effort to lift a bag of gravel up an inclined plane because the rubber band didn't stretch very far," or "The rubber band stretched longer when I lifted the bad of gravel straight up. This showed me that it took a lot of effort to lift the bag that way." *Note: In Standard 4, Key Idea 5 of the NY State Science Standards, it's important for the students to know the role that gravity and friction play in the movement of objects. This point in the lesson may provide an opportunity to revisit those concepts.*	• Consider allowing students to draw their observations, ideas, or notes when appropriate. This allows all students to participate in a meaningful way.

Work Time (continued)	Meeting Students' Needs
C. Writing a Conclusion (10 minutes) • Explain that after scientists conduct an experiment, they *synthesize* their *findings* by writing a *conclusion* statement. Explain that *findings* are what they noticed happened as they conducted the experiment. This statement explains the main idea of what happened during the experiment and what they learned from it. • Help students connect to previous learning by explaining that a conclusion statement is similar to other types of synthesis statements they've written this year. In Module 2, they read texts about a trade and synthesized their learning in short gist statements. A conclusion statement in a science experiment asks the scientist to synthesize what they have learned about a topic through conducting a hands-on science experiment and discussions with their partners. • Point students to the last section of page 11 in their Science journals. Invite students to brainstorm with their experiment groups about a possible conclusion statement and to write it in their Science journal. • Next, ask students to unveil the bottom of page 9 in their texts. Ask them to read it as a group, checking to see if they reached the same conclusions as the author. If their findings were different from the author's, encourage them to NOT revise their hypothesis or their conclusion. Tell them that this happens to scientists. When different people do the same experiment and the results come out significantly different, this tells the scientists that the experiment needs to be conducted again to verify that the same materials were used and the same steps were followed. Instead of changing their conclusion, ask them to add to their conclusions by explaining how their conclusion is different from the author's.	• Using sentence frames can help ELLs articulate their learning. Using the word "because" in the sentence frame helps all students support their thinking with evidence. For example: "The rubber band stretched (more/less) when pulling the bag up the ramp. This means ________."

Closing and Assessment	Meeting Students' Needs
A. Read-aloud of Pages 6 and 7 of *Simple Machines: Forces in Action*: Learning More about the Inclined Plane (5 minutes) • Tell students now they get to learn even more about inclined planes. Read pages 6 and 7 of *Simple Machines: Forces in Action* aloud as students read silently in their heads. • After the read-aloud, give students a few minutes to discuss the gist with a partner. • Tell students their homework is to write a gist statement on a sticky note.	

Homework	Meeting Students' Needs
• On a sticky note, write a gist statement for pages 6–7 of your *Simple Machines: Forces in Action* text. Write legibly and put your name on it because you'll be sharing this with the class tomorrow, and it will be posted on the class Inclined Plane anchor chart. • Continue reading in your independent reading book for this unit at home.	

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Supporting Materials

The Scientific Method Anchor Chart

The Scientific Method
The Scientific Method is the process scientists go through as they ask and answer scientific questions. They do this by making observations and doing experiments.
Step 1: Ask a question
The first step is to form a question that can be answered. Good questions start with question words: *How*, *What*, *When*, *Who*, *Which*, *Why*, or *Where*? For example: "Which simple machine is the best one to help with this task?" "How many objects can be moved with a particular kind of simple machine?"
Step 2: Form a hypothesis
A hypothesis is an educated guess about the result of an experiment based on what you already know about a topic from reading and research. These can be worded like: "I think _______ will happen because _______."
Step 3: Test your hypothesis by conducting an experiment
Scientists need to be careful observers of what happens during the experiment. Think about/read the steps to the experiment. "First _______. Next _______. Then _______."
Step 4: Analyze the data and draw a conclusion
This is where scientists look at the results of the experiment. What happened in the experiment? Look to see if the question developed in Step 1 was answered.

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