2nd Reflective Teaching Assignment

Part 1a: Lesson Plan Analysis Task

Criterion #1: Eliciting Students' Ideas at the Beginning of the Lesson
It's been a week since we did the lesson on static electricity, so I want to remind students of what they learned about positive and negative charges. I want to make sure they are about to connect this lesson to prior information, which will help them organize the information in their head and make a more accurate scientific model. Without first discussing static electricity and their ideas about lightning, students may be confused about the purpose of the lesson and how to start constructing their scientific models. I think discussing last week's lesson and their ideas about lightning will be a good lead in to the activity today.

At the beginning of the lesson, does the lesson enable the teacher to elicit students' ideas about the new content?
The original lesson taught static electricity and lightning in the same lesson. At the very beginning of the lesson, the teacher is supposed to "review with your students what they know about cloud formation, thunder and lightning storms." Since I am doing the lightning lesson separate from the static electricity lesson, I also want to review our last lesson and example of static electricity they thought of.

Does the lesson ask student to make predictions and give explanations for their ideas?
No, the lesson plan does not ask students to make predications – the students actually do very little work with the concept of lightning in the original lesson plan. The teacher is supposed to read a provided explanation of lightning and there is no opportunity for students to discuss how lightning is connected to static electricity before the teacher is supposed to provide them with an explanation. After eliciting students' ideas, we are going to have students draw a diagram of how lightning forms and explain their drawing in sentence form.

Does the lesson provide opportunities for students' ideas and prediction to be recorded and shared with others?
Again, no. After students have filled out the predication section of their worksheet, we will have them share with a partner. I will be walking around the room asking students to explain their diagrams and I will also ask a few students to share with the whole class before starting the movie.

Criterion #2: **Promoting Students' Sense Making**
I want students to draw conclusions and formulate their own explanations about lightning from watching a video instead of just watching without really processing it. I don't want them to use my language or the language of the video, but language and concepts that they are familiar with and that makes sense to them. However, there are some terms and processes that they need to understand and be able to use (like "electrons" or the charge coming up from the ground) in order to fully explain the formation of lightning.

Does the lesson provide students with the vocabulary to explain their findings?
The explanation provided in the original lesson has the teacher using some of the terminology, but the students don't necessarily use it unless the teacher has students engage in a discussion about the "phases in the life of a lightning bolt." Mandy and I are going to review the terms we covered last week and introduce some important new words. We are also going to have the students collectively decide what elements should be represented in everyone's model, so some of the vocabulary should come up then (electrons, positive discharge from the ground, etc). Students also have to explain their final model in sentence forms, giving them another chance to use the vocabulary.

Are students asked to explain the phenomenon in their own words?
The original lesson plan provides a list of discussion questions, but doesn't explain how to implement them. One questions states "Examine the development of a lighting bolt… explain the phases in the life of a lightning bolt." I'm not sure how students are supposed to discuss this given the limited information provided to them in the lesson. Also, not all students would have an opportunity to share their explanation. We are having students draw, write and share their explanations. Students will be using ideas presented in the video, but they will have to put them in their own words since they won't have any references (like a text book) to refer to.

Criterion #3: Assessing Student Learning
I think having an assessment helps students organize their thinking and understand what's important for them to take away from the lesson. If we just watched the video without having students complete some work or an assessment, they probably wouldn't be able to pick out the main points or remember the important facts. The assessment also helps the teacher see what parts of their lesson went well and what parts the students struggled with. I think it increases communication between students and their teacher and gives them something meaningful to discuss.

Does the lesson provide teachers with assessments that allow them to assess each student's understanding of the science ideas and inquiry skills?
No, the original lesson doesn't have any assessment regarding lightning. Mandy and I are going to collect students' predications, evaluations and revisions of their scientific models. This will help us assess both their understanding of the science concepts and their inquiry skills, such as making predictions, evaluating predictions based on new information, revising their predications and communicating their ideas. We are also going to have exit slips – the students must write down a question they still have about lightning or static electricity. This will help us see what students might not understand yet about the concept and modify our lesson (if we taught it again).

Does the assessment accurately measure students progress toward the lesson's learning goals?
The lesson doesn't really have an assessment, but it does have a rubric for grading student's writing about static electricity (from the first part of the lesson). The rubric awards points for paragraph construction, grammar, mechanics and spelling. While these things are important in order for students to be able to concisely communicate their ideas, I don't think it should be a focus of the assessment; it takes the focus away from the science and students' understanding. Also, the stated lesson objectives were:

"Students will understand the following:

1. Static electricity is the cause of lightning.
2. Lightning forms because of an accumulation of electrical charges inside a cloud due to friction…
3. The bottom of a cloud becomes negatively charged and discharges a lightning strike when enough charge has built up."

The writing about static electricity does not measure any of these three goals.

Part 1b: Revised Lesson Plan

Title of Lesson: Static Electricity in the Weather
Grade Level: 5th
Length of Lesson: 45 minutes

Overview

Students will develop a scientific model regarding the formation of lightning based on prior information. Each student will draw a diagram showing how they think lightning is formed and explain their drawings in sentences. They will share and discuss their models, and then watch a short video clip on how lightning forms. Based on the information provided in the video, students will evaluate their models and revise them. The class will decide on the elements that should be represented in everyone's model and use their revised models to explain how lightning is formed.

Learning Goals

Students will be able to…

- Explain that lightning is an example of static electricity.
- Explain that lightning is caused by the attraction between negative charges in the bottom of cloud and positive charges on the ground.
- Draw a diagram showing the formation of lightning, including clouds, the ground, positive and negative charges and the attraction between the charges (a "bolt").
- Make predications, evaluate their predications and revise their initial ideas.

Connections to Standards/Benchmarks/Curriculum

- The main notion to convey here is that forces can act at a distance. Students should carry out investigations to become familiar with the pushes and pulls of magnets and static electricity… By the end of 5th grade, students should know that: Without touching them, material that has been electrically charged pulls on all other materials and may either push or pull other charged materials. *[AAAS: The Physical Setting – Forces of Nature (3-5). Source: http://www.project2061.org/tools/benchol/bolframe.htm]*
- Develop solutions to problems through reasoning, observation, and investigation. *[Michigan Curriculum Framework (Science) I.1.e.2. Source: http://www.michigan.gov/documents/MichiganCurriculumFramework_8172_7.pdf]*

- Show how science concepts can be illustrated through creative expression such as language arts and fine arts. *[Michigan Curriculum Framework (Science) II.1.e.2. Source: http://www.michigan.gov/documents/MichiganCurriculumFramework_8172_7.pdf]*

Context of Lesson

This lesson is part of a unit on electricity and magnetism. This lesson follows a lesson and activity on static electricity. Based on interviews with students, they have had very little instruction on lightning.

Materials

- Scientific Modeling: Lightning worksheet
- Video clip from the Discovery Channel

Students' Ideas

Before the lesson, students should understand…

- Static electricity can occur between objects that aren't touching.
- Understand that items become negatively charged when they pick up additional electrons.
- Explain that static electricity is an electrical current produced by the attraction of two oppositely charged items.

Potential alternative ideas:

- Objects become positively charged because they have gained protons (CASES – Children's Ideas in Science).
- Objects become positively charged because their electrons have been destroyed (CASES – Children's Ideas in Science).
- Static electricity is the buildup of electrons (CASES Unit – Electricity/Magnetism).
- Static electricity is the same as the electricity in our homes or in batteries (Student Interview).
- Energy is associated only with humans or movement, is a fuel-like quantity that is used up, or is something that makes things happen and is expended in the process (AAAS).
- Associate energy only with living things, in particular with growing, fitness, exercise, and food (AAAS).
- Lightning is created by differences in air temperature (Student Interview).
- Lightning is caused by thunder or by clouds hitting each other (Student Interview).

Teaching Strategies: Introduction

- Connect this lesson to previous lessons on static electricity by having students summarize the last activity and lesson. Ask students if they thought of any other examples of static electricity.

- Investigation question: What is lightning and how does it form?

- Talk to students about scientific modeling and the work scientists do. Explain that models are a way for scientists to explain and share their ideas. Models are dynamic – they are always being evaluated and revised

- Each student will be given a worksheet with a space to draw and explain their initial scientific model, based on their predictions about the cause of lightning. Give students 6-8 minutes to work on their models independently. Encourage students to explain their thinking in pictures, labels and sentences.

- Students will then share their predictions in pairs.

Teaching Strategies: Main Lesson

- Watch the video clip "Investigating Electricity" from Discovery Education.

- Tell the students they are going to have a chance to evaluate and revise their models.

- After watching the video clip, have students individually complete the evaluation section on the worksheet ("What do you need to change in your original scientific model").

- As a class, develop a list of elements every student should include in their revised scientific model.

- Give students 10 minutes to draw a new diagram and write an explanation of their model. Walk around and remind students to include all of the elements on the class list and encourage them to be detailed in their diagram and explanation. Students can share with a partner when finished.

Teaching Strategies: Wrap-Up

- Choose 1-2 models to share with the class and point out why they are good models.

- Fill out the "Lightning Fun Facts" on the back of the worksheet as a class and explain the "Flash to Bang" method.

- Exit Slip: "On the bottom of your worksheet, please write down one question you still have about lightning." When students finish, have them hold up their papers and collect them. Students can then line up to return to their classroom.

Assessment

- Collect student worksheets. Individuals should have an initial model and explanation, a written evaluation of their model, a revised model and explanation, completed "lightning fun facts" and an exit slip.

Part 1c: Lesson Plan Rationale

I. Use of Science Curriculum Materials

1. Which of the following best characterizes how you started planning for this lesson?
   - ☐ I had a general idea of the topic I wanted to cover but no materials yet
   - ☐ I had an idea for a student activity or investigation and built a lesson plan around that.
   - ☒ I had an existing lesson plan that I planned on using
   - ☐ Other

2. How explicit was your learning goal before you started developing your lesson?
   - ☐ Very explicit (I knew specifically what I wanted by students to learn and how they would demonstrate their understanding)
   - ☒ Somewhat explicit (I knew specifically what I wanted by students to learn)
   - ☐ Not very explicit (I had identified specific parts of a scientific concept I wanted my lesson to address but wasn't sure about exactly what I wanted students to learn)
   - ☐ I really didn't have a learning goal at first (I had a general sense of what scientific concept(s) I wanted my lesson to address but wasn't sure exactly what I wanted students to learn)

3. What existing lesson plans, curriculum materials, and other resources did you use to develop your lesson? Please list them here.

	Name/Title	Type of Resource	Source	Additional Information
Ex	*Take Me To Your Liter*	*Existing Lesson plan*	*My CT and/or placement classroom*	*From FOSS science curriculum*
1.	*Stormy Weather*	Existing Lesson plan	Online (Discovery Education)	CT wanted a lesson on electricity and weather
2.				
3.				
4.				
5.				

   a. What did you like about features of the curriculum materials you used? What didn't you like? Why?
   b. Were they good choices for developing an inquiry-oriented lesson? Why or why not?
   c. What other factors did you have to consider in using these resources?

I liked how the lesson plan started with experiences with static electricity and moved into lightning so students could relate what they've learned/observed to a larger phenomenon. I think it makes a good connection between the smaller examples of static electricity and lightning. The science is pretty simple and shouldn't be overwhelming to fifth graders (I even learned something!). The lesson basically provided a framework for Mandy and I to work with to develop our lesson – the lesson as is wouldn't have worked for our classes. But the general progression was helpful. We had to elaborate on the lightning parts of the lesson and made it a separate day because there was so much new information to cover. The original lesson plan didn't include any inquiry steps, like predicting or explaining ideas, or a suitable assessment. We also had to consider how this lesson would fit into a unit on magnets and electricity and how to relate it to what students already know.

II. Adapting Science Curriculum Materials

4. Please think about **each of the changes you made** to your lesson. List each one and briefly describe it. Then, **for each change** you made, please answer the following:
   a. How did this change **improve upon** what was already in the existing lesson?
   b. Did this change make your lesson **more or less inquiry-oriented**? If so, how?
   c. What **other factors** did you consider in making this change?

Developing scientific models: This was a big change from the original lesson. We wanted to give students a chance to work within the framework of inquiry. Lightning seemed like an accessible concept for the students, even though they didn't have a good understanding of what causes lightning. They were interested in the topic and had prior knowledge and experience with it. The prior lesson about static electricity also set students up to be able to investigate lightning without a lot of teacher-led instruction. This change allowed more student involvement in the lesson and more student inquiry.
Video: We decided to use the video clip because it was engaging and clearly showed and described the formation of lightning. We thought the visual along with the explanation was a better way for students to learn about the concepts and language than reading or listening to instruction. It was very concise and clear and directly related to the work students were doing with their scientific models. It was a great way to incorporate multimedia resources as well!
Worksheets and Exit Slips: Students needed a place to record their predications, models, revisions and explanations. Giving them a worksheet with the steps laid out helped introduce them to the inquiry framework and keep them on task. It was also helpful to see how their thinking changed between the initial and revised models. They aided the teaching by being able to refer to certain points in the worksheet as an indicator of what students should be doing ("When you finish your drawing, fill in the explanation section"). The exit slips help wrap up and transition into the next task (in my case, I need to line the students up to take them back to their classroom). The students' questions will also help me see how effective this lesson was.

5. How inquiry-oriented do you think your lesson is?
   ☒ Very inquiry-oriented
   ☐ Somewhat inquiry-oriented
   ☐ Not very inquiry-oriented
   ☐ Not at all inquiry-oriented

   Please explain your answer to question #5. Why do you think your lesson was or wasn't inquiry-oriented?

Students are not only investigating a topic, but they are also learning about how they are engaging in inquiry practices. At the beginning of the lesson, we explain that they are going to use scientific models to explain their thinking, like scientists do. Each of the steps is highlighted and explained both in instruction and on the worksheet. Students are given multiple opportunities to work with others, explain their ideas in their own words and use scientific language. Compared to the last lesson, this lesson is less teacher-directed and students are responsible for processing the information in the video and incorporating it into their models. The students develop the list of elements to be included in their models and evaluate their own work. They also have to be thoughtful about their own understanding/confusion to be able to complete their exit slip.

6. Please include any other comments you have about your lesson.

Teach Your Lesson

Now you're ready to teach your lesson. On the day of your lesson, be sure you're ready to go, with all the materials (including handouts) prepared. Also, make sure your field instructor knows when you're teaching.