NTTI Media-Rich Lesson

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NAME

When Lightning Strikes!

LESSON TITLE

Fourth Grade

GRADE LEVELS

1 hour class

TIME ALLOTMENT

OVERVIEW

People have always been fascinated by electricity. The natural electricity we see displayed in a lightning bolt fills us with a combination of fear and awe. A bolt of lightning is about a million volts of electricity. It is five times hotter than the surface of the sun. For years people have made up folklore about what causes the blinding brilliance of a lightning bolt. The Fon people of Benin attribute thunder and lightning to the Orisha, Hevioso, a spiritual minister of the Supreme Being. The Yoruba people of West Africa call the Orisha of lightning and thunder, Shango. In America, some Native Nations believed the lightning came from the magnificent fire bird. The wings of the firebird cracked out thunder; and lightning was the flash from the firebird's eyes. This lesson explores the relationship of atomic particles and static electricity. Although current electricity will be explained, the focus of the lesson is on static electricity.

SUBJECT MATTER

Physical Science-Static Electricity

LEARNING OBJECTIVES

- Demonstrate and explain examples of static electricity.
- Explain the relationship of atomic particles to static electricity.
- Compare and contrast static electricity to current electricity.

STANDARDS

Georgia's Quality Core Curriculum
Standards: QCC #8
Topic: Energy and Its Transformation: Magnetism and Electricity
Standard: Distinguishes between static and current electricity. Produces and identifies examples of static and current electricity such as static cling and complete circuits.

Georgia's Quality Core Curriculum's website
www.glc.k12.ga.us

1. Click QCC Standards and Resources
2. Once your there, put in Grade-4, Subject-Science and Search
3. Go to Physical Science
4. Go to QCC #8 (listed above). This page will also give you a additional lesson plan ideas and web resources

MEDIA COMPONENTS

Internet

www.peachstar.org
Peachstar allows you to download video clips that correlate with the QCCS. The video tapes available cover a variety of topics.

www.brainpop.com
Brainpop.com is a website that provides students with short movies in the areas of science, mathematics, health and technology. Brainpop.com offers 2 free movies daily for each computer you have. The movies allow you to pause, skip ahead, and skip back. Teachers may sign up for 2 free weeks of unlimited movies.

http://www.princeton.edu/~mcbrown/display/faces.html

This address will take you to the Faces of Science: African Americans in the Sciences. This site provides short biographies on several African American scientists.

www.mamiwata.com/shango.html

This address is for your cultural connections. It will tell you the story of Shango, the Yoruba diety who creates thunder and lightning by casting thunderstones.

MATERIALS

Per Class

(Based on a classroom with 20 children. Students work with a partner.)

- 10 plastic rulers
- 10 baggies with different strips of colored tissue
- 10 pieces of wool
- 10 empty soda can, cleaned out
- twenty balloons
- 20 pieces of string
- chart paper and markers or board and chalk
- Chart entitled-What We Want to Know About Static Electricity

Each set of partners receives

- 2 plastic rulers
- baggie with different strips of colored tissue
- piece of wool
- empty soda can, cleaned out
- two balloons with string tied to the ends, write #1 on one balloon, and #2 on the other
- tape

PREP FOR TEACHERS

- Cut colored strips of tissue paper and put in baggies.
- Cut stings, about 6 inches long and tie them to the blown up balloons
- Write #1 on one balloon and #2 on the other
- Go to www.peachstar.org
- Click on peachstar
- Click on video streaming-orange box in right hand corner
- Enter your school's screen name and password
- Type "Flash to Bang" under search for key words
- Click Flash to Bang
- Download to your desktop. This process takes about 2 hours. You can now open the video from your desktop or you can burn it to a CD. The video is full of information, but you will only use the introduction. The introduction is about 60 seconds of lightning. You can certainly use the video clip later in Cross Curricular activities.
- Once the video is downloaded, **press play.** As soon as you see the screen displaying United Artists, **push CTRL P**. This button can be used to pause or play your video.
- **Minimize** the screen until you are ready for it.

- You will also want to download the movie on static electricity. Follow the above mentioned steps for www.peachstar.org.
- Enter 4th grade, physical science, electricity
- Download, movie on static electricity. You must do the downloading in advance. It may take as long as two hours to download. Once you download the movie, save it to your desktop. You can also burn the clip to a CD. You do not have to download the whole clip. Download, "What is Static Electricity". Download, "Two Facts About Static Electricity."
- When you are ready, click Windows Media Player at the bottom of your screen.
- **Press ALT and Enter**. This will enlarge the screen.
- When you are ready for the clip, **press CTRL P** and it will play. **Stop** the clip after you see the title, Flash to Bang. **Press CTRL S** to stop it.
- Go to www.brainpop.com. Brainpop will allow you to see two free movies a day per each of your computers. Click on science movies.
- Go to electricity. Load the movie. It will take a minute for the movie to load.
- **Press play** before class begins. **Step forward** until you see the blue screen with a young man in white, reading a letter. **Press the pause** button (ll). **Minimize** the screen until you are ready for Brainpop.
- When you are finished with the electricity clip on Brainpop, go to (Pick a movie!) and scroll down to Thunderstorms. **Press mute** until you are ready**. Press the step forward** button until you see Tim, young man with brown hair, in front of a green screen. **Press pause**. **Minimize** screen until you are ready for Brainpop.

INTRODUCTORY ACTIVITY: SETTING THE STAGE (Engage)

1. Tell the students that the lesson will focus on electricity. Ask them if they know the two types of electricity. (static, which is natural or current, which is human generated). *If students are unable to identify the two types of electricity*, ask them to tell you what they know about electricity. Through your questioning lead them to current and static electricity. For example, ask them to look around the room and identify the things that are powered by electricity. List those things on the board. Ask students to explain the type of electricity that occurs when you rub your feet on carpet, touch someone and shock them. They should be able to identify static electricity. Ask students to tell you what type of electricity powers the things they listed on the board. Ask them if static electricity powered the listed items. Tell them the type of electricity that powered the listed items flows, kind of like water. If students still are not able to identify current electricity, write the question on the chart under the listed items-*what type of electricity powers these items?* Tell the students they will be able to answer the question as the lesson continues*. If students are able to identify* the two types of electricity, a*sk* the students to give you examples of static electricity and current electricity. Ask them which type of electricity is generated by humans and which type is natural.

2. **Focus for Media Interaction-**Ask the students to watch the clip to see an example of electricity. When you are ready, click Windows Media Player at the bottom of your screen. **Press ALT and Enter. This will enlarge the screen.**

3. Press **CTRL P** and it will **play**. **Stop** when you see the title, Flash to Bang.

4. Once the students have viewed the clip, ask them to tell you about what they viewed. Write lightning on chart paper. Ask them whether lightning is current electricity or static. If they are unable to answer static, write the following question on the chart entitled-What We Want to Know About Static Electricity-*Is lightning an example of static or current electricity?* Tell the students they will be able to answer the question as the lesson continues.

5. **Focus for Media Interaction-** Tell the students to watch the clip from www.brainpop.com on electricity to see the difference between static and current electricity. You should already have the electricity movie on Brainpop loaded. You should have **stepped forward** until you see a blue screen with a young man in white reading a letter. Press the **play** button. **Stop** the clip when you hear *electricity flows through the circuit delivering energy to the light bulb.* **Press Pause.**

6. Use the picture on the screen of the light bulb, the wire and the cell. Ask the students if the picture illustrates current or static electricity.(current).

7. Ask the students to tell you the difference between static and current electricity. (They could say that static electricity is when electrons are pulled from one surface to the other, so there is a build up of a negative charge; and current electricity is when electrons flow through a conductor. They might give an example of static electricity, like lightning, or shocking someone when you walk on the carpet, or getting shocked when you touch a door knob. They may explain that current electricity powers toasters, televisions, etc.). Accept either examples or the explanation that includes electrons.

8. Ask the students what electrons are (the particles of an atom with a negative charge). If they are unable to tell you, write the question-*What are electrons?* On your chart entitled, What We Want to Know About Static Electricity? While the students do the activity below, prepare for the next Brainpop video, Thunderstorms, although you will not use it until much later. **Press mute**. Go to (Pick a Movie!) at the top of the screen, scroll down to Thunderstorms. Use the **step forward button** until you see Tim, a young man with brown hair, and a green background. Press **pause**. **Minimize your screen** until you are ready.

LEARNING ACTIVITIES

Step 1

Break the class up into partners. Tell them they are going to do an activity that will help them explore static electricity. Give each set of partners a baggie with colored strips of tissue, a plastic ruler and a piece of wool cloth.

Step 2
Tell the students to dump the pieces of tissue out on the table. Ask them to predict whether or not the ruler will be able to pick up the pieces of tissue. Ask them to take their rulers and swish them around in the tissue to test their predictions. Ask for their observations. (nothing will stick)

Step 3
Ask the students to rub their rulers with the piece of wool cloth. Ask them to predict what might happen this time. Have students test their predictions. Ask students to share their observations.

Step 4
On a chart entitled, What We Want to Know About Static Electricity? Write the question, why did the tissue stick to the ruler? Ask students to explain why they think the tissue stuck to the ruler. (Accept all answers). Tell the students that throughout the lesson they will gather more information to see if their ideas are accurate.

Step 5
Focus for Media Interaction- Tell the students to watch the clip to find out what all matter is made of. Show them the clip on static electricity from www.peachstar.org. **Begin** the clip with the black screen with about 5 blue and green models of atoms. **Press play. Pause** the clip after the narrator says those incredibly small building block from which all nature is put together. Ask the students what all nature is made of (atoms).

Step 6
Focus for Media Interaction-Tell the students to watch the clip to tell you the 3 parts of an atom. **Press play**. **Press pause** after the narrator says protons, neutrons and electrons. Ask the students to identify the 3 parts of an atom (protons, neutrons and electrons)

Step 7
Focus for Media Interaction-Ask the students to watch the clip to tell you what type of electrical charges protons, electrons and neutrons have. **Press play. Press pause** after the narrator says . . . as a result of this sameness they have a neutral charge.

Step 8
Ask the students what type of charge a proton has? (positive) An electron? (negative) A neutron? (no charge, or neutral). Ask the students what type of charge an atom has if they have the same number of protons and electrons. (neutral). **If students are unable**

to answer use the small square at the bottom of the screen to **rewind**. Use your curser to drag the small square about _ of the way back. Ask the questions above again.

Step 9
Tell students that atoms can lose electrons. Ask students to predict what type of electrical charge an atom will have if it loses electrons. (positive) Ask students what type of charge an atom will have if it gains extra electrons (negative) **Focus for Media Interaction-**Tell the students to watch the clip to see if their predictions are correct. **Press play. Press pause** when the narrator says, ". . . this state of affairs produces atoms with a negative charge."

Step 10
Ask students if their predictions were right. To emphasize the point ask students the following questions: What type of charge does as electron have? (negative) What type of charge does a proton have? (positive) What type of charge does a neutron have? (neutral)

Step 11
Tell the students they are going to do an additional activity to help them understand the nature of static electricity. Tell students to keep in mind what they've learned about electrons and protons. Give the students 2 balloons. The balloons should have a string on the ends. Tape the balloons to the edge of a table so they hang freely.

Step 12
Ask the students to observe what happens when balloons #1 and #2 touch each other. (nothing-the balloons don't attract or repel). Ask them why nothing really happens. (The balloons have a neutral charge).

Step 13
Ask students what the balloons are made of. (atoms) If they have a difficult time, ask them to refer back to the movie. Ask them what 3 particles all atoms are made of. (neutrons, protons, electrons). Ask them what type of charge each particle has. (Neutron-neutral, proton-positive, electron-negative). Ask them what happens when something has the same amount of protons and electrons. (It has a neutral charge).

Step 14
Ask a student to explain again why the balloons did not seem to react to each other, using the above information.

Step 15
Ask the students to predict what will happen if you rub balloon #1 with wool and move it next to balloon #2.

Step 16
Have the students rub balloon #1 with wool and move it next to balloon #2 to test their predictions.

Step 17
Ask students to explain their observations. (The balloons will now be attracted to each other, because balloon #1 now has a negative charge and balloon #2 is now positive.)

Step 18
Focus for Media Interaction-Ask students to watch the next clip to see if their explanation were correct. Show the beginning of Two Facts About Static Electricity. **Press play**. **Press pause** after the narrator says, objects with like charges repel each other.

Step 19
Ask students if their explanation were correct. Ask the students to explain how the charges were unlike. (Balloon #1 had a negative charge and balloon #2 had a positive charge. The electrons in balloon #1 repelled the electrons in balloon #2, leaving the surface of balloon #2 with a positive charge.)

Step 20
Ask the students to predict what will happen if they rub balloon #2 with wool. Have the students test their predictions. After they rub balloon #2 with wool, students should put balloon #2 close to balloon #1. Ask the students to explain their observations. If students do not use the terms electrons and protons and negative and positive charges, encourage them to do so. (The two balloons will now repel because they both have a negative charge. When the balloons were rubbed with the wool cloth they gained extra electrons.)

Step 21
Make sure students understand that opposites attract and like charges repel.

CULMINATING ACTIVITY

Step 1
Give pairs of students a can, a piece of wool and a plastic ruler. Ask the students if they think they can make the can roll along the floor without touching it with the ruler.

Step 2
Discuss their predictions.

Step 3
Have the students use the materials they have to see if they can make the can roll on the floor without touching the can with the ruler. Allow students time to explore. (If

students rub the can and the ruler with wool, both objects will have a negative charge. If they put the negatively charged can on the floor, and place the negatively charged ruler behind it, the ruler will push the can along the floor without touching it. The can and the ruler will repel, resulting in the cans rolling along the floor.)

Step 4
Have students discuss with their partners why the ruler pushes the can without touching it. Tell them to use electrons, protons, negative and positive charges in their discussion.

Step 5
Refer to the questions written on the chart-What We Want to Know About Static Electricity. Ask student to explain why the tissue stuck to the ruler. (*The ruler had a negative charge once it was rubbed with the piece of wool, electrons jumped from the wool to the ruler resulting in the ruler having more electrons than protons, which caused the ruler to have a negative charge. The tissue had a neutral charge, but once the negatively charge ruler came near the tissue the electrons in the tissue were repelled, leaving the protons, which are positively charged, near the surface of the tissue. Opposites attract, so the negatively charged ruler was attracted to the positively charged tissue.)*

Step 6
Ask the students, “What does all this has to do with lightning?” Accept their answers. **Focus for Media Interaction-**Tell the students to watch the clip on thunderstorms from brainpop.com to see if lightning is a form of static or current electricity and to see if their ideas are correct. You should have the screen for brain pop minimized. Enlarge the screen. You should see Tim, a young man with brown hair, in front of a green screen. **Press play. Press stop** when the narrator says, “. . . get shocked by the door knob but on a much larger scale.”

Step 7
Ask students to explain whether or not lightning is a form of static or current electricity. (static) Lead them to use electrons, protons, positive, negative and neutral charges in their explanations. If they are unable to do this, use your skip back button to the beginning of the clip, which is the green screen with a young man in front of it. **Focus for Media Interaction-**Ask students to watch the clip again to find out what negatively charged particles (electrons) and positively charged particles (protons) have to do with lightning.

Step 8
If students watch the clip a second time, ask them to explain what electrons and protons have to do with lightning.

CROSS-CURRICULAR EXTENSIONS

Language Arts

For years people have made up folklore about what causes the blinding brilliance of a lightning bolt. The Fon people of Benin attribute thunder and lightning to the Orisha, Hevioso, a spiritual minister of the Supreme Being.
The Yoruba people of West Africa call the Orisha of lightning and thunder, Shango. In America, some Native Nations believed the lightning came from the magnificent fire bird. The wings of the firebird cracked out thunder; and lightning was the flash from the firebird's eyes. Have students look up folklore from various ethnic groups around the world explaining lightning. Have them identify where these people are in the world by providing a map indicating their location. Compare and contrast the different stories.

www.mamiwata.com/shango.html

This address will tell you the story of Shango, the Yoruba diety who creates thunder and lightning by casting thunderstones.

COMMUNITY CONNECTIONS

Have students interview their grandparents or older relatives on stories they know about lightning. Have students illustrate the stories. Place the stories in a class book for all to share.

www.glovis.com

Glovis technology is an organization dedicated to infusing the contributions of African American scientists into the educational process. They are a tremendous resource, offering, in-service training, demonstration lessons and materials. Invite a representative from Glovis to talk to your class, or your school about the area of physical science. Glovis will be able to discuss careers that are dedicated to the research of thunderstorms and lightning, atoms, static and current electricity. Glovis provides examples of scientists that are from the past and are currently living. The founders of Glovis are themselves patented scientists.