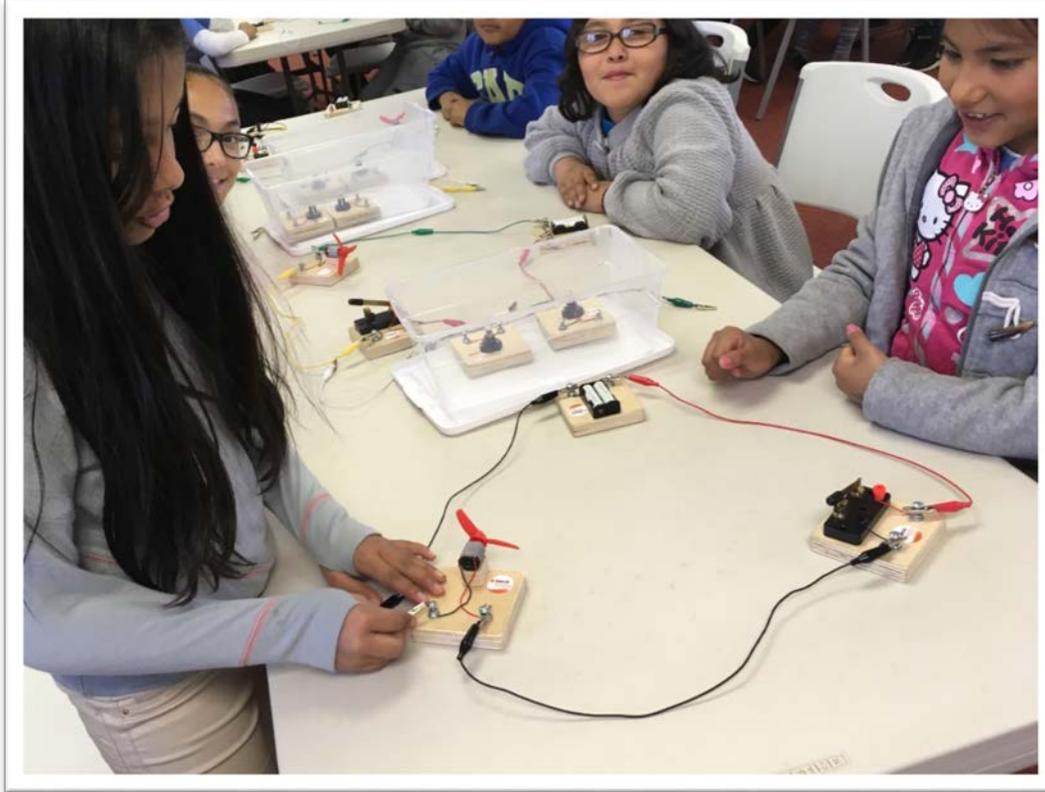


PowerHouse Field Trip: Electricity and Magnetism



3rd Grade Anchor Field Trip Arts Integrated Lessons 2018-2019

Developed by Dr. Nancy L. Andrzejczak
In collaboration with
Student Engagement
Arts and Career Education



Lessons designed to extend the experience of the Powerhouse field trip with English Language Arts and Theater.

Lesson plans using SWUN Template:

1. Review of Electricity and Magnetism (Week long review)
2. Using Readers Theater to reinforce scientific concepts (Week long preparation and presentation)

-Resource Packet

-Ms. Frizzle Readers Theater

**Please use support PowerPoints and resource packet to assist in teaching these lessons.

**Jacqueline White, Executive Director of Student Engagement
Arts and Career Education**

Approx. Minutes	<p align="center">PowerHouse Anchor Field Trip-Support Lesson</p> <i>Lesson plan on the relationship between electricity and magnetism –pre-learning for Ms. Frizzle Readers Theater</i>
8 Minutes	<p><u>Concept/Skill Review</u> Teacher reviews magnetic forces of negative and positive. Make sure that students understand magnetic charge.</p>
6 Minutes	<p><u>Lesson Opener</u> Learning Intention/Lesson Opener</p> <ul style="list-style-type: none"> • Students will learn how magnetism and electricity have a special relationship. The students will learn how electricity is the flow of electrons jumping from one atom to the next. Magnets can create electricity by pulling electrons from one atom to another. • Students will know that electrons have a negative charge and understand that the same charge repel each other. • Students will be able to explain how the jumping of electrons makes electric current and the role magnets have in this process. • Students will be able to distinguish a conductor or an insulator and describe why that is important to know. <p>Success Criteria</p> <ul style="list-style-type: none"> • Teacher identifies for students that they should know the process and the vocabulary meanings for electron, atom, electric current, generator, conductor, and insulator. <p>Learning Progression</p> <ul style="list-style-type: none"> • First, students learn that atoms have electrons. • Second, students learn that electrons have a negative charge. • Third. students learn that electric current happens when electrons jump from atom to atom. • Fourth, students learn that magnets can make the electrons jump and that is how electricity is generated. • Fifth, review learning and restate concepts. (Preparation for the Readers Theater) <p>Anticipatory Set</p> <ul style="list-style-type: none"> • Teacher relates new learning intention to past learning • Connect all students but keep it short <p>Vocabulary</p> <ul style="list-style-type: none"> • Electron: Electron is part of the atom with a negative charge and it is the primary carrier of electricity in solids. • Atom: The basic unit of everything is an atom. • Electric Current: An electric current is the flow of electric charge.

	<ul style="list-style-type: none"> • Generator (generate): A generator is a machine that converts energy into electricity. • Conductor: A conductor is a material that electric current can flow easily. • Insulator: An insulator is resistant to an electric current.
20 Minutes	<p><u>Instructional Input/Modeling (I Do)</u></p> <ul style="list-style-type: none"> • Teacher can demonstrate an electro magnet or show the following video: https://youtu.be/CLuPNTw0RE This is an age appropriate old School House Rock that shows how electricity and magnetism are related. • If you want to students to make illustrated vocabulary cards, the teacher can model the process of writing the definition and drawing an illustration. <p>Checking for Understanding</p>
	<p><u>Structured Guided Practice (We Do)</u></p> <ul style="list-style-type: none"> • Students can work in pairs to create the illustrated vocabulary cards or other demonstration of the vocabulary. • Students Share with A/B partner • Teacher prompts, questions, facilitates or leads students through a task • Teacher guides student’s thinking <p>Check for Understanding</p>
5 Minutes	<p><u>Closure</u></p> <ul style="list-style-type: none"> • Ask students to show their picture or demonstrate the following: • Electric current, electrons and negative charge, what a magnet does, how does an insulator or conductor work <p><u>Final Check for Understanding</u></p> <ul style="list-style-type: none"> • Oral discussion
20 Minutes	<p><u>Student Practice (You Do)</u></p> <ul style="list-style-type: none"> • Students finish their vocabulary cards or illustration for one concept. This is at the discretion of the teacher.,
	<p><u>Collaborative Learning</u></p> <ul style="list-style-type: none"> • Student works collaboratively on an assigned task
10 Minutes	<p><u>Presentation</u></p> <ul style="list-style-type: none"> • Student presents their final product to the rest of the class

Approx. Minutes	PowerHouse Anchor Field Trip-Support Lesson-Readers Theater <i>Lesson plan on performing Readers Theatre-Ms. Frizzle and the Magic School Bus and the Electric Field Trip</i>
8 Minutes	<u>Concept/Skill Review</u> Teacher reviews magnetic forces of negative and positive. Make sure that students understand magnetic charge.
6 Minutes	<p><u>Lesson Opener</u></p> <p>Learning Intention/Lesson Opener</p> <ul style="list-style-type: none"> • Students share what they learned about magnetism and electricity have a special relationship. The students will share how electricity is the flow of electrons jumping from one atom to the next. Magnets can create electricity by pulling electrons from one atom to another. <p>Success Criteria</p> <ul style="list-style-type: none"> • Students will comprehend the scientific principles in the Readers Theater. <p>Learning Progression</p> <ul style="list-style-type: none"> • First, students will review scientific concepts. • Second, student will be introduced to Readers Theater and how it is performed. • Third, students will be divided into groups and roles. • Fourth, students will perform the Readers Theater. • Fifth, the students will discuss the story and what they learned about electricity. <p>Anticipatory Set</p> <ul style="list-style-type: none"> • Teacher relates the Readers Theatre and how it is presented to past learning. <p>Vocabulary</p> <ul style="list-style-type: none"> • Readers Theater: Readers Theater is the presentation of a written work in a script form with actors reading parts. • Back to Audience: Back to Audience is how the actors can show that this character is not on stage by turning his/her back to the audience. • Voice: Voice in drama is the pitch, tone, pace and projection of the actor which is used to create the character. • Character: Character is the personality that is created by the actor.
20 Minutes	<p><u>Instructional Input/Modeling (I Do)</u></p> <ul style="list-style-type: none"> • Teacher can show or demonstrate what Readers Theater is and how different readers are the characters and the narrators. The Teacher can show how you can create a character by changing the voice of the actor. <p>Checking for Understanding</p> <ul style="list-style-type: none"> • Ask students to make a scared or happy voice.

	<p><u>Structured Guided Practice (We Do)</u></p> <ul style="list-style-type: none"> • Give each student a script. • Assign each student a role-a character or narrator. Have them highlight their parts. • Read the play as whole group with each part read chorally by the assigned students. (This will allow students to hear the modeling of good reading) <p>Check for Understanding</p>
5 Minutes	<p><u>Closure</u></p> <ul style="list-style-type: none"> • Ask students who is reading different parts? • How do we use voice to create a character? <p><u>Final Check for Understanding</u></p> <ul style="list-style-type: none"> • Oral discussion
20 Minutes	<p><u>Student Practice (You Do)</u></p> <ul style="list-style-type: none"> • Students work in play groups. A play group is a group of students- with 1-Ms. Frizzle, 1-Janet, etc. • Students practice reading play aloud in separate groups.
	<p><u>Collaborative Learning</u></p> <ul style="list-style-type: none"> • Student can decide how they want to present the play. For example: do they want to use facial gestures, or bounce on chairs to show the rough ride.
10+ Minutes	<p><u>Presentation</u></p> <ul style="list-style-type: none"> • Student presents their final product to the rest of the class or another class, or parent night. • If desired you can have each group just do a page. • Closure: After performances—have the students do the checklist for student participation in Readers Theater. This could be done prior to the “big performance” before parents or another class.

GRADE 3—Support Materials and Expanded Plan

Powerhouse Field Trip: Electricity and Magnetism

Twin Rivers Unified School District

THEME: Electricity is one of the forces in nature.

BIG IDEAS:

- Electricity and magnetism have a special relationship.
- Electricity is the flow of electrons jumping from one atom to the next.
- Magnets can create electricity by pulling them from one atom to jump to another.

ESSENTIAL QUESTIONS:

- How is electricity made?
- What is needed to make an electrical circuit?
- What is the relationship between magnetism and electricity?

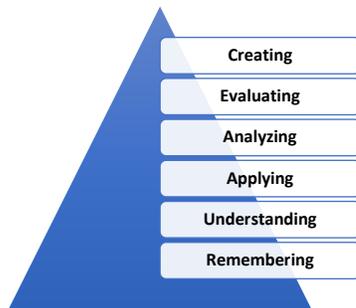
CULTURAL / LINGUISTIC RESPONSIVE STRATEGY:

Respect: Students will use respectful listening and collaborative skills as they work together in groups to perform the Readers Theater script.

Responsibility: Students will be responsible for their contributions to the group process in the performance.

Bloom’s Taxonomy Chart

Students will be involved with creating, analyzing, applying, understanding, and remembering activities.



DEPTH OF KNOWLEDGE (DOK)

The DOK levels are indicated for each lesson in this unit in the student learning goal chart.

SUMMARY: The extension lesson comprises of a PowerPoint and a Ms. Frizzle Readers Theater script. The lesson is designed to reinforce the learning from the field trip to Power House Museum. Readers Theater will provide opportunities to reinforce vocabulary and reading comprehension. Significant research has shown direct impact between participation (not once but over a few times) in Readers Theater and increased student reading fluency, reading prosody, and reading comprehension.

STANDARDS ADDRESSED:

Content Areas	Standards
New Generation Science Standards	<i>Motions and Stability: Forces and Interactions</i> 3-PS2-3. Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
Common Core-English Language Arts	Reading Standards Reading Standards for Informational Text <i>Key Ideas and Details</i> 1. Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. 3. Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect <i>Craft and Structure</i> 4. Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. (See grade 3 Language standards 4–6 for additional expectations.) CA Speaking and Listening Standards a. Engage effectively in a range of collaborative discussions.
Theater	Envision and Conceptualize 1.1.3 a. Create roles, imagined worlds, and improvised stories in a drama/Theater work c. Collaborate to determine how characters might move and speak to support the story and given circumstances in drama/Theater Rehearse 3.1.3

	<p>b. Participate and contribute to physical and vocal exploration in an improvised or scripted drama/Theater work.</p> <p>Performing 4.1.3</p> <p>b. Investigate how movement and voice are incorporated into drama/Theater work.</p> <p>Prepare 5.1.3</p> <p>a. Participate in a variety of physical, vocal, and cognitive exercises that can be used in a group setting for drama/Theater work.</p> <p>Share Present 6.1.3</p> <p>a. Practice drama/Theater work and share reflections individually and in small groups.</p> <p>Reflect RE 7.1.3</p> <p>a. Understand why artistic choices are made in a drama/Theater work.</p>
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STUDENT LEARNING GOALS with DOK Levels:

Subject Focus	Informational Knowledge	Skills & Processes Knowledge
Science	<ul style="list-style-type: none"> • Students will learn about the structure of the atoms. • Students will learn about the role electrons play in electrical current. (Level 1) 	<ul style="list-style-type: none"> • Students will be able to articulate how electricity is created. • Students will be able to explain how magnetism and electricity are connected. (Levels 2-3)
ELA	<ul style="list-style-type: none"> • Students will learn how to read informational text. • Students will learn and be able to apply the new vocabulary. (Level 1-3) 	<ul style="list-style-type: none"> • Students will be able to read with prosody and fluency. Prosody requires understanding and interpreting the text. (Level 4) •
VAPA	<ul style="list-style-type: none"> • Students will learn and apply performance techniques for Readers Theater. (Level 1-4) 	<ul style="list-style-type: none"> • Students will be able to understand and interpret the text through voice and facial gestures creating a dramatic performance. (Level 4) • Students will rehearse with their group and show ability to work cooperatively to produce a performance. (Level 3-4)

PRIOR KNOWLEDGE:

Students should have the ability to read aloud and track text while another person is reading.

CHECK FOR UNDERSTANDING STRATEGY

- K-W-L
- White Boards – Brainstorm Ideas
- Choral Response

LESSON MATERIALS:

- Ms. Frizzle Script for every student
- Yellow highlighters
- Performers might put their script in black folder (this is a performance standard for Readers Theater)
- If available-stools and music stands. This helps with the performance but is not necessary.
- NO costumes are necessary. Readers Theater is designed to have the audience create the story in their minds. It is theater of the imagination.

LESSON VOCABULARY:

Readers Theater: Readers Theater is the presentation of a written work in a script form with actors reading parts.

Back to Audience: Back to Audience is how the actors can show that this character is not on stage by turning his/her back to the audience.

Voice: Voice in drama is the pitch, tone, pace and projection of the actor which is used to create the character.

Electron: Electron is part of the atom with a negative charge and it is the primary carrier of electricity in solids.

Atom: The basic unit of everything is an atom.

Electric Current: An electric current is the flow of electric charge.

Generator (generate): A generator is a machine that converts energy into electricity.

Conductor: A conductor is a material that electric current can flow easily.

Insulator: An insulator is resistant to an electric current.

Character: Character is the personality that is created by the actor.

LESSON SEQUENCE:

Session 1:INTRODUCTION: Review Electricity Concepts

This could be done prior to the field trip or as a review after the trip.

The PowerPoint has several slides to review concepts that are in the Readers Theater script.

Session Sequence:

1. Review scientific vocabulary with students. Students can make illustrated vocabulary cards or you can use any method you regularly use with your students.
2. Show one of the suggested videos or one of your choice, this one is short but reviews all the concepts in a fun animated way. <https://youtu.be/CLuPNThw0RE> A 30-year-old classic from School House Rock, and still great.
3. List everything in the classroom that uses electricity. Talk about the importance of electricity in our lives today.

Session 2: Introduction to Readers Theater

Readers Theater is a great instructional strategy that engages students in reading. Research has proven that using Readers Theater in repeated sessions has a dramatic impact on reading fluency and prosody as well as reading comprehension. Students when performing the script have to internalize the underlying meaning and emotion of the text. In addition, unlike “popcorn” classroom reading, students are driven by the performance aspect and are willing to do close reads and repeated reading because they have an authentic reason for those activities.

Session Sequence: (There is an instructional sequence for Readers Theater included in the PowerPoint for your use if you wish.)

1. Show the PowerPoint and explain what Readers Theater is. Pass out the scripts.
Depending on your students—you can either put them in performance groups or you can read the script out loud. If you read, then students can follow to hear the script. You can stop and do vocabulary instruction or clarification as needed.
2. Assign roles. Depending on your class size there might be 2-3 “acting troupes”. You could assign a couple of roles to one student so you have all students participating.
3. Some classrooms have the students break into their group and work. Other teachers like to do a whole class read through and highlight then. In a whole class read through, group like roles together. (For example: all the Ms. Frizzle’s sit together.)
4. As you read through the script, students will highlight their parts. Note that during practice time, your slower readers will hear all the words numerous times and have to track the script waiting for their lines.
5. Talk with all the students as you do the read through, about vocal quality. Point out lines that students need to infuse the reading with the emotion of the scene.

6. The student acting troupes then rehearse together. They will need time to do several read through opportunities as well as chance to walk through the actual staging.
7. If time, each troupe could perform and students could point out performance aspects they particularly liked and then offer suggestions to make performance better.
8. Then each troupe could perform for another grade level or parent event.

SUGGESTION: If you feel that entire script is too long for practice times. You might consider dividing the script into 2 or 3 parts, each acting troupes those 3-4 pages. This will shorten down rehearsal time and so forth.

Performance Tips: (For Audience Behavior see Audience Lesson Plan)

Readers Theater has even been performed on Broadway. As a theatrical form, it has certain conventions that you can share with your students.

1. Readers Theater is the Theater of imagination. The actors create the characters and scene through their voice and facial expressions. The actors do very little moving—some gestures, but they do not leave their assigned spot. Sometimes a hat, scarf or small prop is used, but often there are no props making Readers Theater very useful for the classroom.
2. The actors line up on the open stage, which is often the front of a classroom or a large room. Actors can be standing or sitting on chairs. The optimum set up, if available, is a collection of stools and music stands. The stools are better than chairs because the actors are more higher and more visible to the audience. Music stands hold the scripts and allow for hand gestures.
3. You will notice not only are there characters but there are narrators. These narrators serve a very important role, they read much of the 3rd person text. This text is not randomly assigned. A narrator is “assigned” to a character. So, notice in the script, Narrator 1 is Ms. Frizzle’s narrator. That person reads things relative to that character. Often time poor readers confuse pronouns in the narrative text and are confused who is doing what, this reading strategy can help them track the reading.
4. Since all the actors are on “stage”, a device is needed to show the audience that a character is not on stage at a point in the script. Readers Theater uses the device of Back-to-Audience. The offstage character turns his back to audience. This signals to the

audience that individual is not there yet. Dottie, for example, is not on stage at the beginning of the play.

Extensions

While props are not necessary for the performance, you might have each group create a model of an atom or other charts to explain the scientific concepts.

ASSESSMENT:

ASSESSMENT STRATEGY

Vocabulary test

Teacher Observation of Performance and student discussion

Student Self-Assessment

ASSESSMENT TOOLS

Student Self-Assessment in the appendix.

RESOURCES: (websites, videos, books, etc.)

Videos:

Electricity:

<https://youtu.be/CLuPNThw0RE> A 30-year-old classic from School House Rock, and still great.

<https://youtu.be/sOP3xKLNJZo> A family lecture at MIT. Very complete, but it is long, so might use in small doses or as a teacher resource.

<https://youtu.be/R1RMV5qhwyE> An animated film on what is an atom.

Appendix: Worksheets, graphic organizers, etc.

Name:

**Student Check List For
Readers Theater Participation**

Readers Theater Participation	I think I could improve	I did a good job.
I practiced reading my part several times.		
I worked with my group to do our best performance.		
I made my voice change to more like the character in the story.		
I projected my voice so the audience could hear me.		
I was a responsible group member.		
I learned about magnetism and electricity and can use my new vocabulary.		

The best part of my performance was when I did....

The part I would like to improve is.....

The Magic School Bus and the Electric Field Trip
By Joanna Cole & Bruce Degen
Adapted to Readers Theater for Educational Purposes

Cast:

Ms. Frizzle

Arnold

Dottie Frizzle

Keesha

Ralphie

Wanda

Carlos

Narrator 1 for Ms. Frizzle

Narrator 2 for Arnold, Ralphie and Carlos

Narrator 3 for Keesha, Wanda, and Dottie

Staging Directions:

Students can sit on stools or stand. If stools are available have the characters sit on stools and narrators stand. Actors can stand in this fashion facing the class.

Scripts can be placed in a black folder.

Have students highlight their parts so they can track the play easily. When not on “stage”, the actor will stand with their back to the audience. An example of this is Dottie, who appears after short introduction. Actors can pantomime small movements, but do not move around the stage. They can use their voice to indicate the emotion of the scene. You could have one prop a model of an atom for Ms. Frizzle to use to clarify the science. This script could be divided in half, with one group doing the first half and the

second the last half. Students love performing, so consider having them perform for other classrooms or parents. The practice time with give authentic re-reading time and let students work on dramatic delivery. How the lines are said—is part of the comprehension of the text.

Please refer to the original book for more science and more parts of the story, this version was abridged for classroom purposes.

Arrangement on stage of actors and Narrators.

Narr.3, Carlos, Arnold, Ralphie, Narr. 2, Wanda, Keesha, Dottie, Ms. Frizzle, Narr. 1

SCRIPT

Narrator 1: It looked like rain on the day Ms. Frizzle decided to teach our class about electricity. She gave us books, she showed us videos, and she helped us do experiments.

Ms. Frizzle: Class, electricity is one of the strongest forces in our lives.

Arnold: Ms. Frizzle is the strongest force in my life.

Ms. Frizzle: Electricity is useful but it can be dangerous. It can hurt you or even kill you! So be careful around electricity.

Narrator 1: As usual the Friz was excited about science.

Carlos: There is no one like Ms. Frizzle

Wanda: She is definitely one-of-a-kind.

Keesha: So is her dress.

Narrator 1: Every once in a while, Ms. Frizzle

Ms. Frizzle: looked out the window and murmured, she should be here any minute.

Keesha and Wanda: Who should be here?

Narrator 3: we wondered, as we made a list of everything in our classroom that uses electricity.

Arnold, Ralphie and Carlos: Lights, computers, CD player, bell, fan ...

Arnold: Everything is made of atoms, the air, the book you are reading, the floor and even your own body all of these are made of atoms.

Wanda: It would take more than a million atoms to stretch across the width of one human hair.

Narrator 3: Just then a red-haired girl cartwheeled into the room.

Dottie: Hello, Aunt Valerie

Narrator 3: said the girl,

Dottie: kissing Ms. Frizzle on the cheek. (blow a kiss in direction of Ms. Frizzle)

Ms. Frizzle: My niece, Dottie Frizzle is visiting today

Narrator 1: said the Friz.

Ms. Frizzle: Dottie we're learning about electricity.

Dottie: Ooh! I just love electricity!

Ms. Frizzle: First we have to learn about atoms.

Dottie: Oooh! I just love atoms.

Narrator 3: Dottie seemed excited about science, just like the Friz.

Narrator 1: Ms. Frizzle took out a pointer and said

Ms. Frizzle: Class to understand electricity, we must understand atoms. Here is a giant model of an atom. (You could use a large poster of a model of an atom)

Narrator 1: She pointed to the outer part of the atom model.

Ms. Frizzle: these tiny parts of the atom are called electrons. Electrons move around the nucleus or center of the atom.

Dottie: Oooh! I love electrons!

Arnold: Two Frizzles! It just isn't fair!

Ms. Frizzle: Most of the time, electrons stay with their own atoms. But sometimes electrons get pulled away. They leave one atom and jump to the next. They make a stream that runs from atom to atom. This stream is called electric current.

Ralphie: Electric current runs from the wall outlet through the plug

Keesha: through the wire and into the fan's motor

Carlos: and that's what makes the fan work.

Wanda: Yeah, that's where the word current comes from. It means "to run". Electrons run through the wire.

Narrator 2: Outside, the sky got darker and darker by the minute, and big raindrops started plopping down.

Narrator 1: Ms. Frizzle picked up a roll of electrical wire.

Ms. Frizzle: I am peeling off some of the plastic insulation to show you the copper wire inside. The metal wire makes a path for the electrons. The plastic covering keeps them in the wire ---and away from us.

Dottie: Wow! It's a super highway for electrons.!

Carlos: Did you know that current runs through some materials easily Why? Because their electrons are loosely bound. They travel easily from atom to atom.

Arnold: Yes, some good paths are metals, acids and water.

Wanda: other materials are good blockers because their electrons are tightly bound. It's hard for them to run.

Ralphie: some good blockers are plastic, rubber, wood, glass and air.

Narrator 1: Frizzie said that

Ms. Frizzle: one way to make electric current is to move a magnet near a wire.

Electricity has a special relationship with magnetism. Magnetism can make electricity.

Wanda: We wrapped 6 feet of thin copper wire around a bar magnet and attached the wire to a meter.

Ralphie: you mean just moving a magnet near a wire makes electrons travel?

Ms. Frizzle: Yes, Ralphie, but we must have an unbroken circuit or circle of wire.

Keesha: If the circuit is broken, the needle on the meter won't move.

Narrator 2: We made a tiny power plant in our classroom.

Arnold, Ralphie, and Carlos: We were making electric current!

Keesha, Wanda and Dottie: Our mini-power plant can move one little needle.

Ms. Frizzle: but the city power plant sends enough electricity for our whole town.

Narrator 2: Just then, lightning flashed and thunder cracked outside. (if you wish you could hit a pan or drum lid to make a thunder sound) The lights in our room flickered and went out.

Keesha: There's no electricity!

Ms. Frizzle: We're experiencing a blackout.

Arnold: We're not going to stay here in the dark, are we?

Ms. Frizzle: Let's find out what happened. To the bus everyone!

Dottie: Oooh! I love buses.

Narrator 3: Soon we were riding on the old school bus, trying to find out what had caused the blackout. It wasn't long before we saw the problem.

Narrator 2: The lightning had hit a tree and knocked it down. The falling tree had broken the power line.

Carlos, Wanda, Keesha: Sparks were flying everywhere!!!

Arnold: Electrons can't run to our school because the pathway is broken.

Ralphie: Where are those electrons when you need them?

Carlos, Wanda, Keesha: Help! Let's get out of here!

Ms. Frizzle: It's smart to be afraid of a downed power line children.

Dottie: I must be extra smart!!

Ms. Frizzle: Stay away from a downed power line, it could kill you!

Narrator 1: The Friz didn't waste a minute. She made a U-turn and drove away.

Ms. Frizzle: Inside those building is the equipment that makes electricity.

Dottie: Oooh, let's visit the power plant now.

Ms. Frizzle: What a wonderful idea, Dottie. First the power plant burns coal or gas to make heat. The heat turns water into steam. The steam pushes a turbine. So here we go into the turbine.

Narrator 2: The turbine had blades like a fan. The steam pushed on the blades and the turbine spun around.

Narrator 3: We spun around the shaft and slid along to the next part of the power plant.

Ms. Frizzle: Let's go look at what all this spinning is used for.

Carlos, Wanda, Keesha, Dottie, Arnold, Ralphie: We were too dizzy to reply. (rocking your head like you are spinning.)

Narrator 2: The shaft led us to the generator—the part of the plant that actually makes electricity.

Arnold: Almost all power plants use magnets. Without magnetism, we could not make large amounts of electricity.

Narrator 3: This generator was really big, but it worked just like the little one we had made in school! On the outside were coils of wire. On the inside was a magnet.

Narrator 1: The shaft turned the magnet and the moving magnet made electric current run in the wire. Then the current flowed into a power line or large wire leading out of the plant.

Ms. Frizzle: Next we'll observe what all this electricity is use for...

Narrator 2: Suddenly we began to get smaller and smaller and smaller until we could fit inside the power line.

Ms. Frizzle: Class we are leaving the power plant by high voltage wire.

Dottie: Oooh! I love high voltage!

Arnold: I've always thought of myself as a low-voltage kind of person.

Keesha: Volts measure the push of the electric current. The higher the voltage the more pressure there is to push the current through the wire.

Narrator 3: We got even smaller. Now we could fit between the spaces in the wire. Electrons were jumping all around us, making current.

Carlos: Does each electron run the whole from the power plant to my house?

Ms. Frizzle: No! It jumps only to the next atom. Each electron moves forward only one atom but the current flows along the wire.

Narrator 2: We followed the Friz from the power plant through the lines toward our town, dodging electrons as we went. (Actors move back and forth like dodging the electrons)

Wanda: Look at all the electrons in here!

Ralphie: And look how fast they're moving.

Dottie: Ooh! I love fast.

Arnold: Not this fast!

Narrator1: On the way, we passed through transformers, devices that made the voltage in the wire higher or lower. Higher voltage helps the current travel the long distances from the plant to the cities. Lower voltages are using in factories and even lower in our homes.

Keesha: Where are we going?

Ms. Frizzle: We're on our way to a lightbulb.

Wanda: Why is Ms. Frizzle taking us to a lightbulb?

Carlos: Because she doesn't want to go to a heavy bulb. Get it! Ha Ha

All other actors: Groan.

Narrator 1: We were moving down the power line when Ms. Frizzle said

Ms. Frizzle: Here we are.

Narrator 3: we followed her through the wires and into a lamp.

Wanda: We're going right into a lightbulb.

Narrator 2: Inside the bulb, we squeezed into a very, very, very thick wire, the filament.

Ms. Frizzle: the filament makes the bulb light up.

Narrator 1: Billions and billions of electrons were pushing through the thin filament all at once. That made the filament get white hot. When something is white hot, it glows with light.

Dottie: Oooh! This tiny filament makes a big light.

Narrator 3: We scarcely had time to put our sunglasses on and we were in and out of the bulb and on our way. We came to Keesha's house. Her grandmother was using a power saw to make her a bookcase.

Ms. Frizzle: Oh good. This gives us a chance to see how the saw is driven by an electric motor. The motor has magnets inside. Remember how we made electric current with a magnet? Well it works the other way, too. Electric current can turn a piece of metal into a magnet. This kind of magnet is called an electromagnet. Electromagnets are what make the motor run.

Dottie: Oooh! I find magnets so attractive!

Arnold: Maybe if you are a paper clip.

Ms. Frizzle: Follow me up the wires into that vacuum cleaner that your Grandpa is using.

Narrator 3: We were going to leave, but Grandpa turned off the vacuum cleaner.

Wanda: It's time to go.

Ralphie: Forget it No one is going anywhere, not even Ms. Frizzle.

Keesha: Now that's a switch.

Ms. Frizzle: Which you switch something to OFF, the switch pulls the metal pieces apart. The electrons cannot flow, and the appliance shuts down.

All the students (loudly and with scared voices): OH NO!!! we were stuck in a vacuum cleaner!! Save us Grandpa!!

Narrator 2: Just then the puppy ran in with dirty feet and Grandpa got up to vacuum the rug.

Narrator 1: Quick we jumped down the wires and back along the power lines back to the school.

Narrator 3: We flowed through an outlet and into a wire of a floor waxing machine. The next thing we knew we were popping out of a hole in the wire's insulation.

Narrator 2: As soon as we had grown back to our regular size, Ms. Frizzle led us back to the classroom.

Ms. Frizzle: Mr. Johnson, you'd better repair that frayed insulation on the power cord to your waxer. You might get shocked!

Dottie: Frayed So!

All the other students: Groan.

Narrator 3: It had been some day. We gone through wire and had close encounters with subatomic particles. Now everything was back to normal in our class, Except Ms. Frizzle of course.

Dottie: I'll be running along now. Thanks for the trip. It was electrifying!

All the actors and narrators: THE END!