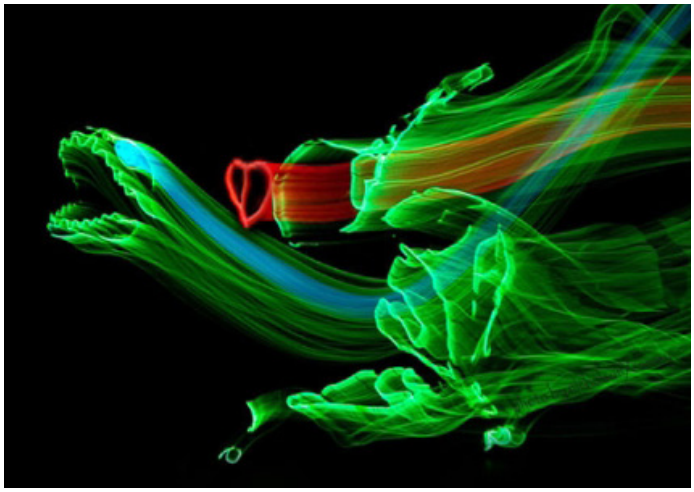
Teacher Resource Guide: DiNO-Light



The lessons and activities in this guide are driven by the Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects (2010) which help ensure that all students are college and career ready in literacy no later than the end of high school. The College and Career Readiness (CCR) Standards in Reading, Writing, Speaking and Listening, and Language define general, cross-disciplinary literacy expectations that must be met for students to be prepared to enter college and workforce training programs ready to succeed.

21st century skills of creativity, critical thinking and collaboration are embedded in the process of bringing the page to the stage. Seeing live theater encourages students to read, develop critical and creative thinking and be curious about the world around them.

This Teacher Resource Guide includes background information, questions, and activities that can stand alone or work as building blocks toward the creation of a complete unit of classroom work.

Community engagement and education programs at PlayhouseSquare are made possible by the generous support of foundations, corporations and donors.

cuyahoga arts & culture

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The following is a partial list of the Ohio Revised Science Standards and Model Curriculum, Grades K through Eight (2011), that align with the performances, lesson and activities found in the Teacher Resource Guide

Pre-K to 4:
Science Inquiry and Application During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Observe and ask questions about the natural environment;
- Plan and conduct simple investigations;
- Employ simple equipment and tools to gather data and extend the senses;

- Use appropriate mathematics with data to construct reasonable explanations;
- Communicate about observations, investigations and explanations; and
- Review and ask questions about the observations and explanations of others.

Grade 3 Physical Science (PS) Topic: Matter and Forms of Energy
This topic focuses on the relationship between matter and energy. Matter has specific properties and is found in all substances on Earth. Heat is a familiar form of energy that can change the states of matter.

Content Statement
Heat, electrical energy, light, sound and magnetic energy are forms of energy. There are many different forms of energy. Energy is the ability to cause motion or create change.

Content Elaboration
Grade 3 Concepts:
Examples of energy causing motion or creating change include a falling rock causing a crater to form on the ground, heating water causing water to change into a gas, light energy from the sun contributing to plant growth, electricity causing the blades of a fan to move, electrically charged objects causing movement in uncharged objects or other electrically charged objects, sound from a drum causing rice sitting on the drum to vibrate, and magnets causing other magnets and some metal objects to move.

Grade 4 Physical Science (PS) Topic: Electricity, Heat and Matter
This topic focuses on the conservation of matter and the processes of energy transfer and transformation, especially as they apply to heat and electrical energy.

Content Statement
Energy can be transformed from one form to another or can be transferred from one location to another. Energy transfers from hot objects to cold objects as heat, resulting in a temperature change. Electric circuits require a complete loop of conducting materials through which an electrical energy can be transferred. Electrical energy in circuits can be transformed to other forms of energy, including light, heat, sound and motion. Electricity and magnetism are closely related.

Grade 4 Concepts:
The addition of heat may increase the temperature of an object. The removal of heat may decrease the temperature of an object. There are materials in which the entire object becomes hot when one part of the object is heated (e.g., in a metal pan, heat flows through the pan on the stove transferring the heat from the burner outside the pan to the food in the pan). There are other objects in which parts of the object remain cool even when another part of the object is heated (e.g., in a Styrofoam® cup, very little of the warmth from hot liquid inside the cup is transferred to the hand holding the cup).

Electrical conductors are materials through which electricity can flow easily. Electricity introduced to one part of the object spreads to other parts of the object (e.g., copper wire is an electrical conductor because electricity flows through the wires in a lamp from the outlet to the light bulb and back to the outlet).

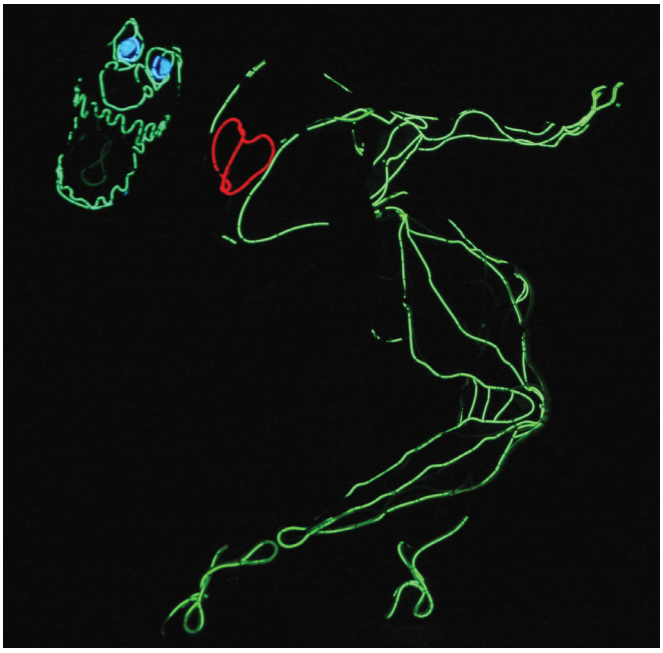
Electrical insulators are materials through which electricity cannot flow easily. Electricity introduced to one part of the object does not spread to other parts of the object (e.g., rubber surrounding a copper wire is an electrical insulator because electricity does not flow through the rubber to the hand holding it).

Electrical conductivity must be explored through testing common materials to determine their conductive properties.

Grade 5-8:
Science Inquiry and Application During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:
- Identify questions that can be answered through scientific investigations;
- Design and conduct a scientific investigation;
- Use appropriate mathematics, tools and techniques to gather data and information;
- Analyze and interpret data;
- Develop descriptions, models, explanations and predictions;
- Think critically and logically to connect evidence and explanations;
- Recognize and analyze alternative explanations and predictions; and
- Communicate scientific procedures and explanations.

ABOUT THE SHOW

This heart-warming original story features a friendly dinosaur named *DiNO-Light* who wanders away from home and discovers a world of creatures that light up the darkness and help him find the true meaning of love. Unique and visually dazzling, *DiNO-Light* has been praised for its cutting-edge blend of puppetry, technology and dance by audiences all over the world.



ABOUT THE CREATORS

Corbian Visual Arts and Dance

The show's creators Ian Carney and Corbin Popp met while dancing in Twyla Tharp's Broadway show *Movin' Out*. Becoming fast friends through their mutual love of art, theater and technology, Corbin showed Ian a product called EL wire and their creative partnership took off.

EL wire is electroluminescent wire powered by batteries and is used mostly to illuminate walkways, signs and instrument panels on cars. Carney and Popp quickly built rudimentary characters. Then, with the help of their wives, Eleanor Carney and Whitney Popp (who are also dancers), they began to build the rest of their puppetry-based creatures. Their first performance work, *Darwin*, was the recipient of the prestigious Jim Henson Foundation Grant.

"... an eye-popping display of storytelling that's like nothing else you've ever seen... Corbian Visual Arts and Dance is a force to be reckoned with" – Broadwayworld.com

Lightwire Theater

Ian and Eleanor Carney founded Lightwire Theater and, in conjunction with Corbian Visual Arts and Dance, began pre-production on their first project in January 2011. Using Corbian's signature electroluminescent puppetry, Lightwire Theater has adapted two classic tales for the stage: *The Ugly Duckling and The Tortoise & the Hare.*

Building and Understanding the Characters:

Each character in the *DiNO-Light* story is built from a framework of struts and joints covered with black cloth and then lined with EL wire. The wire is attached to a battery pack that the actors wear and operate and the wire glows when current is run through it. The building process requires knowledge of both art and technology.

The designers had to solve problems such as how to make a hinge joint that does not stress the light wire, or a battery pack that is powerful but not too heavy for the actors to wear while moving. Some of the characters like the dinosaurs or birds consist of costumes that the actors wear; others like the fish and the flowers are puppets that are manipulated by the actors. There are also many props that the actors manipulate such as the staff, the book, the bone and the heart.

The Choreography

The story of *DiNO-Light* is told through movement, gestures and images much like a ballet. Many of the scenes are carefully choreographed to convey specific meaning; there are also scenes whose main purpose is to entertain the audience and make them laugh.

The choreographers are working with three specific parameters that are defined by the nature of the puppets. **First**, the effect of the light against a black background creates a two dimensional effect. **Second**, the actors have to try to remain invisible, this means that one actor cannot pass in front of another otherwise they will be back-lit and their bodies will show. **Last**, the puppets or costumes themselves have physical limitations in how they can move, for example the legs on the dinosaurs and birds can only move in parallel lines, that is the feet must face forward at all times.

Puppetry

Puppetry is an ancient art form that exists in many different cultures. Puppets are used in storytelling to convey simple, clear meaning about universal themes such as love, friendship or discovery. Some examples of different kinds of puppets are shadow puppets, hand puppets, a ventriloquist's dummy, marionettes or the creatures made from light wire in the *DiNO-Light* show.

Building a puppet can be considered a visual art while a puppet performance is part of the theater arts. In DiNO-Light, instead of using dialogue, the actors use a musical score to enhance the atmosphere of the story and the show is choreographed using movement and gesture like a dance piece. All the different art forms are equally important in telling the story of *DiNO-Light*.

Did You Know?

- The show runs on approximately 250 AA and 9v batteries.
- Many of the batteries come from Broadway shows that only use their batteries for one performance.
- You will see approximately 2,000 feet of EL wire during the performance.
- It took 4 YEARS to bring this show to life!
- A skateboard, trucks, super balls, shin–guards and paint poles are just some common household items and toys used in the costumes!

What will you find backstage at the DiNO-Light performance?

Hot glue guns, solder iron, zip ties, battery tester, spare battery packs, backups, a battery recycle box, and bike racks to hold the creatures!

COMING TO **THE THEATER!**

PlayhouseSquare is an exciting venue to see live theater! As the country's largest performing arts center outside of New York, the not-for-profit performing arts center utilizes the arts to engage individuals and attract more than one million guests per year to 1,000+ annual events. PlayhouseSquare thus acts as a catalyst for economic growth and vitality within the region.

As audience members, you and your students play a vital role in the success of the performances. You are part of a community that creates the theater experience. For many students, this may be their first time viewing a live theater production. We encourage teachers to discuss some of the differences between watching a television show, attending a sporting event or viewing a movie at the cinema. Here are a few examples to start the discussion:

- Students are led into the theater and seated by an usher.
- Theaters are built to magnify sound. Even the slightest whisper can be heard throughout the theater. Remember that not only can those around you hear you; the performers can too.
- Appropriate responses such as laughing or applauding are appreciated. Pay attention to the artists on stage; they will let you know what is appropriate.
- There is no food, drink, or gum permitted in the theater.
- Photography and videotaping of performances is not permitted.
- When the houselights dim, the performance is about to begin. Please turn your attention toward the stage.
- After the performance, you will be dismissed by bus number. Check around your seat to make sure you have all of your personal belongings.

PRE-SHOW ACTIVITIES

Technology Twist

Kindergarten
Physical Science (PS)
Topic: Properties of Everyday Objects and Materials
This topic focuses on the production of sound and on observing, exploring, describing and comparing the properties of objects and materials with which the student is familiar.
Content Statement
Objects and materials can be sorted and described by their properties.

Grade 3
Physical Science (PS)
Topic: Matter and Forms of Energy
This topic focuses on the relationship between matter and energy. Matter has specific properties and is found in all substances on Earth. Heat is a familiar form of energy that can change the states of matter.
Content Statement
Heat, electrical energy, light, sound and magnetic energy are forms of energy.

Grade 5
Physical Science (PS)
Topic: Light, Sound and Motion
This topic focuses on the forces that affect motion. This includes the relationship between the change in speed of an object, the amount of force applied and the mass of the object. Light and sound are explored as forms of energy that move in predictable ways, depending on the matter through which they move.
Content Statement
Light and sound are forms of energy that behave in predictable ways.

Corbian Visual Arts and Dance, along with Lightwire Theater, have created an original story for children with a technological twist!

Students will identify characteristics of EL wire puppets and discover applications of technology.

MATERIALS:

- Computer with internet access
- "Creating the Show" handout
- Overhead or Smartboard

1. To build interest and excitement, begin a discussion about puppets. Ask students to identify the characteristics of a puppet.
2. Tell students you've discovered a different puppet form that you would like to share with them. Go to http://lightwiretheater.com/gallery/videos and click the video entitled "Darwin – Behind the Video."
3. Have students watch the video with the purpose of observing the puppets in action. Do not provide an explanation regarding the EL wire.
4. Ask students to identify the characteristics of the puppets they observed on the video. What did they notice?
5. Using an overhead or Smartboard, share the "Creating the Show" handout found on the next page. Explain each step and allow students to ask questions. Have they ever seen something similar to EL wire? If so, where? What else do they want to know about the technology?
6. Finally, explain they will see this form of puppetry during the performance at PlayhouseSquare!

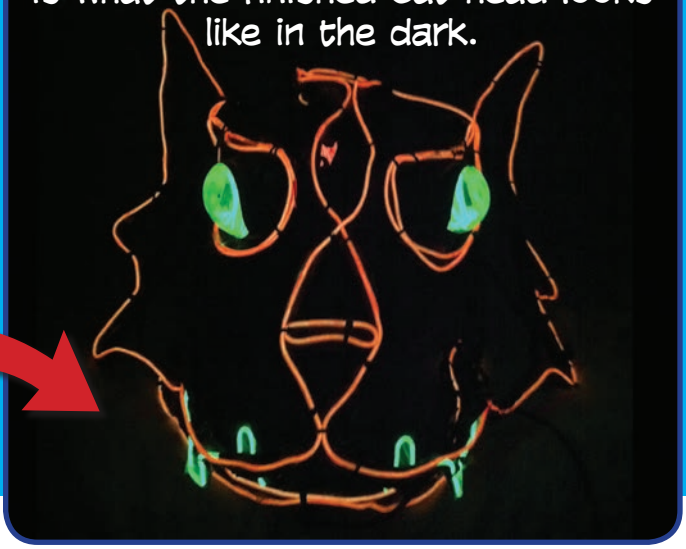
CREATING THE SHOW

First they drew what they wanted the animal to look like.

Then they made the puppet with a helmet and aluminum wire.

Then they put it on and started to rehearse.

Finally, they added the EL wire and a power pack, turned it on and this is what the finished cat head looks like in the dark.



What kind of animal would you want to make a puppet of?

Draw a picture of your animal here →

FAST FACTS:

- EL wire stands for Electroluminescent wire.
- EL wire looks like neon but has the flexibility and versatility of wire.
- EL wire does not emit heat.
- Electroluminescence emits light in response to the passage of an electric current to a strong electric field. The display lights of a car's instrument panel are an example of electroluminescence.
- Electroluminescence is different than chemiluminescence. Examples of chemiluminescense include luminol tests and glow sticks.

IMPROVISATION FOR THE CLASSROOM

Machine

This is a great game that gives the kids a chance to express themselves creatively both physically and vocally. A leader begins by making some sort of noise and motion repeatedly (such as pushing their hand forward and honking), and participants join in one at a time, interacting with those already in play to create a human machine that moves and makes sound. This game can be used to encourage members to leave their inhibitions behind and collaborate in a silly game. This game is also useful in learning to play with different height levels, collaborating with other members and repeating a motion/sound over and over. For more advanced/older kids, the machine can be made to actually accomplish a task, such as making a pizza.

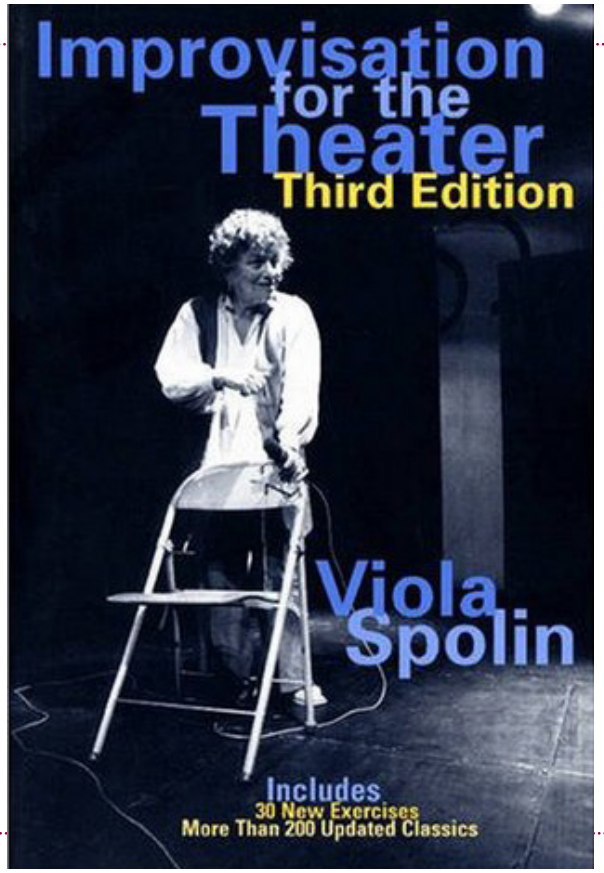
Variations

Tell the players the machine goes into overdrive, until it explodes. Or tell the players the power`s out, and the machine slowly grinds to a halt.

Who Started the Motion?

This works on peripheral vision and ensemble playing. One player, deemed the "guesser," is sent outside the room and the others form a circle. The players in the circle elect one person to be the "initiator." That person starts some easy, repeatable motion and everyone else in the circle follows along. The guesser is brought back into the room and placed in the center of the circle. The initiator changes the motion every so often upon instruction from the "caller" (perhaps a teacher). The person in the center is given three tries to guess who the initiator is. It is up to the caller to make sure that the initiator changes motion frequently enough and that the guesser doesn't take too long between guesses. If everyone in the group stares at the initiator, the guesser will have no problem. The trick is to look at someone, who is looking at someone, who is looking at the initiator, who is in turn looking at someone else. The motion trickles outward from the initiator. It's up to the guesser to find the center of the pattern.

College and Career Readiness Anchor Standards for Speaking and Listening
Comprehension and Collaboration: 1



Viola Spolin (November 7, 1906 – November 22, 1994) was an important innovator of the American theater in the 20th century. She created directorial techniques to help actors to be focused in the present moment and to find choices improvisationally, as if in real life.

She later called these acting exercises "Theater Games" and formed the first body of work that enabled other directors and actors to create improvisational theater. Her book, "Improvisation for the Theater," which published these techniques, includes her philosophy, as well as her teaching and coaching methods, and is considered the "bible of improvisational theater."

Spolin's contributions were seminal to the improvisational theater movement in the U.S. She is considered to be the mother of improvisational theater. Her work has influenced American theater, television, and film by providing new tools and techniques that are now used by actors, directors, and writers.

POST-SHOW ACTIVITIES

Make Your Own Battery

How to Make a Homemade Flashlight

Please Read Carefully!

- All experiments use safe, low-voltage battery power. Household electrical current contains high voltage that could cause serious injury. DO NOT use household electrical current for any of these experiments. ALL experiments should be conducted under adult supervision.
- Carefully follow wiring instructions for each experiment. Improper wiring can result in battery leakage and/or rupture.
- DO NOT take a battery apart. Contact with internal battery material can cause injury.
- DO NOT dispose in fire, recharge, put in backwards, or mix with used or other battery types. This may cause batteries to explode, leak and cause personal injury.

http://www.wikihow.com/Make-a-Homemade-Flashlight - Quick_.26_Easy_Method

1. **Gather your supplies.** Clear an area to work in and invite the kids to come watch you manipulate electricity with your bare hands. You'll need:
   - An empty toilet paper roll (or lightweight cardboard rolled into a small tube)
   - 2 D batteries
   - Tape (electrical tape works well)
   - 5" (12.5 cm) long piece of wire (if you're using a speaker wire, use the copper kind)
   - 2.2 volt light bulb (different bulbs are an option, but it may or may not work as well. A bulb from a string of Christmas lights works quite effectively.)
2. **Tape the wire to the negative (–) end of one of the batteries.** Make sure it's snug and not going anywhere, or your light will end up flickering. You could use tin foil instead of wire, but it's a little less dependable and harder to work with.
3. **Tape the bottom of the toilet paper roll/cardboard well so that it is completely covered.** You don't want any light to sneak through, dissipating its strength -- that would be one poorly working flashlight. If you didn't have reason to use black electrical tape yet, now you do.
4. **Insert the battery, wired end first, into the toilet paper roll.** Even though the wired end is facing the taped bottom of the roll, the other end of the wire should be sticking out of the open end. If the wire isn't sticking out enough to come around the edge of the battery, you need to shorten your tube.
5. **Insert the next battery, negative side first.** Its negative side will meet the positive side of the battery, which is already inside. This connection continues the flow of electricity from back to front, ultimately lighting up your device.
6. **Tape the bulb to the top of the battery.** Be confident there's an adequate direct connection between the two surfaces (basically, make sure it's sturdy). Make sure you can still see the bottom half of the bulb.
7. **Light up your flashlight**. With the wire, touch the silver part of the bulb. If it doesn't light up after a few tries, check the tips below for troubleshooting. If it does function, now you have a working flashlight with an on/off feature.

Grade 4
Physical Science (PS)
Topic: Electricity, Heat and Matter
This topic focuses on the conservation of matter and the processes of energy transfer and transformation, especially as they apply to heat and electrical energy.
Content Statement
Energy can be transformed from one form to another or can be transferred from one location to another.

1.

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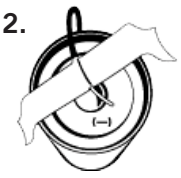
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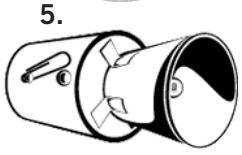

Making Light Bounce

http://www.education.com/science-fair/article/making-light-bounce/

Objective:
To demonstrate that light travels in straight lines. To experiment with reflecting light.

Research Questions:
- How does light travel?
- What happens to the path of light when it hits an object?
- How can light be reflected?

Light travels in a straight line. It continues in that straight line until it hits another object. The light then can be absorbed, refracted or reflected. A shiny object such as a mirror can be used to redirect light from its source to another location through reflection.

MATERIALS:

- 3 or more mirrors
- Flashlight (This should be a strong flashlight, like a MagLite)
- Book

Experimental Procedure:
1. Dim the lights in the room so that the light from your flashlight will show well during this experiment.
2. Set up a book on a table so that it's standing. Point your flashlight at the front side of the book. What happened to the beam of light? Draw an illustration.
3. Lean a mirror against the front of the book so that it's standing. Point the flashlight at the mirror and turn it on. What happened to the beam of light? Draw an illustration.
4. Have an adult or friend help you use 2-3 more mirrors to direct the flashlight beam to the backside of the book through reflection. Try many different ways to do this. Draw diagrams of each path you create to reflect the light to the back of the book.

Grade 3
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Topic: Matter and Forms of Energy
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Critical Response Questions

Students understand a performance more deeply by discussing what they enjoyed, observed and wondered about following the experience. Use the questions below to begin a conversation. Make note of students' interests and explore their ideas further.

1. What did you notice? (Describe without judgment: "I notice...") If judgment emerges, ask for evidence on which the judgment is based: What did you see that makes you say that?

2. What did it remind you of? How can you connect this work to your own life? (Examples may include a memory, music or other experience that this work triggers.) When students access and share their prior knowledge they build more connections to the work. (There are no wrong answers or associations.)

3. What emotions do you feel as you respond to this work? Describe feelings using one or two words. People tend to remember those things that they can connect to an emotion.

4. What questions did it raise for you? ("I wonder...")

5. What meaning or understanding was intended or conveyed in this work? What do you think was the artist's intent?

6. What did you find most interesting about the puppets? What else would you like to know about the puppets?

7. How did music help tell the story?

8. Why do you think the creators chose to use EL wire puppets to tell the story?

RESOURCES

Books

10-Minute Puppets Paperback by Noel MacNeal. Workman Publishing Company, 2010.

Dance Improvisations: Warm-Ups, Games and Choreographic Tasks by Justine Reeve. Human Kinetics; 1st edition, 2011.

Doodling with Jim Henson by Jim Henson. Walter Foster, 2011.

Jim Henson: The Works – The Art, the Magic, the Imagination by Christopher Finch. Random House; 1st edition, 1993.

Puppet Planet: The Most Amazing Puppet-Making Book in the Universe Paperback by John Kennedy. North Light Books, 2006.

The Everything Kids' Science Experiments Book: Boil Ice, Float Water, Measure Gravity-Challenge the World Around You! (The Everything® Kids Series) by Tom Robinson (Author). Adams Media Publishing, (2001).

The New York Public Library Amazing Scientists: A Book of Answers for Kids by The New York Public Library (Author) and Jim Callan (Author). Wiley Publishing (2001)

Web Resources

http://lightwiretheater.com/ Visit Corbian Visual Arts and Dance & Lightwire Theater's website to see how they use technology in their performances, meet the cast, and watch videos of their EL wire puppets in action!

http://www.storyarts.org Story Arts, Inc. is a non-profit organization which focuses on storytelling and the diverse ways that storytelling can enrich multi-cultural understanding, interpersonal communication, and literacy. The site includes activities and lesson plans based on storytelling in the classroom.

Software

Dinosaur Safari by Creative is designed to recreate the world that you would encounter if time travel really were possible. Instead of bringing the dinosaurs to the modern world, Dinosaur Safari takes you to the world of the dinosaurs. Developed in collaboration with designers and scientists from the Oregon Museum of Science and Industry, this multimedia adventure provides hours of enjoyment travelling through time, hunting dinosaurs and collecting their photos. Platform: Windows, Mac. Available on Amazon.com

Apps

Britannica Kids: Dinosaurs is an interactive reference guide with information on 35+ popular dinosaurs as well as articles about dinosaur environments and characteristics, theories about their extinction, and important archeological discoveries. In addition to text and photos, there are dinosaur-themed mini-games including a quiz, jigsaw puzzles and a "brush-off" game that simulates digging for dinosaur bones. Available for iPhone, iPod Touch, iPad. $4.99

Dinosaurs: American Museum of Natural History Collections Introducing the first official app from the American Museum of Natural History, *DINOSAURS: American Museum of Natural History Collections.* This FREE app lets paleontologists of all ages explore the Museum's famous fossil halls in depth. www.amnh.org/apps