Teacher Guidebook

DOKTOR KABOOM presenting THE SCIENCE OF SANTA and LIVE WIRE!

THE ELECTRICITY TOUR

Sponsored by Regions
For over 130 years Regions has been proud to be a part of the Middle Tennessee community, growing and thriving as our area has. From the opening of our doors on September 1, 1883, we have committed to this community and our customers.

One area that we are strongly committed to is the education of our students. We are proud to support TPAC’s Humanities Outreach in Tennessee Program. What an important sponsorship this is – reaching over 25,000 students and teachers – some students would never see a performing arts production without this program. Regions continues to reinforce its commitment to the communities it serves and in addition to supporting programs such as HOT, we have close to 200 associates teaching financial literacy in classrooms this year.

Thank you, teachers, for giving your students this wonderful opportunity. They will certainly enjoy the experience. You are creating memories of a lifetime, and Regions is proud to be able to help make this opportunity possible.

Jim Schmitz
Executive Vice President, Area Executive
Middle Tennessee Area
Welcome to the Wacky World of Doktor Kaboom!

*Doktor Kaboom* offers your students a riotous romp through the varied regions of science. Actor David Epley has created a fun and engaging character, but don’t be fooled by the spiky hair, goofy goggles, and extravagant German accent. Science is the real star of this show.

Rare indeed is the student that is not totally pumped up and energized about science after this hour long, one-man, scientific extravaganza. Utilizing catapult flung bananas, overflowing five foot high test tubes, eye-spinning optical illusions, and a smoke-ring blowing air cannon, Dr. Kaboom grabs students by their t-shirts boldly exclaiming, "Mein Gott! Science is fun!"

Your students will be so caught up in the fun and jokes, they might not even realize that they are learning along the way. There is real science going on under the surface of the show. *Doktor Kaboom* introduces concepts in physics, optics, and chemistry. Epley, in the guise of the crazy character he has created, promotes science safety and self-esteem. Above all, he encourages students to dive head first into their scientific studies.

TPAC Education Study Guide

*Doktor Kaboom: Live Wire and The Science of Santa!*

With thanks to Teaching Artist Neil Spencer and Dr. Kaboom

**Introduction:** Welcome to the Wacky World of Doktor Kaboom

Kaboom Vocabulary List

**Two Performances:** The Science of Santa and Live Wire!

Introducing The Science of Santa

Introducing Live Wire! The Electricity Tour

Scientists Are Fun- Dramatize your Science Projects!

Demonstrations for the Classroom

Photo by Martin Albert
The Science of Santa

Science and Magic are the same thing. Therefore, Santa Claus must be the greatest scientist alive. This realization does not sit well with the towering ego of science comedian, Doktor Kaboom. Join us as Kaboom struggles valiantly to solve the magical mysteries of the man in red. In this new holiday show, Doktor Kaboom attempts to learn the secrets behind making reindeer fly, getting down those tight chimneys, and knowing who’s been bad or good. Will he succeed?

LIVE WIRE!
The Electricity Tour
commissioned by the Kennedy Center

This show explores the nature of electricity. What is it? What does it do for us? Where does it come from? With Tesla Coils, Van de Graaf Generators, and a ping pong shooting robot, Doktor Kaboom explains everything from voltage and current, to charges, conservation of energy, and plasma.

Doktor Kaboom is the creation of Actor/Comedian David Epley

David has been fortunate enough to discover two passions in his life. Science, his first, took him to studies at the North Carolina School of Science and Mathematics. His second, performing, become his career, and for 20 years David has made his living writing, performing, and directing original interactive comedy across the US and Canada.

Since creating the character of Doktor Kaboom, science education has become David’s life, taking him to theaters, festivals, and schools all over the world. Recent performances of note include the John F. Kennedy Center, the Singapore Science Festival, and the World Science Festival.
**Doktor Kaboom Vocabulary**

**Chemical**: A substance with a distinct molecular composition that is produced by or used in a chemical process.

**Chemical Reaction**: occurs when two different elements or compounds come together and at least one of them changes its composition or identity.

**Exothermic**: chemical reactions that produce (or give off) heat.

**Experiment**: a scientific procedure undertaken to make a discovery or to test a hypothesis.

**Electrons, Protons (+), Neutrons (-)** are the basic parts of an atom.

**Atoms**: The building blocks of matter.

**Current**: the flow of electrons

**Voltage**: the pressure pushing electrons along an electrical current

**Theory**: a supposition or a system of ideas intended to explain something

**Van de Graaff Generator**: A Van de Graaff generator is a device for making lots of static electricity.

**Static electricity** is made from extra charges stored some place so that they can't move. Normally charges don't like to collect in one place. They like to find opposite charges as partners and run away from particles with the same charge. ([http://wonders.physics.wisc.edu/van-de-graaff.htm](http://wonders.physics.wisc.edu/van-de-graaff.htm))
The Science of Santa

*Doktor Kaboom will investigate and attempt to explain, with humor, safety and scientific demonstrations, three of the great mysteries of Santa:*

How does Santa go down the chimney?

How do the reindeer fly?

How does Santa know who is naughty and nice?

Before the performance, explore with your students:

1. What are their ideas about how Santa’s actions are accomplished? What kind of tools, machines, technology, or forces of nature could be used? Encourage students to use their imaginations (we won’t put these ideas to the test like Dr. Kaboom!)

2. What else do they wonder about how Santa gets his job done? For example, how does he land his sleigh so perfectly on small rooftops? Brainstorm possible theories as a class.

3. How would a scientist test those theories? We can’t observe Santa during the night, so how can we discover if our hypothesis would work? Older students can work in teams to discuss possible hypotheses, and share their theories and experiment ideas with the group.

4. Making observations and asking questions about how things work is an important part of a process called The Scientific Method.

5. Use one of the classroom demonstrations. Try varying part of the procedure to turn it into an experiment. (Or, just for fun, “Air Pressure with a Boiled Egg” is easy and impressive – could this be a possible solution for Santa in the chimney?)

After the Show - questions from Doktor Kaboom

1. What does Doktor Kaboom mean when he says science and magic are the same thing?

2. Do you think Doktor Kaboom got anything right about how Santa does what he does? Which ones? Why or why not?
Make a mini Hovercraft

Doktor Kaboom will investigate and attempt to create a type of hovercraft to explain how Santa’s sleigh flies. Use this activity to create a small hovercraft in your classroom!

You will need
* Old CDs or DVDs (Note: They will no longer be playable after this demo)
* Balloons, medium sized
* Pull spout bottle caps
* superglue

What to do
1. Glue the bottle lid over the hole of the CD. Make sure it is centered over the hole.
2. Make sure you can still open and close the lid.
3. Let it dry completely.
4. Attach the balloon to the opening of the lid. Push the stem of the balloon as far as you can down the bottle lid.
5. Open the bottle lid.
6. Blow air into the balloon through the hole in the CD.
7. Close the lid so the air cannot escape.
8. Release the hovercraft and watch it glide across the table.

How does it work?
When the cap is pulled up, it will let the air flow through and under the CD, lifting it up and causing it to hover. The balloon is the lift engine that supplies a steady stream of pressurized air underneath the CD. You don’t need a skirt as the CD is light enough to lift by itself.

Make it an experiment
- Compare the hovercraft to a disc without a balloon sliding across the same surface.
- Experiment by moving it over different surfaces and see how it responds.
- Can it work over water?
- How might you build this bigger?
**Doktor Kaboom: LIVE WIRE!**

*Ideas to explore before and after the show*

**What do you WONDER?**

- How does electricity travel?
- Can we create electricity? Where do we get it?
- What are other sources of energy?
- What makes static electricity?

**What do you KNOW?**

- We use electricity every day, from home to school and all night long. Share examples.
- What happens when there is a “power outage”? What alternatives do we use?
- What do scientists do? (Observe. Ask Questions. Test Theories.)

**After the show: What inspired your students? What would they like to know more about?**

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**Famous Scientists**

In *LIVE WIRE! The Electricity Tour* Dr. Kaboom mentions Nikola Tesla and Thomas Edison, scientists known for their work with electricity. *Who are some other famous scientists and what is their contribution to how we live today?*

<table>
<thead>
<tr>
<th>Scientist</th>
<th>Birth Year - Death Year</th>
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<tbody>
<tr>
<td>Nikola Tesla</td>
<td>1856-1943</td>
</tr>
<tr>
<td>Thomas Edison</td>
<td>1847-1931</td>
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Inventor Nikola Tesla contributed to the development of the alternating-current electrical system that's widely used today and discovered the rotating magnetic field (the basis of most AC machinery). Source: Biography.com

Inventor Thomas Edison created such great innovations as the electric light bulb and the phonograph. A savvy businessman, he held more than a 1,000 patents for his inventions. Source: Biography.com
Scientists are Fun!

Doktor Kaboom is a character created by actor/comedian David Epley. In his shows, David combines his love of science with his performing abilities to create shows that educate and entertain on a grand scale. Encourage students to create their own science demonstrations with a dose of Dr. Kaboom’s style - keeping in mind his values of respect, safety and confidence.

Brainstorm
Discuss with students: What are some techniques David Epley uses to make Science so much fun?

**Humor * A Strong Character * Audience Participation * Good Storytelling * Demonstrations**
**Respect * Safety * Confidence**

Select and practice a demonstration
There are many simple scientific demonstrations* available online. Guide students to select one or two to do to consider or offer a predetermined set of options. As a project, give students the opportunity to develop their own mini show featuring a real science demonstration. They can work individually or in teams to take their presentation to the next level. The demonstration “Roll a Soda Can with Static Electricity” is used as an example for the suggestions below.

Choose a Character
As a class, practice “getting into” different character types.... old man, young girl, body builder, business person, cowboy, minion, etc. With students standing in a circle, call out a character type. Students respond by moving in ways that show: What is this character’s posture? How does he/she walk? How would this character brush teeth? Toss a ball? Eat an ice cream cone? Walk on a hot beach? Add more attributes to your characters: very enthusiastic like a sports fan, impatient, absent minded, distracted by cell phone, very strict, etc. Practice as a group and then individually until students really know and understand their character.

Problem Solved
In most plays and stories, there is a problem that characters have to solve. Your science demonstration can be made more interesting for the audience if there is a problem that can be solved through your demonstration. The problem can be real or wacky, as long as the storytelling convinces the audience that it is important! (For example: On planet Dirigible, the balloons have an annual contest to prove their power! Watch as our hero, Mr. Red Balloon, attempts to move a soda can without even touching it! Oh no – his competition is spoiling the contest by putting drops of water in the can! Who will win!?)

The Scientific Method
Plan your presentation using the scientific method and test variables (which one will be best!?). For example, in the “Roll a Soda Can” demonstration, there is an opportunity for audience participation, or for a team of students with different hair lengths (or wigs!) to get involved investigating “does the length of the person’s hair effect the power of the static electricity?”

*sciencebob.com/category/science-fair-ideas*
Roll a Soda Can with Static Electricity

You will need
* An empty soda can
* A blown-up balloon
* A head of hair

What to do

1. Place the can on its side on a flat smooth surface like a table or a smooth floor.

2. Rub the blown up balloon back and forth through your hair really fast.

3. Hold the balloon close to the can without actually touching the can. The can will start to roll towards the balloon without you even touching it!

Try This Too: While you’ve got the balloon out, tear up part of a tissue into tiny pieces about 1/4 inch (.5 cm) big. Rub the balloon in your hair again and bring it close to the tissue pieces. They will be attracted to the balloon and then jump away.

How does it work?

When you rub the balloon through your hair, invisible electrons (with a negative charge) build up on the surface of the balloon. This is called static electricity, which means “non-moving electricity.” The electrons have the power to pull very light objects (with a positive charge) toward them – like the soda can.

MAKE IT AN EXPERIMENT

The project above is a DEMONSTRATION. To make it a true experiment, you can try to answer these questions:

1. Does the size of the balloon change the power of the pull?

2. Does the length of the person’s hair effect the power of the static electricity?

3. How much water can you put in the can until the balloon can’t pull it anymore?

Find this demonstration and more like it at: sciencebob.com
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