SCHOLASTIC
Tom Snyder Productions®

Electric Current

printed from PDF

This Teacher's Guide belongs to:

____

(Teacher name here)

XSCI ELE U 05

Credits

Science Court is produced and published by Tom Snyder Productions.

General Manager
Richard Abrams

Editor-in-Chief
David A. Dockterman, Ed.D.

Science Court Design & Conception
Tom Snyder & David Dockterman

Senior Product Manager
Catherine Weicker

Animation

Starring
Paula Poundstone, Bill Braudis, Paula Plum, Fred Stoller, H. Jon Benjamin, Jennifer Schulman

Produced by
Loren Bouchard

Executive Producers
Tom Snyder, Bonnie Burns

Written by
Tom Snyder, David Dockterman, Bill Braudis

Directed by
Tom Snyder, Loren Bouchard

Additional Characters
Micaela Hebert, Julianne Shapiro, Amy Snyder, Tim Snyder, Kathy St. George

Coordinating Producer
Niki Hebert

Animation
Andre Lyman (Art Director), Sam Ackerman, Max Coniglio, Aldina Dias, Aya Fukuda, Chris Georgenes, Kim O'Neil, Bob Thibeault

Audio-Video Editing & Production
Managing Audio Editor: Lisa Gillim
Audio Editors: Loren Bouchard, Paul Santucci, Adam Simha
Managing Video Editor: Ivan Rhudick
Video Editors: Andre Lyman, Chris Georgenes, Max Maguire

Ranch Coordinator
Jennifer Schulman

Music
Tom Snyder

Software

Software Graphics & Interface Design
Bob Thibeault, Liz Hurley

Programming
Magic Software

Quality Assurance
Cornelia Sittel, Kevin Kennedy-Spaien

Video & Audio Production
Lisa Hamanaka, Edgar Gresores

Editorial Development & Design
David Dockterman, Lisa Hamanaka, Annette Donnelly, Todd Mahler, Maria Flanagan, Alyson Amaral Roy

Print Production
Amy Ashman, Tina Cretella

Content Consultants
Dr. Kathleen Vandiver, Lexington, MA Public Schools
Robin Benoit, Francis W. Parker Essential Charter School, Devens, MA

Special Thanks
Carlisle, MA Public Schools
Lexington, MA Public Schools
Burlington, MA Public Schools
Mannington, WV Public Schools
Concord, NH Public Schools
Watertown, MA Public Schools
Newton, MA Public Schools
Albuquerque, NM Public Schools
Hingham, MA Public Schools
Belmont, MA Public Schools
Wellesley, MA Public Schools
The Meadowbrook School, Weston, MA

Cover Photos (left and right)
Mike Hansen

For more information about Tom Snyder Productions or for a free catalog, please call us at

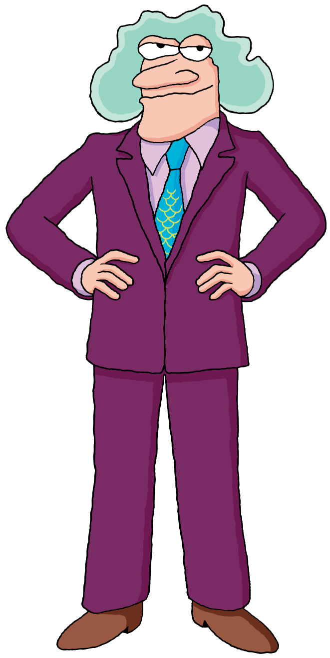
800-342-0236

or visit our Web site at

www.tomsnyder.com

Table of Contents

Overview



What Is Science Court?

This *Science Court* package is one of a series of classroom programs designed to teach fundamental concepts in elementary and middle school science. A humorous courtroom drama provides the vehicle for demonstrations and explanations as lawyers battle over a case.

The trial is being covered by courtroom correspondent, Jen Betters. The students, working in cooperative teams, act as courtside commentators. At various breaks in the trial, Jen leads the students through a review of the facts, a hands-on activity, and a prediction about what will happen next. At the end of the trial, the students predict how the jury will vote. *Science Court* is fun, funny, and a great learning experience.

Science Court is a software program for the classroom, used with a whole group of students and led by a teacher. The activity uses technology to get people in a group to interact, not with a machine, but with each other.

How Long Does It Take?

Typically, it takes teachers three class periods to complete this *Science Court* title. There are four parts to the courtroom drama. At the end of Parts 1, 2, and 3, your class can do one or more hands-on activities. Students will then work in teams to answer six questions and predict what will happen next. Depending on how far you wish to carry the hands-on activities, you can expect to get through one to two parts in a class period. In Part 4, students predict the jury's verdict. This prediction will take only part of a class period.

What You Get & What You Need

What You Get

- ***Science Court* CD-ROM** — Including the *Science Court* software, an electronic Teacher's Guide and worksheets, and Word Wall vocabulary files.

- ***Science Court* Teacher's Guide** — Including a complete set of reproducible student Information Sheets and Hands-On Activities.

What You Need

- **Computer with CD-ROM drive** — Refer to the chart below to determine the requirements for your computer.

Type	Minimum Processor	Operating System(s)	Minimum RAM	Other
Macintosh Computer	G3 500 MHz	Mac OS X 10.4 Mac OS X 10.3	256 MB RAM	Audio speakers
Windows Computer	Pentium III 500 MHz with sound	Windows XP Pro Windows 2000 Windows Vista	256 MB RAM	Projector (recommended)

- **Copies of the reproducible Information Sheets and Hands-On Activities.** These are found in the back of this Teacher's Guide and also can be printed directly from the software program. There are four different Information Sheets for each part of the trial (and an extra diagram for Part 1). See page 41 for more details.

- **Materials for the Hands-On Activities** following Parts 1, 2, and 3 of the trial. The amount of materials depends on how you organize the activities. You can gather one set of materials as a demonstration for the whole class or gather enough materials for each student. Refer to the Preparation section for a complete list of all the materials needed for each Hands-On Activity.

- **Copies of the assessment materials** in the Reproducibles section of this Teacher's Guide.

Learning Objectives

In *Science Court: Electric Current*, I. M. Richman refuses to relinquish his ping pong trophy to the new champion, Mary Murray. But he does agree to let her look at it. On the way into Richman's mansion, Mary trips and breaks the wire for Richman's alarm system. He repairs the wire with his dog's leash, but later notices that the circuit is broken. Did Mary attempt to steal the trophy, or does it have something to do with how the electric current traveled through the repaired wire?

Students learn these scientific concepts:

- the components of an electric circuit
- the difference between an open and closed circuit
- how electrons travel to make an electric current
- that some materials are better conductors of electricity than others

Students learn in hands-on activities to:

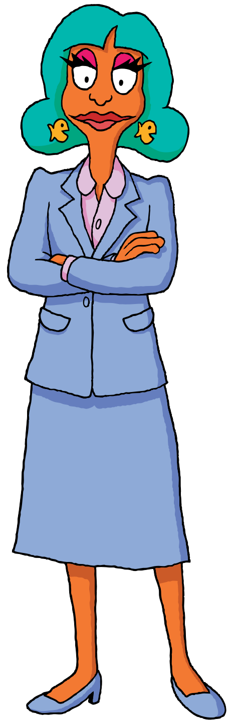
- demonstrate open and closed circuits
- simulate the flow of electrons in an electric current
- compare the electrical conductivity of various materials

Students learn how to work as a team by:

- becoming members of an interdependent group
- listening and talking with others
- sharing a common goal

Students learn content vocabulary:

- amp
- atom
- battery
- complete circuit
- conductor
- electric charge
- electric current
- electricity
- electron
- insulator
- load
- molecule
- nucleus
- open circuit
- parallel circuit
- series circuit



Research Basis

What Our Students Don't Know in Science

Recent data on student performance paints a disheartening picture of what our students know and can do in science. On the 2000 National Assessment of Educational Progress (NAEP) only 29 percent of 4^{th} graders scored at the targeted proficient level. Of 8^{th} graders, 32 percent hit that mark, and a mere 18 percent of 12^{th} graders achieved proficiency. To make matters worse, those results reflect no improvement in scores, and even a slight decline among 12^{th} graders, compared to the 1996 NAEP results (The Nation's Report Card: Science 2000). Results from the 1999 Trends in International Mathematics and Science Study (TIMSS) confirmed the mediocrity of American students' scientific literacy. Those tests placed U.S. 8^{th} graders slightly above the international average, well behind the leading nations of Japan, Hungary, and Singapore (National Center for Education Statistics, 2000).

What do these assessments tell us about the particular gaps in student science learning? The National Assessment Governing Board (NAGB), which sets the standards for science achievement on the NAEP, differentiates student performance among three levels — basic, proficient, and advanced. Most U.S. students, regrettably, remain stuck in the basic level. They show "some of the knowledge and reasoning required for understanding;" they're able to "follow procedures;" and they have "the ability to identify basic scientific facts and terminology." Essentially, at the basic level students can recall information and follow direction. At the proficient and advanced levels, however, students begin to demonstrate "solid understanding." These students can assess, evaluate, and plan scientific investigations appropriate to their grade level. They can infer relationships, explain their understanding of scientific phenomena, and apply science to real-world problems (NAGB, 2000). Moving from basic to proficient, from recall and procedure to understanding and application, is the gap we must fill in order to improve the science performance of our nation's students.

Obstacles to Comprehension

Why has traditional instruction failed to raise student achievement in science from the level of basic recall and direction-following to deep understanding? In the last two decades, science education research has explored how the ideas that children bring with them to science class affect their learning. Students come to school with (often faulty) preconceived views in all areas of science — astronomy, biology, physics, chemistry, and so on. (For a bibliography of the thousands of studies and articles in the area of children's preconceptions in science see Duit, 2003; and for a summary of those studies, see Wandersee, et al., 1994.) These concepts emerge from a variety of sources, including children's early experiences with the physical world, and they can be very resilient, even in the face of new teaching (Fisher, 1985; Carey, 1986). Instead of revising their understanding, children often simply incorporate the new information the teacher conveys into their existing incorrect conception.

Instruction for Science Success

Conceptual misunderstandings in science abound. Students believe that the changing distance from the Sun causes the seasons. They believe sounds can be heard in the vacuum of space and think that dinosaur fossils are real bones. These kinds of fundamental misconceptions can block the road to true understanding. Fortunately, research has revealed instructional elements and approaches that have proven effective in building deep and lasting understanding. Research has shown:

1. the importance of addressing students' naïve concepts directly;
2. the need for students to articulate their understanding independently;
3. the usefulness of multimedia in providing access to complex concepts;
4. the value of providing multiple pathways for acquiring and demonstrating understanding; and
5. the necessity of providing support to those teachers who have a limited knowledge of science themselves.

Science Court incorporates these validated instructional elements in a multi-modal, multimedia-rich program that attacks naïve concepts directly. Each title in the series identifies common naïve conceptions and moves learners toward the acquisition and application of correct scientific notions.

The program reaches all types of learners through its use of multiple forms of media and avenues for demonstrating understanding. The entire class watches the trial before breaking into small groups to address and discuss the concept and make predictions about the trial. Through a mix of visuals, print materials, and hands-on activities, students invalidate the incorrect notion and come to understand the correct scientific concept.

Individual assessments capture students' retention of the new information and their ability to apply it in new contexts. The *Science Court* approach overcomes the obstacles to accurate conceptual learning and builds the skills and comprehension that are characterized as proficient and advanced on the NAEP.

Sources

Carey, S. (1986). Cognitive science and science education. *American Psychologist*, 41 (10), 1123–1130.

Duit, R. (2003). *Bibliography: Students' and Teachers' Conceptions and Science Education*. Kiel, Germany: IPN.

Fisher, K. M. (1985). A misconception in biology: amino acids and translation. *Journal of Research in Science Teaching*, 22, 53–62.

National Assessment Governing Board (2000). Science Framework for the 1996 and 2000 National Assessment of Educational Progress Science Consensus Project, Washington, DC: U.S. Department of Education.

National Center for Education Statistics, U.S. Department of Education (2000). *Pursuing Excellence: Comparisons of International Eighth-Grade Mathematics and Science Achievement from a U.S. Perspective, 1995 and 1999*. P. Gonzales, C. Calsyn, L. Jocelyn, K. Mak, D. Kastberg, S. Arafeh, T. Williams, and W. Tsen. NCES 2001-028. Washington, DC: U.S. Government Printing Office.

O'Sullivan, C. Y., Lauko, M. A., Grigg, W. S., Qian, J., & Zhang, J. (2003). The Nation's Report Card: Science 2000. National Center for Education Statistics, U.S. Department of Education.

Wandersee, J. H., Mintzes, J. J., & Novak, J. D. (1994). Research on Alternative Conceptions in Science. In Gabel, D. (Ed.), *Handbook on Research on Science Teaching and Learning*. New York: Macmillan.

This Research Basis was excerpted from *Teaching Science for Understanding: The Research Behind Science Court*, available from the research reports section of www.tomsnyder.com.

Preparation

Quick Checklist

Before class gather the following materials:

- ❑ *Science Court* CD-ROM
- ❑ Computer
  A projector or large-screen monitor is recommended.
- ❑ Materials for hands-on activities
- ❑ Reproduced copies of the student sheets
- ❑ A class list showing group composition
  Assign each group a number. The program can use these numbers and the letters on the Information Sheets to choose students randomly to answer questions and participate in discussions.

Before class preview the following:

- ❑ The content on pages 12–15
- ❑ The software program itself for 15 minutes

Previewing Content

Part 1 — Why Is The Light Out?

Summary:

I. M. Richman, the reigning town ping pong champion, has just been bested by Mary Murray. But Richman refuses to surrender the trophy he's held for many years. He demands a rematch. Mary thinks the trophy is rightfully hers now, and Richman agrees to let her at least look at it.

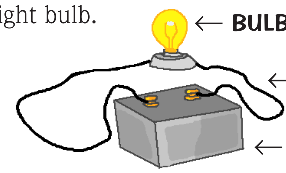
On the way into Richman's mansion, Mary's foot gets tangled in a wire, and she tears a piece of it away. The wire, it turns out, was part of Richman's alarm system, and he thinks that Mary may have broken it on purpose. He sends her away and reconnects the wire ends with his dog's leash. Later, though, Richman sees that his alarm circuit has been broken. He sounds an alarm. Fortunately, Science Court attorney Doug Savage is passing by and responds. He agrees with Richman that Mary may have attempted to steal the trophy. But first, Doug calls expert Julie Bean to the scene to make sure that the alarm system is okay.

In the Hands-On Activity, students build their own circuits and switches to see firsthand how they work and can be broken.

Questions & Answers:

Students examine Richman's alarm system. They discuss and answer questions about how circuits and switches work.

Q1 On the back of this page, draw and label a picture of a complete circuit showing a battery, wires, and a light bulb.



Q2 What would happen if you removed one wire from the circuit you drew?

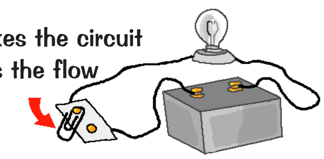
Answer: If you remove a wire, you have an incomplete circuit, and the light bulb will go out.

Q3 With the wire removed, is the circuit you drew open or closed?

Answer: With the wire removed, the circuit is open.

Q4 Add a switch to the circuit you drew that makes the circuit open.

Answer: This switch makes the circuit open because it interrupts the flow of the electric current.

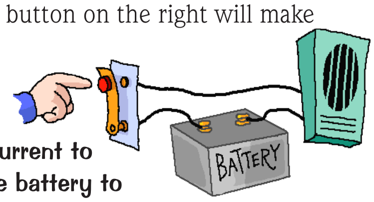


Q5 Give three examples of things in your house that can be turned on by changing an open circuit to a closed circuit.

Answer: My lamp, heater, and television all work on circuits. What examples did you think of?

Q6 Explain how pushing the button on the right will make the buzzer "buzz."

Answer: Pushing the button closes the circuit and allows the electric current to flow from one end of the battery to the buzzer, making it buzz, and back to the battery.



Prediction & Answer:

Students predict Julie Bean's explanation of what could make Richman's alarm light go out.

What would make the alarm light go out?

Answer: The alarm, or all clear, light is lit up when the alarm circuit is closed. The light will turn off if the switch on the circuit is opened. The light will also go out if the wire that runs around Richman's estate is broken, which would open the circuit.

Part 2 — What About Electrons?

Summary:

Dr. Bean concludes that Richman's alarm system is a simple circuit and switch that should work. The light will go out if someone opens the switch or breaks the wire. That's enough for Doug. He accepts the case and takes Mary Murray to Science Court for attempting to steal Richman's trophy.

Mary is represented by Alison Krempel and her assistant, Tim. During the trial, Tim asks Richman how the alarm could have gone off if the wire surrounding the house had been broken earlier by Mary. Much to Tim's surprise, Richman explains that he fixed the wire. Then what could have happened? It looks bad for Mary as Alison cross-examines Julie Bean. Alison asks Dr. Bean to explain how the alarm system works. Dr. Bean starts talking about atoms and electrons, but Doug is lost. What do electrons have to do with electricity?

In the Hands-On Activity, students create a simulation of that electron flow.

Questions & Answers:

Students learn about atoms and electrons. They discuss and answer questions about how the flow of electrons from atom to atom makes electric current.

Q1 Name three things that are made of atoms.

Answer: **Everything is made of atoms. You, the desk, water, and even the air are all examples of things made of atoms.**

Q2 Name the two main parts of an atom.

Answer: **An atom is made up of a nucleus and electrons that circle around it.**

Q3 What is an electric current?

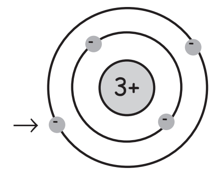
Answer: **An electric current is the flow of electrons from atoms with extra electrons towards atoms missing electrons.**

Q4 Why does a battery have a positive end and a negative end?

Answer: **The negative end stores all the extra electrons that will flow to the positive end, which is missing electrons.**

Q5 Draw a picture of an atom which has extra electrons.

Answer: **Here is an atom with an extra electron.**



Q6 Start at the negative end of a battery and describe what happens to the electrons when a closed circuit turns on a light.

Answer: **Electrons hop from the negative end of the battery, travel down the wire, go through the light bulb — making it glow — and return to the positive end of the battery.**

Prediction & Answer:

Students predict how Julie will answer the question.

How do atoms and electrons make an electric current?

Answer: **All atoms are made of a nucleus and electrons that whiz around it. Sometimes atoms have extra electrons, and sometimes they're missing electrons. Electric current is the flow of electrons from atoms with extra electrons towards atoms missing electrons.**

Part 3 — Why Won't It Conduct?

Summary:

While Julie explains how electrons hop from atom to atom in an electric current, Tim visits Richman's estate looking for clues. He rushes back to Science Court to tell Alison about an important discovery. They call Professor Parsons to the stand and ask to move the trial to Richman's estate.

At Richman's estate, Tim points out that Richman repaired the alarm wire with his dog's leash. And Parsons explains that electrons move through some materials better than others. But, Doug says, the rubber-coated aluminum leash must be loaded with electrons. Wouldn't the electric current just flow right through it?

In the Hands-On Activity, students build an open circuit to test the conductivity of various materials, including an aluminum paper clip and a coated paper clip.

Questions & Answers:

Students discuss and answer questions about how some materials conduct electricity better than others.

Q1 What's the difference between a conductor and an insulator?

Answer: **A conductor allows electrons to pass from atom to atom. Insulators have atoms that resist the flow of electrons.**

Q2 Name two other things besides copper wire that might conduct electricity.

Answer: **Lots of things conduct electricity. A penny, a paper clip, and water will all conduct electricity. What others did you think of?**

Q3 Why are some materials better conductors than others?

Answer: **Good conductors are materials made up of atoms that are willing to exchange electrons. The atoms in poor conductors hold their electrons more tightly.**

Q4 Why do you think we cover electrical wire with a thin layer of rubber or plastic?

Answer: **Rubber and plastic are insulators and protect us from electric currents.**

Q5 Name two other materials that are poor conductors of electricity and might make good insulators.

Answer: **Glass, cloth, paper, and wood are all poor conductors of electric current and could be used as electrical insulators.**

Q6 What would happen if you stuck an insulator in the middle of a circuit?

Answer: **It would make the circuit an open circuit by blocking the flow of electrons.**

Prediction & Answer:

Students predict how Professor Parsons will answer Doug's question about why the electric current won't flow through the rubber-coated wire leash.

Why won't the leash conduct electricity?

Answer: **The wire leash is covered in rubber, and rubber is a very poor conductor of electricity.**

Part 4 — Predicting the Verdict

Summary:

Professor Parsons shows that, although the aluminum will conduct electricity (though not as well as copper), the rubber coating won't. The alarm system circuit, he concludes, was not complete.

In the closing argument, Doug has very little to say. On the other hand, Alison explains that the circuit in Richman's alarm system was always broken after Mary tore the wire. Richman just didn't notice until later. No one tried to break into his house. Alison even gets the jury singing a song about electric current.

Student Predictions:

Students discuss, debate, and predict what the jury's verdict will be.

The Verdict:

The jury finds that Mary Murray is not guilty of trying to steal the ping pong trophy. The members of the jury suggest that Mary and Richman have a rematch as soon as possible.

Preparing for the Hands-On Activities

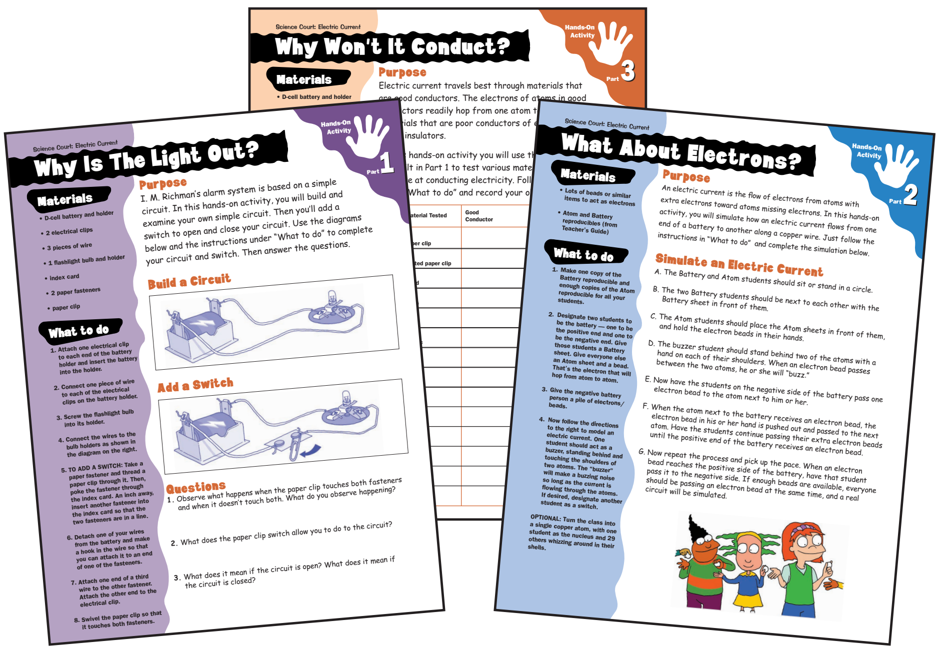
Students will be more engaged in challenges to scientific misconceptions when they are actively predicting, observing, and summarizing scientific phenomena. The hands-on activities in *Science Court* complement the key ideas in each part of the humorous trial. You can generally complete these hands-on activities in 15-20 minutes with your class.

Preview each activity by printing and reading the hands-on activity sheet. It's a blueprint for the hands-on activity, with a list of materials, step-by-step instructions, and an area for students to record observations, results, and analyses. You can choose to reproduce one hands-on activity sheet per group or one per student.

Decide how you want to conduct each hands-on activity. You can have students work in small groups, or you can demonstrate for the whole class and call on students to participate in the demonstration.

Gather materials ahead of time. Most of the materials are common supplies; others might require a visit to your school's science resources.

For any hands-on materials that are not currently available in your classroom or science center, you can contact Delta Education, the largest producer of curriculum-based elementary school science kits in the United States. Visit the website at www.delta-education.com, or call 800-258-1302.

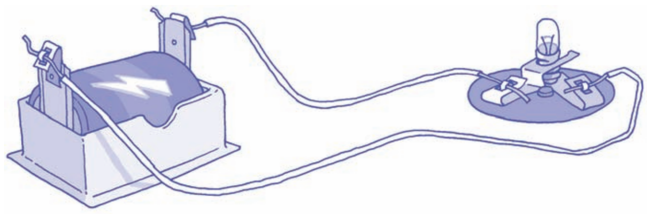


Hands-On Activity for Part 1

In this activity students build a complete circuit with a switch to open and close it.

Materials:

- D-cell battery
- battery holder (or rubber band)
- 2 electrical clips
- 3 pieces of wire
- 1 flashlight bulb and holder
- index card
- 2 paper fasteners
- 1 paper clip



Hands-On Activity for Part 2

In this activity students simulate the flow of electrons in an electric current.

Materials:

- lots of beads, beans, pennies or something similar to act as electrons
- 1 copy of the Battery reproducible
- a copy of the Atom reproducible for each student

Hands-On Activity for Part 3

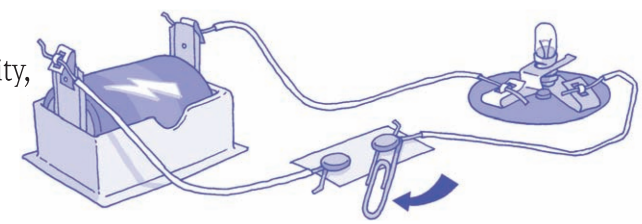
In this activity students make an open circuit to test the conductivity of various materials.

Materials:

- same materials as Part 1

  and

- materials for testing conductivity, including a normal paper clip and a coated one



Implementation

Classroom and Group Management

You have many options for creating learning groups in your classroom. We've found that it works best to assign students to groups deliberately and in advance of the class period. Ideally, teams should have diversity and a good balance of skills and personalities. Keep the same groups through the *Science Court* activity. Use your class list and your intuition to:

- Divide the number of students by four.
- Create groups with four students in each group.
- Assign remaining students to create some groups of five.
- Examine the makeup of each group and move student names among groups to balance the abilities and personalities.

Here's a chart format to help you, with extra spaces for any groups of five. Use a pencil so you can rearrange as needed:

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Student A						
Student B						
Student C						
Student D						

Assess the physical layout of the room and adjust student desks if necessary. You'll use the computer and a projector or interactive whiteboard to display the software program, but a good portion of work takes place away from the computer when students are doing hands-on activities and answering questions. Students will need space to work together as a group.

Supports appear throughout the program to assist with classroom and group management, including:

- An overview to prepare students (and yourself!) called How Science Court Works
- Step-by-step screen directions to sequence the activity
- Audio for students to hear directions for the activity
- Audio for students to hear the questions and the answers
- Extra audiovisual support for using hands-on worksheets
- Extra audiovisual support for the answering process
- Random Student Picker for the teacher to call on students

Activity Walkthrough

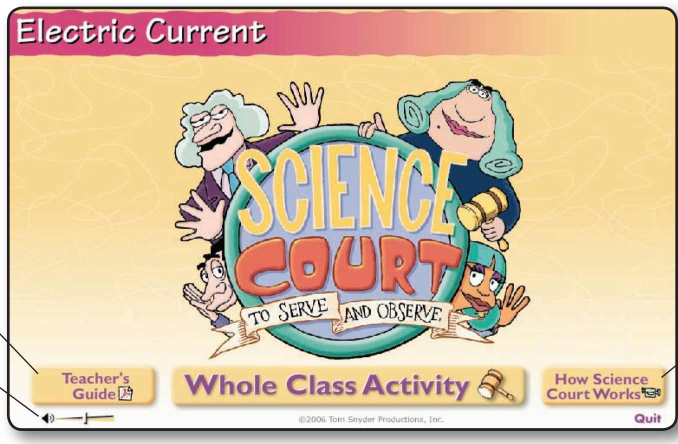
The software program will lead you through the classroom activity. Three parts of the trial include an animation, a hands-on activity, a set of questions, and a prediction. The final trial part is an animation with closing arguments and a prediction on the verdict. Throughout the program, the software offers specific supports for classroom management.

No installation is required. You can use the program directly from the CD-ROM without installing it to the computer.

You can also copy the program to a hard drive using the instructions in the Read Me file on the CD-ROM, in compliance with your license agreement (1-computer license or multiple-computer license).

❶ Launch the Program

- Double-click the *Science Court* program icon. The title screen will appear.



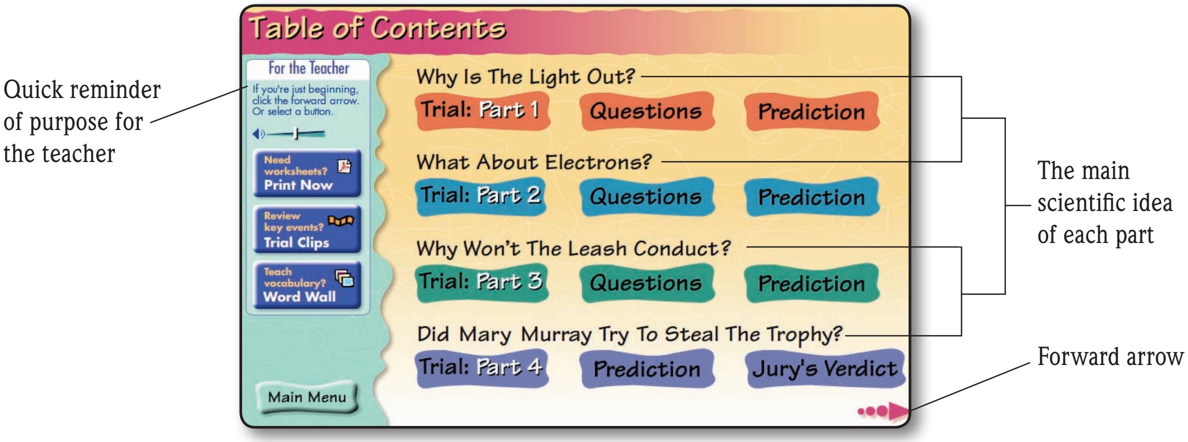
- Click **How Science Court Works** if this is the first use with your class.

- Click **Whole Class Activity** to continue.

❷ Table of Contents

The Table of Contents is where you start and resume the whole class activity. After you select a trial part from the Table of Contents, you will see a set-up screen before the animation. Make sure all of your students can see. If you're starting from the beginning, you'll see an introduction to the case.

At the end of Part 1, Jen Betters, our *Science Court* correspondent, will summarize what's happened. She will then guide students through a set of questions about the content and a prediction about what will happen next, in this case what an expert will say about how an alarm system works.



Click the forward arrow to start the activity.

❸ Set Up

The software program helps you manage each part of the activity in the classroom and gives you a step-by-step sequence.

Click **Audio** to hear the directions read aloud and play them for your students. You can use this on each screen.

Click **Print Now** to open the reproducibles in a PDF reader, such as *Adobe Acrobat*, and print them. Skip this step if you've already reproduced the worksheets.

Photocopy the reproducibles before class. You can print from the software program, or you can photocopy them from the printed Teacher's Guide.

Close the PDF reader and click the Set Up screen to return to *Science Court*.

Student worksheets

Students, working in cooperative groups, answer six questions on the worksheets. A group will work together to answer the questions. Everyone has the same six questions, but each of the four Information Sheets has a different quote from a key participant in the trial. This quote will help students answer the questions, meaning that each student in a group has information valuable to contribute to the group.

Click **Word Wall** to open this feature.

The Word Wall is a resource for reinforcing vocabulary used in *Science Court: Electric Current*. Before your class watches Part 1 of the trial, you may want to confirm that they know these background vocabulary terms:

- electricity
- battery

Refer to the vocabulary section later in this Teacher's Guide for specific uses of the Word Wall.

Click **Exit the Word Wall** when you are finished.

Click the forward arrow to watch the trial.

❹ Trial Animation

The animation begins automatically. Enlarge the application window to take advantage of your whole screen.

Show/Hide Captions button

Animation controls

Watch the trial with your class.

Click the forward arrow when the animation has finished playing.

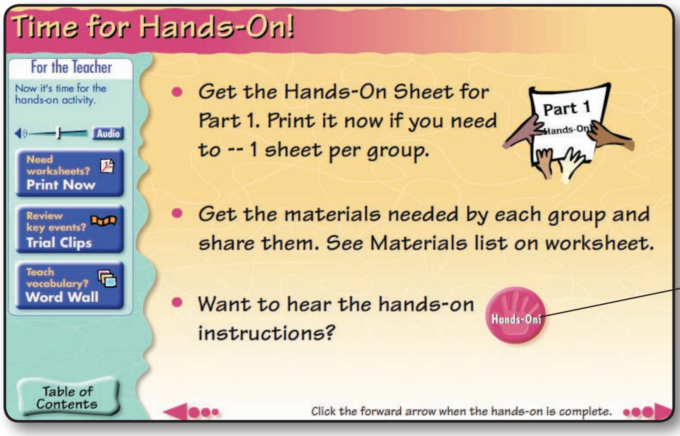
❺ Time for Hands-On

This is the point at which your class does the hands-on activity. The purpose is to shed light on the unfolding trial and related scientific concepts.

You have some choices:

- You can have each group do the activity, or you can demonstrate the activity for the class.
- You can reproduce one hands-on sheet for each group, or you can reproduce one for each student.

The information about the activity (materials, instructions, and recording results) is located on the hands-on worksheet for each part. Before class, you should have gathered the materials listed on the hands-on worksheet.



Hands-On support

▶ Click the **Hands-On** button to give your class a brief audiovisual overview for using the hands-on worksheets.

▶ Conduct the hands-on activity with your class.

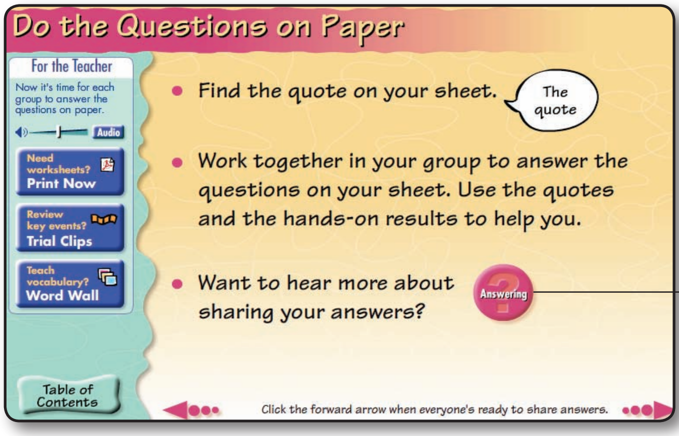
For extra classroom management support during the hands-on activity, consider using some additional display tools, especially if you have an interactive whiteboard:

- Open the PDF file to go over the sheet with the class. Use interactive white-board markers, the spotlight, and window-shade (reveal) tool to guide the class in the hands-on activity.
- Use a large digital clock display to help keep track of time. (The hands-on activities should take about 15-20 minutes.)

▶ Click the forward arrow when you are finished with the hands-on activity.

❻ Do the Questions on Paper

This is the point at which students work in small groups to exchange information and answer the 6 questions on their sheets. You should circulate among the groups in the classroom while they work.



Support for the answering process

Click the **Answering** button to give your class a brief audiovisual explanation of the answering process.

Key expectations for students are:

- Working cooperatively with other members of their group
- Exchanging information found in the different quotes on student sheets
- Answering all 6 questions
- Making sure each student in the group can answer each question
- Being able to answer the questions verbally without reading the worksheets
- Being prepared to be called on randomly

Give the class time to work.

For time management, consider using a large digital clock display to help keep track of time. (Answering the questions should take about 10-15 minutes.)

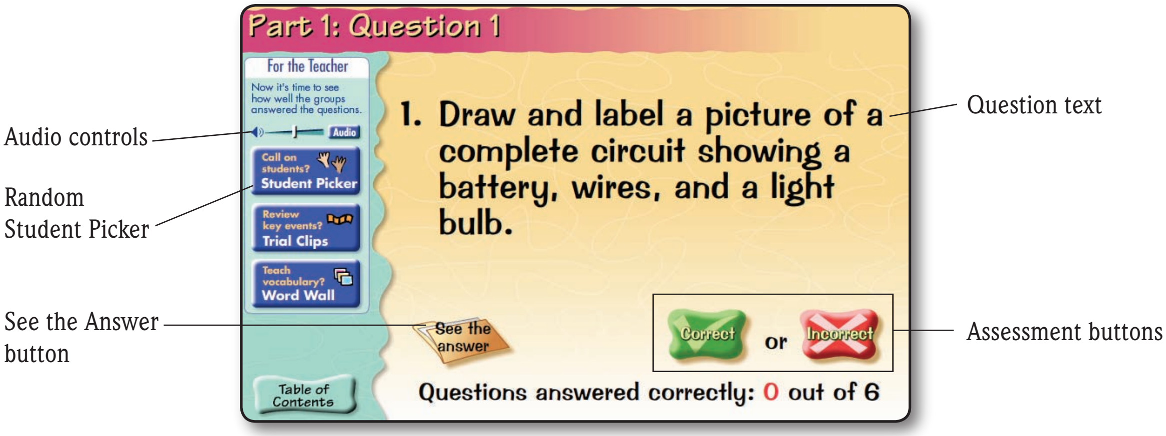
Click the forward arrow when the class is ready to share their answers.

❼ Questions and Answers

You, the teacher, will manage the sharing and assessment of student answers. The basic guidelines are to:

- Call on students randomly using the Student Picker button.
- Ask students to answer without reading from their worksheets.
- Be tough but fair in evaluating student answers and explanations.

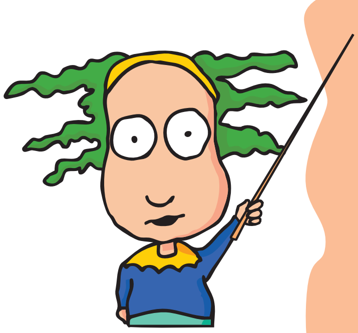
As a class, students must answer 4 of the 6 questions correctly to continue. If fewer than 4 are marked correct, the program starts over with Question 1.



Click the **Audio** button to hear Jen Betters read the question aloud.

Click the **Student Picker** to call on groups and students in a group.

Enter the number of groups into the Student Picker. Make sure you have assigned each group a number. Students will be identified by the A, B, C, and D on their worksheets.



Using the Random Student Picker

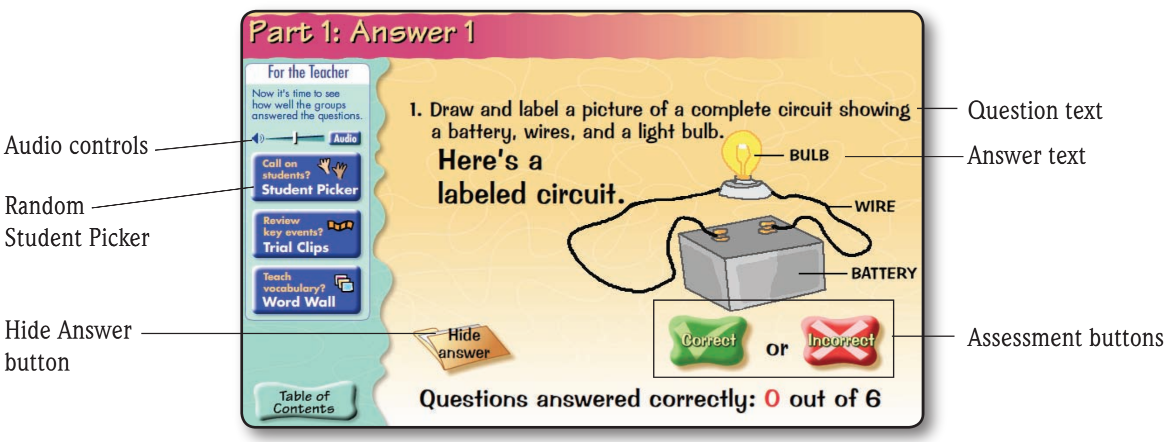
Use the Random Picker as much as you want to solicit answers from as many students as you want. Be creative, and use this feature to create fun and suspense.

There are a few different ways of using the Random Student Picker to call on students. Use the Random Picker to select a group and to select a student.

- Use the Random Picker to select a group, then you select which one of the students will answer.
- Use the Random Picker to select a group, then ask the group to select which one of them will answer. (Don't let them select a group member more than once.)
- Use the Random Picker to select a student who has worksheet A, B, C, or D, and ask for a volunteer.
- If a student is having difficulty answering, use the Random Picker to select another student to help the first one, making it a team effort.

Click **See the Answer** to display an answer with the question.

This feature helps you evaluate student answers the moment they are offered. The answers in the program are a guideline for accurate student answers. Keep your ear tuned to the quality of student answers.



You are in charge, and you are the one to assess whether an answer is correct. You can ask several students in succession to articulate answers to the same question. You can ask one student to answer each question.

Student answers will vary, particularly with questions that ask students for examples. Some answers should be used to provoke short class discussions. Some answers, such as drawings, may be best presented and explained by writing on the board.

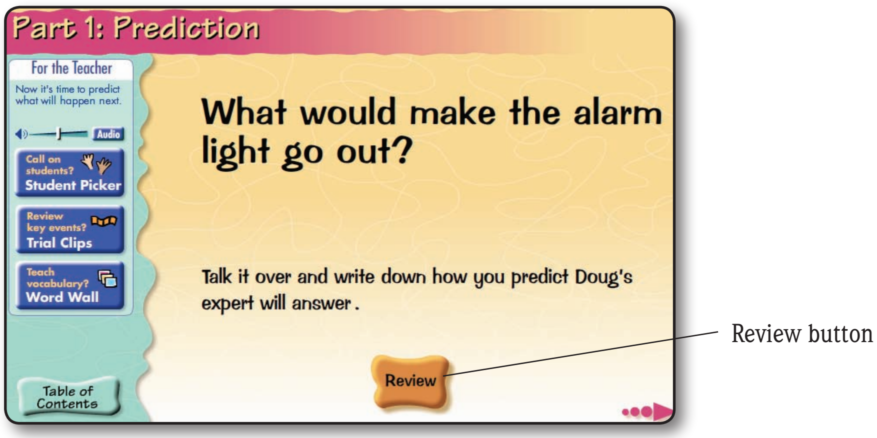
The class cannot continue past this point until they get at least 4 of 6 answers correct.

❽ Prediction

The class will predict what happens next in the trial. The bottom right corner of each worksheet asks students for their predictions.

At this point in the activity, you can poll the class (using the Random Picker) to offer their predictions and support them with explanations.

During some parts of the trial, students must make a choice between two characters (usually Alison Krempel and Doug Savage, the attorneys arguing the case).



Click **Review** if students need a reminder about the events leading up to this point in the trial.

❾ Stopping and Resuming the Whole Class Activity

After a prediction, it's a good stopping point for the activity. This walkthrough went through Part 1 of the trial. Parts 2 and 3 are similar. Part 4 is the trial's conclusion, without the questions and the hands-on activity.

- Click **Table of Contents** any time you want to navigate to a specific part of the trial.

You'll use the Table of Contents whenever you resume the program.

The Table of Contents has some other features to try.

- Click **Trial Clips** if you are resuming the activity and students need a reminder about the events in the trial.

- Click **Word Wall** for access to this vocabulary resource. See page 32 for more information.

- Press CTRL-Q on the keyboard to quit the program.

⑩ Follow Up: Appealing the Verdict

If the students disagree with the verdict reached by the jury or any of the judge's rulings along the way, they can appeal the decision to a higher court. Have students write up their arguments, including all relevant scientific evidence and demonstrations. Students can send their appeals by regular mail to:

Tom Snyder Productions

100 Talcott Avenue

Watertown, MA 02472

ATTN: Appeals Science Court

Or email to:

sciencecourt@tomsnyder.com

Extending Vocabulary with the Word Wall

Science Court provides a good opportunity for vocabulary instruction. Students need explicit attention on vocabulary to support their learning in science. Effective teaching practices for vocabulary include:

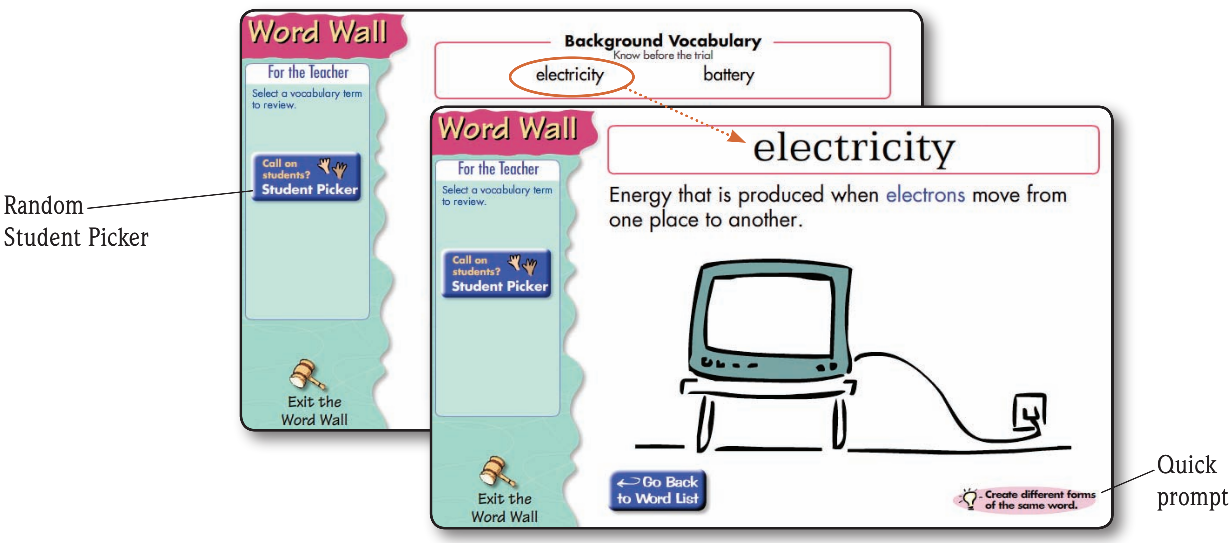
- Embedding vocabulary instruction within a context, in this case, the *Science Court* activity
- Providing multiple exposures to vocabulary terms, and using multiple representations
- Asking students to generate a response to vocabulary terms, enabled by the quick prompts that appear on the definition screens
- Giving students an expectation of being called on to participate, using the Random Student Picker

Within Science Court

The program has a Word Wall to complement the vocabulary exposure students receive in the main trial activity. The Word Wall provides students with a framework of the language they need to comprehend the *Science Court* topic and demonstrate their understanding during the activity (verbal, written, and visual representations).

At any point in *Science Court*, you can call up the Word Wall. **Background vocabulary** are the terms students should know before they watch the trial. **Activity vocabulary** are the terms that appear in Parts 1, 2, and 3 of the trial. (Some definitions are used in the question-and-answer activity.) **Additional vocabulary** are terms that further support the *Science Court* topic.

Click a term to see a definition screen with a visual example.



Use the Random Student Picker to call on students to read the term and its definition, and to respond to the quick prompt that may appear in the lower right corner. The quick prompt helps you generate a few moments of class discussion around the term. On the screen above, the quick prompt to "Create different forms of the word" gives your students a chance to connect "electricity" with electric, electrical, electro- (prefix), electrify, and so on.

These are some quick prompts you may see:

- Give an example.
- Find the root of the word.
- Create different forms of the word.
- Connect this to the trial.
- Use the term in a sentence.
- Think of a word that means the same thing.
- Think of a word that means the opposite.

Beyond Science Court

You can use the Word Wall in many ways. The CD-ROM has a Teacher Guide directory, or folder, that has Word Wall files in multiple formats:

- Microsoft PowerPoint
- Promethean Flipchart (version 2.5+)
- SMART Notebook (version 9.5+)

Some ideas for further vocabulary projects include:

- Record audio for each definition screen
- Add your own contextual images to the definition screens
- Print the vocabulary definition screens in small (card) or large (wall) formats
- Cover up the term, or the definition, to create a vocabulary challenge
- Build your own definition screens for other science topics for a class library

Assessment

Science Court offers teachers many assessment opportunities as students engage in discussion with one another, complete worksheets and quizzes, and tackle hands-on experiments. Frequent class discussions help teachers monitor students' growing mastery of the content and understanding of concepts. In addition, the resources in this *Science Court* Teacher's Guide provide teachers with critical assessment feedback.

Assessment Components

Worksheets and In-Class Assessment

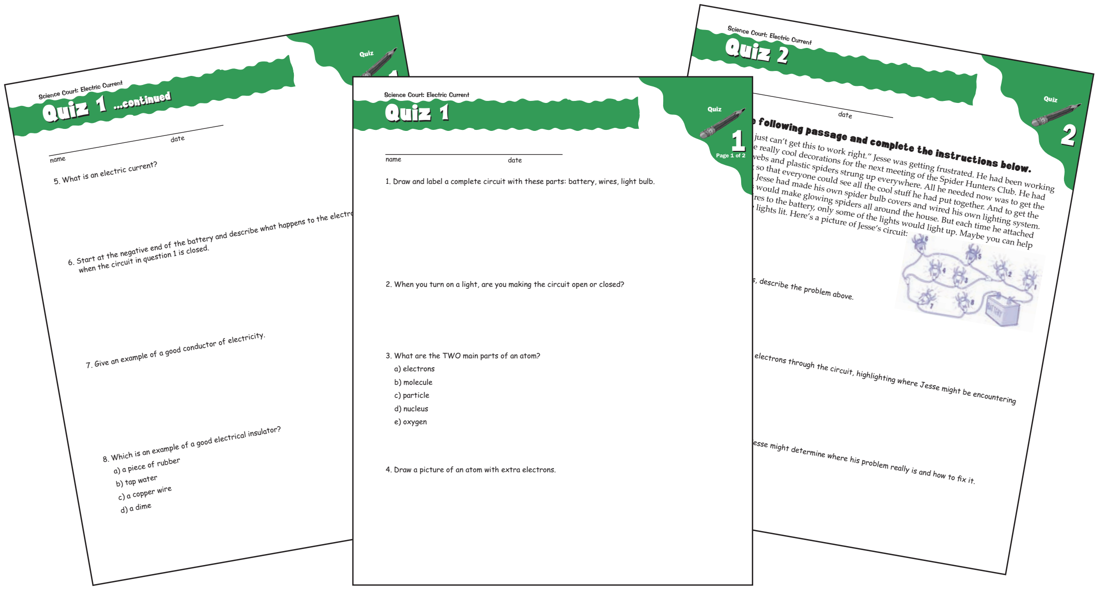
The *Science Court* worksheets are an easy way to assess a group's understanding of key science concepts. Working collaboratively, students respond to 18 open-ended questions based on information presented in the story. Answer keys are included at the end of this Teacher's Guide. During the class activity you can also make note of students' understanding and articulation when they are called on to share answers.

Assessment Rubric

The assessment rubric can be used to assess Quiz 2 and the hands-on experiments. You can also use it for your own custom assessments with *Science Court*, or for students' lab reports, presentations, or any other performance-based tasks. *(The assessment rubric is located on page 36.)*

Quizzes

This *Science Court* title includes a two-part quiz. Quiz 1 contains multiple-choice and short-answer questions about science vocabulary and concepts presented in the program. Quiz 2 goes a step further, asking students to apply what they've learned to a new situation. An answer key with sample student responses is provided for teachers. *(Quizzes and answer keys are included in this Teacher's Guide as well as in a separate compilation booklet of Science Court assessments.)*



Quiz 1 checks for understanding that every solid object is made up of lots of tiny particles, and that the effects of temperature on these particles can cause an object to expand or contract. Quiz 2 asks students to demonstrate an awareness of what an electric current is and how it is conducted through a circuit.

Learning from the Assessment

Assessment can do more than just measure what students have learned. It can also be used to generate new learning. For instance, build on students' understanding of electric current to introduce the concept of resistance. As a current travels along a wire, it encounters resistance to its movement. So, the further a current has to travel, including up and through devices like light bulbs, the more resistance it meets. That resistance causes the current to lose strength. Students can investigate how resistance applies to series and parallel circuits and how current that has to travel a long way, like from the power plant to your house, maintains its strength.

Science Court Assessment Rubric

Use this rubric, in combination with the sample answers, to help you assess student performance on Quiz 2. Use the sample answers to assess correct and incorrect answers. Then, use this rubric to assess your students' abilities to think and communicate scientifically. You can also use this rubric to assess student work on hands-on experiments or other projects you assign. (Permission is granted to copy for educational use.)

3 – responses demonstrate understanding and are consistently thoughtful, accurate, and complete

2 – responses demonstrate understanding, but contain errors or lack detail

1 – responses demonstrate limited understanding

0 – no understanding is demonstrated

Student Name: ____________________ Assessment: ____________________ Date: ____________________	3	2	1	0	N/A
Problem Statement Student understands the problem and is able to articulate it in his or her own words.					
Scientific Ideas Student demonstrates a thorough understanding of scientific concepts and ideas.					
Terminology and Language Student uses scientific terminology and language appropriately and correctly.					
Supporting Materials Student uses supporting materials such as diagrams, graphs, and pictures to support scientific explanations.					
Application of Knowledge Student effectively and accurately applies scientific knowledge, skills, and methods to new situations.					
Scientific Inquiry and Method Student uses his or her understanding of science processes and methods to effectively plan and conduct a systematic investigation.					
Technology and Instruments Student uses technology and simple instruments appropriately and correctly to gather and process data.					

Rubric based on the National Science Education Content Standards

Beyond Science Court

The concepts that underlie *Electric Current* provide a foundation for further research.

More Activities

Here are some suggestions for extending what students have learned in *Science Court*.

Parallel and Serial Circuits

Materials needed: D-cell battery and holder, 2 electrical clips, 4 pieces of wire, 2 flashlight bulbs and holders.

Procedure: A. Make a series circuit: 1) Place the battery in the holder. 2) Insert the electrical clips at either end of the battery. 3) Twist the bulbs into their holders. 4) Connect the bulb holders with a pair of wires. 5) Now connect one of the bulb holders to the battery with another pair of wires. Note the brightness of the lights.

B. Make a parallel circuit: 1) Disconnect one of the wires from the battery to the bulb holder. 2) Disconnect one of the wires connecting the two bulb holders. 3) Connect one wire from the battery to the unconnected bulb and another wire between the two bulbs. Note the brightness of the lights.

Explanation: In the series circuit, the electric current encounters increased resistance as it travels from one bulb to the next. That's why the second bulb is dimmer than the first in the series. In the parallel circuit, the current has the same resistance to each bulb. They glow with the same strength.

Electricity at Home

Many of the appliances and devices in your home, from the toaster and the alarm clock to the computer and the television, rely on electricity. Where does that electricity come from? How does it get created? How does the current travel to your house? Research the flow of electricity in your home. Pick one appliance or device and trace the electric current that makes it work.

A Better Burglar Alarm

I. M. Richman's burglar alarm seems kind of silly. He has to watch a light, waiting for it to go out. There must be a better way. Use what you have learned about circuits to design a better burglar alarm. First, design it on paper. Then, if you can, gather the materials together to build your design. Make it a class or family project. And share your results with others.

School-Home Connection

As you know, students who talk about their classroom learning experiences outside the classroom are more likely to have a deeper understanding of concepts and greater retention of information. One of the ways to get them to "talk about it" is to enlist the cooperation of parents in the home. When parents express interest in what students are learning in school and students respond by explaining and showing what they have done in the classroom, comprehension and retention increase dramatically.

The letter in the Reproducibles section enlists the cooperation of parents in helping their youngsters continue to learn . . . right in their own homes. The letter tells about *Science Court*, and suggests that parents ask their children to tell them about the courtroom trial and to explain what science concepts were introduced. It encourages parents to have their children share hands-on activities, particularly those that can be duplicated in the home.

Here are two steps you can take to foster a powerful school-home connection around *Science Court*.

- Photocopy the letter and send it home with each student, or print it in a class newsletter that is sent to all parents.
- Duplicate and send home one or more of the hands-on activities from the *Science Court* Teacher's Guide. (Most of the materials are easy for parents to gather.)

Technical Support

If you experience problems with *Science Court*, you have several resources, including the Read Me file on the CD-ROM, our Customer Service Team, and our Web site. Visit our Web site technical support area for Frequently Asked Questions (FAQs).

Contact us through the ways listed below:

Toll-free:

800-342-0236 (U.S. & Canada only)

Hours:

Monday through Thursday, 8 A.M. to 7 P.M. (EST); Friday, 8 A.M. to 5 P.M. (EST)

Email:

tech@tomsnyder.com

Web:

www.tomsnyder.com
www.tomsnyder.com/contactus/faq.asp

When you call, please have the following information available:

- Software title and version number
- Your computer's operating system
- Your computer's memory (RAM)
- Your computer's speed and processor type

If possible, please have the telephone near the computer when you call.