Follow-up Activities

- Prepare peanut butter for children to sample by smoothing peanuts in a food processor. In small groups, have children share and make a list about what they know about peanut butter. Help each group come up with questions about peanut butter that can be answered by doing some classroom and library research. (Some possible questions are: Where does peanut butter come from? Who invented peanut butter? Why does peanut butter stick to the roof of your mouth? How many people like peanut butter? Why are some people allergic to peanut butter? Will seeds grow in peanut butter?) Provide a number of resources for their inquiries. Some print suggestions are:

  — Adler, David. *A Picture Book of George Washington Carver.* Holiday House, New York, NY; 2000.
  — Keller, Kristin Thoennes. *Peanuts to Peanut Butter*. Capstone Press, Mankato, MN; 2004.
  — Zevy, Aaron. *No Nuts For Me.* Tumbleweed Press, Toronto, ON; 1998.

  Some worthwhile Internet URL's are:
  — www.peanutbutterlovers.com
  — inventors.tqn.com/education/inventors/library/weekly/aa041897.htm.

- The parachute investigation from the show is an excellent opportunity for students to practice and apply many of the inquiry skills from the National Science Education Standards. Using that as a focus activity, have your students work in teams to create a parachute that will safely transport a raw egg to the ground without cracking.

- Have students prepare a poster for the science classroom listing and illustrating the tools of scientific inquiry:
  — ask questions
  — form a hypothesis
  — gather information
  — take notes
  — form a conclusion
  — make observations
  — investigate
  — use equipment & tools
  — look for explanations
  — communicate discoveries

- Have students work together to research scientists and inventors that interest them. Be sure to provide age-appropriate books about scientists and their chosen fields of research. Have each group present a report to the class outlining the questions asked by the scientists and the skills used by the scientist to come up with answers.

Internet Resources

Periodically, Internet Resources are updated on our web site at www.LibraryVideo.com

- **yucky.discovery.com/flash/**
  The "Yuckiest Site on the Internet" offers scientific explanations to all sorts of real-world questions often thought of by kids. It is a great place to begin exploring science concepts. ***(Continued)***

- **www.exploratorium.edu/snacks/snackintro.html#science**
  This site from the Exploratorium Science Museum lists over 100 engaging activities that give children opportunities for hands-on science learning and the opportunity to build on science concepts.
- **www.nap.edu/readingroom/books/nses/html/**
  The National Science Education Standards were published in 1996 to provide guidelines for educators as they work to improve K–12 science instructional experiences for their students. This document can be used by all teachers to become familiar with the inquiry skills appropriate for specific grade level groupings.
- **www.project2061.org/tools/index.html**
  The Project 2061 publications developed by the American Association for the Advancement of Science are available online and are important tools for school science reform. The documents contain specific science literacy goals organized in benchmarks by grade level.

Suggested Print Resources

- Campbell, Brian & Lori Fulton. *Science Notebooks: Writing About Inquiry*. Heinemann, Orlando, FL; 2003.
- Hammerman, Elizabeth. *Eight Essentials of Inquiry-Based Science, K-8.* SAGE Publications, Thousand Oaks, CA; 2005.
- Llewellyn, Douglas. *Inquire Within: Implementing Inquiry-Based Science Standards.* SAGE Publications, Thousand Oaks, CA; 2001.
- Olson, Steven. *Inquiry and the National Science Education Standards: A Guide for Teaching and Learning.* National Academy Press, Washington, DC; 2000.
- Pearce, Charles. *Nurturing Inquiry: Real Science for the Elementary Classroom*. Heinemann, Portsmouth, NH; 1999.

TEACHER'S GUIDE CONSULTANT

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Science as Inquiry for Children™

Grades K–4

This guide is a supplement designed for teachers to use when presenting this program. The guide provides teachers with a brief introduction to scientific inquiry, a summary of this show, vocabulary, follow-up questions, activities and print & Internet resources for students and teachers to explore.

SCHLESSINGER SCIENCE LIBRARY

An Introduction to Science as Inquiry:

Science education can be viewed from two perspectives: knowledge and abilities. Having a strong knowledge base in science enables students to better understand the world around them. Practicing the skills of science while solving everyday problems, students will learn to raise good questions and find accurate answers about the objects, forces and organisms in their world. Instruction in both scientific ideas and processes is necessary for students to have a well-balanced science education.

Learning science skills should be an active process that allows children to focus on their own questions as they develop the ability to plan and execute a scientific investigation. Inquiry is the name given to the instructional approach that focuses on the processes of science. Students who are practiced in the inquiry approach find that these skills empower them to engage in problem solving in all areas of their lives. Inquiry-based teaching and learning goes well beyond the traditional scientific method to focus not only on engaging students in the "doing" of science, but also on teaching students how to become involved in the following general processes:

- Framing and asking scientific questions
- Making careful, systematic observations
- Conducting science investigations and experiments
- Using scientific equipment and tools
- Constructing reasonable explanations
- Communicating the findings of investigations and experiments
- Checking explanations against accepted scientific knowledge
- Evaluating the integrity of investigations and experiments

The National Science Education Standards: Science as Inquiry

In 1996, the National Science Education Standards were published, providing guidelines to educators as they work to improve K–12 science curriculum and instructional experiences for their students. The Standards deal with all traditional content teaching and learning expectations, along with the principles of Science as Inquiry. This important document lists specific science learning expectations within grade level groupings called "benchmarks" at grades K–4, 5–8 and 9–12. It would be helpful for all teachers to become familiar with this document to learn about the inquiry skills appropriate for specific grade level groupings.

Program Summary

Science is all around us at every moment of our lives. When we least expect it, the skills of scientific inquiry can come to the rescue! In this exciting program, two young students find themselves locked in their classroom at the end of the day after everyone has left school for a week-long spring vacation. The young scientists must use the inquiry skills they have learned in science class to help them escape. As they make observations and raise questions about their predicament, they have a surprise encounter with Benjamin Franklin, Marie Curie and George Washington Carver. These three famous scientists join forces to help the children sharpen their inquiry skills as they consider and test alternative methods for either surviving within the classroom or escaping from it safely. They jointly formulate and test hypotheses, including the building of a life-sustaining ecosystem and the development of a safe parachute system. All the while the "magic blackboard" automatically records the inquiry skills that are employed during this engaging science process.

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the show.

science — Knowledge and information about the world that is obtained through observing and experimenting. Science incorporates content knowledge and process skills including observing, classifying, predicting, measuring, experimenting and investigating.

scientist — Anyone who learns about the world in order to solve problems and answer questions.

inquiry — An organized investigation to gain information about something and solve problems. The process of inquiry involves seeking answers to questions by asking questions, looking for patterns, researching, developing a hypothesis and designing an experiment in order to test the hypothesis.

hypothesis — An educated guess; a proposed explanation for a scientific question or problem.

data — Measurements and observations collected and recorded during an investigation or experiment.

observation — The process of examining closely with attention to detail in order to gather data during an investigation or experiment.

evidence — Information gathered by scientists to help them explain the conclusions of their investigations.

investigation — The act of answering scientific questions through a carefully designed series of steps, possibly including: systematic observation, making measurements, collecting data and drawing and communicating conclusions.

experiment — An investigation in which the scientist attempts to test a hypothesis.

control — Part of an experiment that remains the same. Controls are needed in order to have something to compare the rest of the experiment to.

variable — Something that can change. Scientists try to control the way variables change when they perform experiments and often perform experiments many times to try to account for small changes due to variables.

model — A smaller or simpler version of something. By studying models, people can learn a lot about how real things work.

conclusions — Explanations that scientists come up with after they perform an investigation.

ecosystem — A community in which living things (plants and animals) and non-living things (air, soil and water) form a working environment that helps the living things survive.

Focus Questions

1. What are some of the key skills needed to do science?
2. Why is it a good idea to raise questions and to test out possible explanations before taking action?
3. Who were the three famous scientists that magically appeared in the classroom?
4. What are some of the things that made Benjamin Franklin a famous scientist?
5. What scientific discoveries made George Washington Carver famous?
6 What is Marie Curie famous for?
7. How can children use science to solve problems?
8. Why is listing your observations an important part of scientific inquiry?
9. How did George Washington Carver help Howard and Sally to use science skills while they were learning about ecosystems?
10. What science skills were used by the children studying the pond ecosystem?
11. Why is it important to take notes when you do an experiment?
12. What is a hypothesis? What do asking questions and making observations have to do with developing a hypothesis?
13. How do you test a hypothesis?
14. Once they learned about ecosystems, why did Howard and Sally decide that creating a classroom ecosystem would not help them solve their problem?
15. Why did the children make and test three parachutes of different sizes and drop them from different heights?
16. Why is it a good idea to repeat an experiment many times?
17. Why do you think that the kids decided not to jump out of the window with parachutes?
18. What did Howard and Sally learn when they conducted the investigation with the boiling water and the container with the ice?

Follow-up Discussion

- If you could ask one of the three scientists anything, what would you ask?
- One of the scientists said, "Inquiry is not always about discovering what works. In fact, some of the best investigations are those that fail!" Why do you think this is true?
- If Ben Franklin, Madame Curie or George Washington Carver walked into your classroom right now and asked you to explain what kinds of people were involved in science, what would you say to them?