Using Handouts and Activities

Big Ideas

$E=mc^2$ has a human story. Science is influenced by society.

Handouts (pages 18–20)

Who Was Einstein?* • *$E=mc^2$ Explained* • *Some Outstanding Women of Nuclear Physics

Place handouts in the *$E=mc^2$* display area or near related books. Distribute handouts to book groups before they read about related topics. For book suggestions, see handouts and resource lists (pp. 5–7). Use the questions at the end of handouts as discussion starters.

Magnet Maze (page 21)

Use magnets to move paper clips and learn about invisible magnetic force.

Big Idea

Science is a process of inquiry.

Ages: 3–7
Time: 10–15 minutes
Group Size: 1–10 children
Materials (per child): 1 bar magnet; about 12 small metal paper clips; *Magnet Maze* activity sheet taped onto a piece of poster board; pencil or crayon

Get Ready

Photocopy the *Magnet Maze* activity sheet and tape onto pieces of poster board. Obtain bar magnets from Nasco (www.enasco.com, 12 small magnets for $2.70, item #SB16503M) or Carolina (www.carolina.com, 10 large magnets for $12.50, item #95-5033).

Run the Activity

1. Introduce how magnets work by putting a paper clip on the floor or a low table. Ask: *Who can lift up this paper clip?* (A child will pick up the paper clip.) *Now, can you lift the paper clip without touching it? What if I give you a magnet?* (Child will use magnet to pick up the clip.) *So the magnet does something that moves the paper clip, even though we can't see what that is. Let's find out how strong this magnet's force is.*
2. Distribute materials to each child. *Can your magnet pick up two clips in a chain like this?* Demonstrate by picking up one paper clip with the magnet, then touching that clip to a second clip (don't link clips). *How many paper clips do you think your magnet could pick up? Make a guess and then try it.*
3. Explain that a magnet's force can even work through something else, like a piece of poster board. Hold the poster board at a slight angle, then move a paper clip on top of the poster board by holding a bar magnet underneath it. *Now explore your maze. Without touching the paper clip, can you move it through the maze?*
4. Encourage children to put the paper clip on top of other materials (such as a book, a glass jar, a table top). Does the magnet work through these materials?

What's Happening

Magnets are surrounded by a *magnetic field*, which generates a force that pulls on things that are made of certain kinds of metal (like paper clips). The magnetic field around the magnet can cause certain other objects, such as paper clips, to become temporarily magnetized and stick to the magnet. The stronger a magnet is, the greater distance it can act across, and through a thicker material, such as the poster board.

Running Activities

Try an activity yourself before doing it with a group. You will know what to expect and can modify materials or instructions based on your setting.

Share your enthusiasm for the topic—it will be contagious!

Photocopy the activity sheets onto colored paper for extra appeal.

Make extra copies of activity sheets for participants to take home.

Establish a signal—such as ringing a bell—that tells everyone to stop and listen to you.

Do not hand out materials until you are ready for participants to use them.

Connect the activity to science. At the end of an activity, ask: *What do you know now that you didn't know before you did this activity? What new questions do you have?* Point out that scientists, like Einstein, work in this way: Observations lead to questions, and investigating those questions leads to new ideas and new questions. Encourage participants to continue investigating at home.

$E=mc^2$ Puzzle (page 22)

Solve a crossword puzzle using questions related to Einstein and his ideas.

Big Ideas
Science is a process of inquiry. The legacy of $E=mc^2$ continues.

Ages: 8–13
Time: 15–20 minutes
Group Size: 1–10 participants
Materials (per person): *$E=mc^2$ Puzzle* activity sheet; pencil

Run the Activity

Distribute photocopies of the activity sheet and invite players to work alone or in pairs. Explain that players will complete a crossword puzzle by answering questions related to Einstein and his ideas. They can use the jumbled word bank for extra hints. Then they solve a riddle by arranging the circled letters of the completed crossword.

Answer to riddle: SOCKS

Putting the Pieces Together (page 23)

Work as a group to solve a puzzle and learn about the scientific process.

Big Ideas
Science is a process of synthesis. Science is influenced by society.

Ages: 10–14
Time: 15–20 minutes
Group Size: 6–10 participants
Materials (per group): 1 set clue slips (see Get Ready); *Putting the Pieces Together* activity sheets; pencils; scrap paper; table

Get Ready

Make clue slips by copying the clues listed at right onto index cards (one clue per card). Place clues in an envelope. Photocopy the *Putting the Pieces Together* activity sheet.

Run the Activity

1. Have each player pick a clue from the envelope. If there are fewer players than clues, go around again. If there are more players than clues, pair up extra players with those holding clues.
2. To get started, ask: *What kinds of things are on your clues?* (part of a name and part of a phrase) *What do you think might be the problem you need to solve?* (to figure out how the words go together)
3. Participants first need to determine that the scientists' names will help them pair up. Although some names may be unfamiliar, logic and elimination will help players form the correct pairs. Once correctly matched, give each pair a pencil and scrap paper so they can write down what their clue slips form (some need to be unscrambled). Then have the whole group decide what the lines together form. They can rearrange the lines by moving the sheets of paper on a table. If they get stuck, ask each pair to read aloud their line, or suggest they look for punctuation or rhyming words.
4. Once the puzzle is solved, hand out the activity sheet with the complete limerick. Talk about the problem-solving process by asking: *How many people did it take to solve this puzzle?* (many or all of them) *How is this like the way scientists work?* (Scientists collaborate and rely on findings of others to help make sense of their own work, find answers, and inspire new questions.) Even Einstein did not figure out everything behind $E=mc^2$ himself. He relied on centuries of questions, ideas, experiments, and debates that occurred before and while he was working. The names of the scientists on the clue slips are just some of the men and women whose work helped Einstein come up with his ideas.

Clue Slips

Albert
"Energy mass the

Einstein
and are same.

Marie
it…$E=mc^2$!"

Curie
I'll call

Galileo
he wasn't scared:

Galilei
And to reject Isaac Newton

Isaac
need just I

Newton
name; catchy a

Antoine–Laurent
Albert shrugged when

Lavoisier
his teachers glared,