

# RESOURCES

Help for Teachers

## Making Connections with Literature

Using literature as a supplement and enhancement for instruction is good teaching practice because:

- Children learn from everything they experience.
- Children learn more effectively when instruction is associated with positive emotions, such as those evoked by a good book.
- Literacy is key to children's success as learners.
- There are many different learning styles.

We encourage you to incorporate books of all kinds into your work with *Mechanisms and Other Systems*. We've included an annotated list of quality books of all kinds on the following pages—storybooks in which the use of mechanisms and other systems are demonstrated, as well as nonfiction books on how things work, how to make things, how to

conduct experiments, and how some people have had bright ideas that led to inventions that help us in our everyday lives.

But don't stop with these. You know your students and how they learn better than anyone else. When you see a book that might further your instructional goals, interest or challenge a particular student, or evoke feelings that make learning more fun, add it to the books that are available to your students.

## Mechanisms & Other Systems

***Action Robots: A Pop-up Book Showing How They Work***, by Tim Reeve. Dial Books: New York, 1995.

(Recommended grades: 2-6)

Fact-filled pop-up book describes the many kinds of robots that are being used today in science, industry, and medicine. Each page has a three-dimensional figure with tabs that can be pushed, pulled, or moved to simulate the actions of these remarkable machines. The book itself is a mechanism!

***Alexander and the Wind-up Mouse***, by Leo Lionni. Dragonfly Books/Alfred A. Knopf: New York, 1974.

(Recommended grades: PreK-3)

A fantasy about the friendship between a real mouse and a mechanical mouse. Enjoyable language arts extension for hands-on mechanism processing and inquiry-based questioning.

***Alexander Graham Bell: Making Connections***, by Naomi Pasachoff. Oxford University Press: New York, 1998.

(Recommended grades 4-6)

This compelling biography of a true scientific visionary charts the course of Alexander Graham Bell's remarkable life, showing how his early studies of speech and sound and his experience as an instructor of the deaf led to his invention of the telephone in 1876.

***The Berenstain Bears Go In and Out***, by Stan Berenstain and Jan Berenstain. Random House: New York, 2000.

(Recommended grades: K-3)

Going out to eat fast food isn't fast at all when the Berenstain Bears use the revolving door. This simple "Early Steps into Reading" book integrates mechanisms and fosters reading for beginners.

***The Berenstain Bears' Science Fair***, by Stan Berenstain and Jan Berenstain. Random House: New York, 1984.

(Recommended grades: K-4)

Papa Bear teaches Small Bear and Sister about machines and how they work and helps them prepare projects for a science fair. Information is presented in simple terms and lively pictures. An enjoyable, concrete extension to mechanisms for younger students.

***The Best of Rube Goldberg***, by Charles Keller. Prentice Hall: Englewood Cliffs, NJ, 1979.

(Recommended grades: 4 and up, Teacher Resource)

Contains a collection of more than 90 humorous inventions, which have appeared in Rube Goldberg's cartoons during his career. For 55 years, this cartoonist drew machines and contraptions of marvelous complexity and ingenuity to perform such basic tasks as scratching your back or hitting a mosquito. His mechanical inventions have fascinated, amused, and challenged people.

***Batteries, Bulbs, and Wires***, by David Glover. Kingfisher: New York, 1993. (Recommended grades: 2-6)

Activities and projects introduce how electricity and magnets work at home and in the everyday world. Filled with bright, clear photographs with at least one activity to illustrate each concept.

***Cars And How They Go***, by Joanna Cole. Thomas Y. Crowell: New York, 1983. (Recommended grades: 2-6)

Turn the key, shift the gears, step on the gas pedal, and drive away. It all seems simple until you look under the hood. Dozens of working mechanisms, push and lift, slide and turn, to make the power that makes the wheels go round. Reader-friendly visuals provide for easy comprehension of a car's mechanisms.

***Construction for Children***, by Barbara Eichelberger and Connie Larson. Dale Seymour, 1996.

A collection of activities focusing on problem solving, constructing, and evaluating working models based on themes from literature.

***Cutaway Trains: Look Inside Machines to See How They Work***, by Jon Richards. Millbrook Press: Brookfield, CT, 1998.

(Recommended grades: K-3)

Presents different kinds of trains, including steam trains, diesel locomotives, and electric monorails, and discusses how they perform various jobs. Detailed full-color illustrations peel off the outer layers to reveal the complex technology and mechanisms within some of the fastest and most powerful trains in the world.

***Danny Dunn and the Swamp Monster***, by Jay Williams. McGraw-Hill: New York, 1971. (Recommended grades: 4-6)

Danny and his friends discover a superconductor, which they use in an adventure in Africa involving an electric fish. Excellent explanations of electrical circuits, current, resistance, and magnetic fields are provided in the story.

***Dear Mr. Henshaw***, by Beverly Cleary. William Morrow & Co.: New York, 1994. (Recommended grades: 3-6)

In his letters to his favorite author, ten-year-old Leigh reveals his problems in coping with his parent's divorce, being the new boy in school, and finding his own place in the world. A portion of the book describes how the boy sets out to catch a thief by rigging a battery-powered burglar alarm to his lunch box, and how this invention gains him respect. An outstanding literary link for developing ELA skills while integrating circuits with literature.

***Doctor De Soto***, by William Steig. Farrar, Straus & Giroux: New York, 1990. (Recommended grades: K – 3)

This diminutive resourceful mouse dentist copes with the toothaches of various animals. He utilizes various mechanical devices in his practice to accommodate his patients. Excellent literature link for introducing mechanisms to young students, while integrating inquiry-based questioning and ELA skill development.

***Electric Gadgets and Gismos***, by Alan Bartholomew, Kids Can Press: Toronto, 1998. (Recommended grades: 4-6)

Battery-powered easily built gadgets that go. Clear step-by-step instructions and detailed color illustrations. Creative fun with hands-on mechanisms.

***Electricity***, by Peter Riley. Franklin Watts: New York, 1999. (Recommended grades: 3-6)

Explains simple circuits, generating electricity, motors and their uses in everyday life. Presents hands-on experiments.

## Mechanisms & Other Systems

***Garrett Morgan, Inventor***, by Garnet N. Jackson. Modern Curriculum: Cleveland, 1992. (Recommended grades: K-4)

A brief biography of the African American inventor that describes, in rhyming text, how his lifelong interest in machines led to the invention of the traffic signal. An excellent interdisciplinary literature link for mechanisms integrating technology, social studies and African American history.

***Get Ready for Robots!*** by Patricia Lauber. HarperCollins: New York, 1987. (Recommended grades: 4-6)

An introduction to robots, describing clearly and accurately the tasks they can perform at home and in industry, and the things they might do in the future. Explains the limitations of what robots can be programmed to “see” and “do,” and why some robots still need adult control.

***How Do You Lift a Lion?*** by Robert E. Wells. Albert Whitman: New York, 1996. (Recommended grades: 2-6)

Basic introduction to levers, wheels, and pulleys. It aims to introduce some principles of physics to young readers. The concepts of gravity, leverage, friction, and pulleys are illustrated accompanied by some physical problems involving animals. A very clever book for introducing young students to mechanisms.

***Levers***, by Michael Dahl. Capstone Press: Mankato, MN, 1996. (Recommended grades: K-3)

Describes the many kinds, uses, and benefits of levers. Lots of visuals with text. A helpful word-to-know list for students is in the back of book.

***Liz On The Move (The Magic School Bus)***, by Joanna Cole and Bruce Degen. Scholastic, Inc.: New York, 1999. (Recommended grades: K-6)

Wanda has a new tree house, and she is ready to move in with all her favorite things. Liz helps her friend get the job done in no time with a handy clothesline pulley, ramps, and wheels. An enjoyable look at using simple machines to make a task easier.

***Machines***, by Janice Van Cleave. John Wiley & Sons, Inc.: New York, 1993. (Recommended grades: 3-6)

A collection of science projects and experiments that explore simple machines. Primary grade students can use this link for projects with adult supervision. Upper grade students can be involved independently. A good teacher resource for classroom projects.

***Machines and How They Work***, by David Burnie. DK Publishing: New York, 1991. (Recommended grades: 3-6+)

Begins by defining machines and then discusses early machines, both simple and complex. Pictures like “Time and Motion” and “Bicycles” show the development of the modern machine. Mechanisms come alive as sundials, wristwatches, water wheels, modern hydroelectric generators, sewing machines, and cars are illustrated.

***Machines And How They Work***, by Harvey Weiss. Thomas Y. Crowell: New York, 1983. (Recommended grades: 4-6)

An introduction to six simple machines, and their use in more complex machines such as derricks, bulldozers, and metal lathes. Historical background material is provided along with modern examples. Reinforces understanding of basic physics principles!

***Machines as Tall as Giants***, by Paul Strickland. Random House: New York, 1989. (Recommended grades: K-3)

A variety of very large machines, including tower cranes, a dockyard crane, oil production platform, space shuttle, and a concrete silo are depicted on two pages sideways to emphasize heights. Easy to read text accompanies each picture.

***The Magic School Bus and the Electric Field Trip***, by Joanna Cole and Bruce Degen, Scholastic Inc.: New York, 1998. (Recommended grades: 1- 6)

Ms. Frizzle takes her class on a field trip through the town's electrical wires so they can learn how electricity is generated and how it is used. Many facets of electricity from circuits and switches to computers are covered.

***Marbles, Roller Skates, Doorknobs: Simple Machines That Are Really Wheels***, by Christopher Lampton. Millbrook Press: Brookfield, CT., 1994. (Recommended grades: 2 – 6)

Discusses the physical principles involved in the functioning of wheels. Explains how simple machines work that are actually wheels. Included examples are machines that are familiar to children such as a pizza cutter, a bicycle, and a water faucet. Well illustrated and easily comprehended.

***Mike Mulligan and his Steam Shovel***, by Virginia Lee Burton. Houghton Mifflin Company: Boston, 1977. (Recommended grades: K-3)

A fun book both in its text and gray crayon drawings! Mike Mulligan remains faithful to his steam shovel Mary Anne, against the threat of the new gas and diesel-engine contraptions. He digs his way to a surprising and happy ending.

***National Geographic: How Things Work***, by John Langone. National Geographic Society: Washington, D.C., 1999. (Recommended grades: 4-6+; also a teacher resource)

A fascinating and clearly written book that helps the reader understand the mechanisms and principles behind machines, processes, and systems. Stunning photographs and diagrams illustrate this book.

***The New Way Things Work***, by David Macaulay. Houghton Mifflin Company: New York, 1998. (Recommended grades: 5+/ Teacher resource)

From levers to lasers, windmills to web sites, a visual guide to the world of machines. This revised edition includes a new section devoted to digital machinery.

***On Wheels***, by Huck Scarry. Philomel Books: New York, 1980.

Join caveman Peter Pebble on a journey through time and space to observe the development of the wheel from its probable discovery in the Stone Age to the early 1900's and gasoline powered "horseless carriages." Also included are such wheel-related processes as road and bridge building, blacksmithing, and harness making. Integrates American history, world history, and social studies.

***Paper Engineering for Pop-Up Books and Cards***, by Mark Hiner. Parkwest Publishers: 1986.

Illustrates the ten basic mechanisms, which are used in making pop-up books. This book is a gem for teachers interested in acquainting children with the engineering principles of pop-ups both as an appreciation of books they enjoy and as an introduction to making their own. A great resource for hands-on mechanisms!

***The Pop-Up Book of Big Trucks***, by Peter Seymour. Little, Brown & Co.: Boston, 1989. (Recommended grades: 1-3)

Using a variety of moving parts, pull tabs, lift ups, die cuts, slides and hinges, this unique pop-up book involves readers in the workings of all sorts of big trucks. You can raise and extend the ladder, lift the tailgate, dump the sand, and turn the barrel on the cement mixer.

***Projects With Machines***, by John Williams. Gareth Stevens Children's Books: Milwaukee, 1990.

(Recommended grades: 2-6)

Provides instruction for making and using a variety of machines, including levers, diggers, cranes, and pulleys.

***Pulleys***, by Michael Dahl. Capstone Press: Mankato, MN, 1999. (Recommended grades: K-3)

Easy-to-read science book that describes the many different kinds, uses, and benefits of pulleys. Full color photographs are tied closely to text. Important words to know are listed at the end of the book.

***Richard Scarry's Pop Up Wheels***, by Richard Scarry. Simon & Schuster: New York, 1997. (Recommended grades: PreK-2)

This book is bursting with vehicles of all shapes and sizes. Hands-on connection for mechanisms with this pop-up!

***Roller Coaster Science: 50 Wet, Wacky, Wild, Dizzy Experiments About Things Kids Like Best***, by Jim Wiese.

John Wiley & Son: New York, 1994. (Recommended grades: 4 and up)

This entertaining and educational book describes the science behind such amusements as roller coasters, swings, bumper cars, curve balls, and more. Contains numerous activities and experiments to help reinforce scientific principles and covers a variety of disciplines including math, chemistry and physics. Great resource link for hands-on work with mechanisms.

***Seesaws, Nutcrackers, Brooms: Simple Machines That Are Really Levers***, by Christopher Lampton.

Millbrook Press: Brookfield, CT, 1994. (Recommended grades: 3-6)

Explains the principles involved in the functioning of levers, and how these simple machines are used in daily life. Graphics provide visual reinforcement.

***Simple Machines***, by Michael S. Dahl. Capstone Press: Mankato, MN, 1996. (Recommended grades: K-3)

Easy-to-read science book introduces young readers to simple machines, with full-color visuals tied closely to the text. The book provides basic information about levers, inclined planes, pulleys, and wheels and axles.

***Simple Machines***, by Deborah Hodge and Ray Boudreau. Kids Can Press Ltd.: Toronto, 1998. (Recommended grades: K-4)

Thirteen hands-on experiments are clearly explained using full-color photographs and step-by-step directions. Extensions of each activity are included in an appendix.

***Springs***, by David M. Glover. Heinemann: Portsmouth, NH, 1997. (Recommended grades: 2-6)

How are a jack-in-the-box, a door lock, and an umbrella alike? How can springs help you get somewhere on time? These questions and others are answered, and the book explains how different kinds of simple machines are all around us, making our work and play easier. Visuals provide easy comprehension of mechanisms and their purposes.

***Switch On, Switch Off***, by Melvin Berger. HarperCollins: New York, 1990. (Recommended grades: K-3)

The magic of a light switch is made accessible to everyone with this easy-to-read introduction to electricity, from the generator to the individual light bulb. The book includes an experiment in which electricity can be generated using just a magnet, a compass, and a piece of wire.

***Tom Edison's Bright Idea***, by Jack Keller. Steck-Vaugh: Austin, TX, 1992. (Recommended grades: 2-6)

A biography for beginning readers, focusing on the inventor's research with electricity and circuits and his invention of the incandescent light bulb.

***Until I Met Dudley: How Everyday Things Really Work***, by Roger McGough. Walker & Company: 1997.

(Recommended grades: 1-6)

A young girl used to have fantastic ideas about how things work, but Dudley, a bespectacled dog, tells her how it really is. He explains the workings of mechanical objects such as vacuum cleaners, refrigerators, dishwashers, toasters and garbage trucks. Each explanation is preceded by a fantasized description and illustration of how things might work in the world of imagination. Great for developing critical thinking skills.

***What Was It Like Before Electricity***, by Paul Bennett. Steck-Vaughn: Austin, TX, 1995. (Recommended grades: 2-6)

On a visit to great-grandmother, a boy and his friends learn about daily life and mechanical power before the availability of electricity. This book is easy to read independently, and provides an informative literary link for integrating science, technology, and language arts.

***The Wheeling and Whirling Around Book***, by Judy Hindley. Candlewick Press: Cambridge, MA, 1994.

(Recommended grades: K-3)

This book explores the virtues of circles and disks and spirals and spheres, of rolling and spinning and turning and churning. Some of the things it describes are merry-go-rounds, gears, axles and conveyor belts. It combines exciting stories, poems, and artwork with elements of the best non-fiction.

## Mechanisms & Other Systems

*Wheels and Axles*, by Michael S. Dahl. Capstone Press: Mankato, MN, 1996.

(Recommended grades: K-3)

An easy-to-read science book describing the many different kinds, uses, and benefits of wheels and axles. Full color photos are closely tied to text.

*Wheels and Cranks*, by David Glover. Rigby Education: Crystal Lake, IL, 1997.

(Recommended grades 2-5)

Introduces the principles of wheels and cranks as simple machines, using examples from everyday life. Great visuals.

*Wheels At Work*, by Bernie Zubrowski. William Morrow & Company: New York, 1986.

(Recommended grades: 5 and up)

A “Boston Children’s Museum Activity Book” lets you find out how useful and versatile the ordinary wheel is, with over 50 hands-on experiments. Helpful resource for classroom teachers looking for fresh ideas in extending mechanisms activities.

*Why Didn’t I Think of That?*, by Webb Garrison. Prentice-Hall: Englewood Cliffs, NJ, 1977.

(Recommended grades: 5 and up)

From alarm clocks to zippers, ballpoint pens, cash registers, elevators, Lionel trains, safety pins, sewing machines, windshield wipers, Yale locks, and more. Every one of these inventions came to its inventor as a brainstorm. A good resource for extended activities.



# Assessment

Nearly everyone agrees about the importance of assessment, but what exactly is it, and why is it so significant in education? In a very broad sense, education is like a very large design problem and assessment is the method of evaluating the design. However, education has many objectives, not just one, so assessment also includes a complex process of deciding what to assess and how. Another major complication is that many different kinds of people have a stake in the outcome of the educational process. Parents want to know how much their children are learning and how they can best help them. Politicians worry about the backlash from voters if the educational system appears to be “failing,” however that term is defined. Administrators fear that they will be held accountable for low test scores in their schools.

Teachers, who have the most sustained and direct involvement of any adults in the educational process, are constantly looking for ways of knowing how well and how much their students are learning. This data can come from both formal and informal assessment methods, and may be either qualitative or quantitative. At the same time, teachers are often held accountable to conflicting requirements that are difficult or impossible to meet. For example, the goal of providing a supportive and welcoming learning environment may be in conflict with the

regimentation imposed by administrative requirements. Another common concern of teachers is that high-stakes testing will require them to “teach to the test” rather than to support student learning.

Regardless of demands from outside the classroom, a teacher’s primary responsibility is to engage students in exploring and understanding the subject matter. Assessment includes any method of finding out how much of this exploring and understanding actually happens. Information gained through assessment is the only factual basis for knowing what students are learning, how to motivate learning more effectively, how and whether to redesign the curriculum, how to tailor it to the needs of individual students, and how and when to involve parents in the process. Assessment is far too extensive and important to be narrowly defined by standardized test results or to be determined by people outside the classroom.

Here are some basic conclusions that follow from this view of assessment:

- Assessment should be based on clear educational goals.
- Many different kinds of information should be collected as part of assessment. Some of the most important assessment data is totally unexpected.
- Assessment should not be divorced from curriculum; every learning

activity should also provide information for assessment.

- Whenever possible, students should become involved in assessing their own learning—for example, by evaluating their own designs or predictions.
- Assessment should examine not only what students have learned, but also the opportunities provided by the curriculum and the learning environment.

We will illustrate each of these points using examples from the teacher stories in Chapter 4 of this guide.

## Educational Goals

In order to assess the learning outcomes of an activity, it is necessary to know what the educational goals were. However, the purpose of a curriculum unit may not be so clear-cut. Any worthwhile educational activity probably has more than one goal. Also, a teacher’s goals may (and often do) change as the activity progresses, or there may be unintended outcomes that are far more significant than the original goals.

In thinking about assessment, it is important to regard educational goals in a broad, flexible way. For example, when Mary Flores began her unit on mechanisms, her primary goals were for her students to understand the concept of a mechanism, see some of

the purposes of mechanisms, and be able to identify simple machines within more complex mechanisms. As the unit unfolded, however, a new issue developed that was at least as significant as any of the original intentions. The culminating activity was to be the design of “Rube Goldberg” devices using the simple machines the students had studied. Quite by accident, the custodian discarded some of the students’ initial designs. Although Mary was crestfallen, the students saw this mishap as an opportunity to redo and improve upon their original designs. Thus the focus of the unit became the design process itself, and the possibility of revisiting an initial design and making it better.

Rigid adherence to an initial set of goals assumes that the educational process is entirely predictable, which is not the case. Every teacher has both short- and long-term goals for her students, and it is difficult to know in advance when something will happen to advance the long-term goals unexpectedly. As one teacher put it during a discussion on assessment, “You can talk about goals all you want, but what I really care about is that they feel good about themselves and about what they are able to accomplish.”

## Information from a Variety of Sources

If educational goals are complex and multifaceted, so are the means of

assessing to what extent these goals are met. The narrowest view of assessment, most popular in political circles, confines it to standardized tests. A somewhat broader view expands assessment to include all kinds of paper-and-pencil instruments designed specifically for assessment, such as worksheets, homework assignments, tests, and quizzes.

Our view of assessment is broader still. In the course of an activity, nearly anything students do generates information that is valuable for assessment. To give just one example, when students talk about their work, they often provide useful data about the learning process. Mary’s student Priscilla, for instance, provided this little gem of information about how she was grappling with the design process: “It’s making me angry, because I tried hard to make my mechanisms work, but now I have to make another one.”

Part of the attraction of teaching is that much of what happens in the classroom is unpredictable, and some of the surprises are pleasant and even thrilling. Consequently, it is impossible to decide in advance what all of the methods of assessment will be. Often, serendipity provides ways of assessing students’ learning that nobody could have anticipated. A dramatic example, already cited, occurred when the custodian threw out Mary’s students’ work, forcing them to redesign it and reflect on the design process. More mundane examples happen frequently. Unexpectedly, a child may make a comment or ask a question that indicates reflection about the concepts

and connections made among them. For example, one of Angels’ students asked, “What materials are inside the pull-string switch in the garden area? Wouldn’t the inside of the switch burn with all that electricity and heat?”

## Curriculum as a Major Source of Assessment Data

In order to maximize the amount of information available, the curriculum itself must be seen as a rich source of assessment data. Each of the teachers whose stories appears in Chapter 4 of this Guide used a brainstorming activity as part of a unit. Annette Purcell asked her first-graders for examples of tools and what they do; Mary Flores and Shirley Nieves asked their special education students to cite mechanisms from their own experience; Kathy Aguiar elicited examples of controls from her third-grade special education students; and Angel Gonzalez requested instances of switches from his fifth-grade science students.

Each of these brainstorming sessions was both a worthwhile educational activity and also a valuable opportunity to assess the students’ prior knowledge about the topic. Similarly, when Shirley’s students sorted mechanisms by categories, they were both learning about mechanisms and providing their teacher with useful assessment data. The same could be said of virtually any activity associated with a curriculum unit. Model making, design activities, presentations to the class, journals, and discussion within a work group are all potential sources of assessment information.

## Students Assess Their Own Learning

Should the audience for assessment data include students themselves? Obviously, students need to know how well they are doing, so they can gauge their own efforts and develop realistic goals for their own learning. However, traditional assessment is usually presented to students in an adversarial manner, in the form of test grades and report cards that frequently undermine rather than enhance their motivation for learning. In traditional forms of assessment, students are always evaluated by adults rather than by themselves, and the outcomes of assessment often have high stakes. Both of these factors contribute to the view of assessment as an antagonistic process. How can students gain access to candid data about their own learning without interpreting it as somehow the product of bad intentions?

A way out of this dilemma is suggested by some of the activities in Chapter 4. Technological analysis and design activities often provide occasions for self-assessment, where students evaluate their own work against an objective standard rather than one arbitrarily set by adults. Angel's students, for example, discussed the role of switches in circuits by making the analogy with the role of valves in controlling the flow of water. Then they took apart and examined some switches to see how they interrupt and restore the flow of electricity when

turned off and on, respectively. As a culminating activity, they had to design their own switches and incorporate them into systems such as intrusion alarms. This design project was also a form of self-assessment. As the students tested their own designs to see if they worked, they were also evaluating how much they had learned about switches and whether they had been able to apply this knowledge to a practical design problem.

## Assessing the Learning Environment

Like anybody else who designs or plans anything, most teachers engage in informal assessment of their work on an ongoing basis. They ask themselves, "Is it working?" This question is really one of self-assessment: "What is the quality of the learning opportunities I have provided for my students?"

Some of this self-assessment by teachers is based on student learning outcomes of the many kinds described above. At the same time, teachers also assess learning opportunities on the basis of their own perceptions and experiences. Several examples of these self-assessments appear in the teachers' stories in Chapter 4. Annette, for instance, states, "Several children found the movement of the scissors confusing. I would change the presentation by suggesting that they keep one part of the scissors fixed. The stationary part would make a better frame of reference for seeing the movement of the other part."

Mary actually revised her activity in midstream based on a self-assessment: "I instructed the morning students to begin grouping the mechanisms. Things did not go smoothly. They did not understand the term grouping. I had to think quickly. How could I get them to understand the concept?" By the end of the day, she had invented an activity on grouping in which students categorized themselves based on their similarities and differences.

Angel went even further. Finding that some students "were having difficulty and became frustrated in setting up complete circuits," he decided to interrupt the work on controls and switches. His students spent the next two months doing a "batteries and bulbs" unit from a science curriculum before returning to electrical controls later in the year.