



National 4-H Curriculum
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Electric

Group Helper's Guide





Acknowledgments

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The Story of Electricity and Magnetism by Bernard Seeman, 1967, Harvey House, Inc., New York

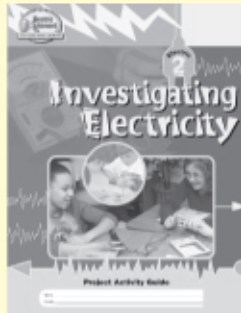
Science Projects About Electricity and Magnets by Robert Gardner, 1994, Enslow Publishers, Inc. Springfield, NJ.

For more on Electricity, look for these other guides in this set.



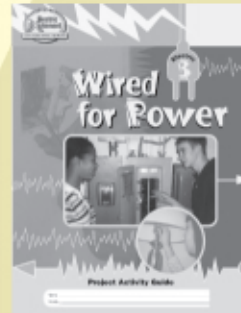
Magic of Electricity

- Chapter 1: Getting Started**
- Activity 1 Plugging in
 - Activity 2 Getting It Together
 - Activity 3 Bright Lights
- Chapter 2: Electricity on the Move**
- Activity 4 Control the Flow
 - Activity 5 Conducting Things
 - Activity 6 Circuit Sense
 - Activity 7 Is There a Fork in the Road?
- Chapter 3: Magnets in Motion**
- Activity 8 May the Force Be with You
 - Activity 9 A Passing Force
 - Activity 10 Attract or Repel?
 - Activity 11 Earth Attractions
- Chapter 4: Current Attractions**
- Activity 12 Electric Attractions
 - Activity 13 Sense the Current
 - Activity 14 Make it Spin



Investigating Electricity

- Chapter 1 Getting Started**
- Activity 1 Get It Together
 - Activity 2 Going Back and Forth
 - Activity 3 The ElectriDetective's Most Important Tool
 - Activity 4 Investigating Ohm's Law
 - Activity 5 To Flow or Not to Flow
- Chapter 2 Understanding Circuits**
- Activity 6 Decoding Circuit Diagrams
 - Activity 7 Case of the Series Circuit
 - Activity 8 Case of the Parallel Circuit
- Chapter 3 Circuits in Action**
- Activity 9 Circuit Sense
 - Activity 10 The Off and On Case
 - Activity 11 The Case of the Switching Circuit
- Chapter 4 Electricity at Work**
- Activity 12 Stronger Connections
 - Activity 13 Stop the Crime



Wired for Power

- Chapter 1: Let's Get Started**
- Activity 1 Tools Are Important
 - Activity 2 The Code of Safe Practices
 - Activity 3 How Much Electricity Are You Using?
- Chapter 2: Looking for Electricity**
- Activity 4 Where the Service Begins
 - Activity 5 Wired for Power
 - Activity 6 Light Up Your Life
 - Activity 7 What's In a Name (plate)?
- Chapter 3: Understanding Electricity**
- Activity 8 How Much Is Too Much?
 - Activity 9 What's In the Box?
 - Activity 10 Is It Live?
 - Activity 11 Are Your Outlets Grounded?
- Chapter 4: Putting it Together**
- Activity 12 The Amazing Journey
 - Activity 13 Waits What?
 - Activity 14 You the Electrician



Entering Electronics

- Chapter 1 Introducing Electronics**
- Activity 1 What Is This and That?
 - Activity 2 Hunting for Electronic Wizards
- Chapter 2 What do I need?**
- Activity 3 How Many and How Much?
 - Activity 4 Hot Wire Hook-Ups
 - Activity 5 The Capacity to Resist
- Chapter 3 Learning About Semiconductors**
- Activity 6 Diodes—One Way Only!
 - Activity 7 Dim Your Bright Lights!
- Chapter 4 Performing with LEDs**
- Activity 8 Does Your LED Glow?
 - Activity 9 How Fast Do I Blink?
- Chapter 5 Who's Been Snooping?**
- Activity 10 Gotcha!
 - Activity 11 My! How Bright is the Light?
- Chapter 6 Bigger and Better!**
- Activity 12 Surprise! Surprise!
 - Activity 13 More Volume, Please!

Electric

Group Activity Guide

Contents

| | |
|--|----|
| The Experiential Learning Process | 2 |
| Developing Life Skills | 3 |
| Youth Learning Characteristics | 4 |
| Chapter 1 Electric Explorations | |
| Activity 1 Generating Electric Excitement | 6 |
| Activity 2 Conducting an Electric Skillathon | 8 |
| Activity 3 Tour Time | 11 |
| Activity 4 Loading the Circuit | 12 |
| Activity 5 Switching Switches | 14 |
| Chapter 2 Electric Games | |
| Activity 6 Electric Quiz Bowl | 16 |
| Activity 7 Hunting for Hazards | 18 |
| Activity 8 Electric Bingo | 20 |
| Activity 9 Playing Electric Pyramid | 22 |
| Activity 10 Electric Glossary Game | 24 |
| Activity 11 Guessing Game | 26 |
| Chapter 3 Talking About Electricity | |
| Activity 12 Parts and Symbols | 28 |
| Activity 13 Show Time | 30 |
| Activity 14 Public Performance | 32 |
| Electric Project Meeting Ideas | 34 |
| Evaluating the Impact | 35 |
| Electric Resources | 36 |



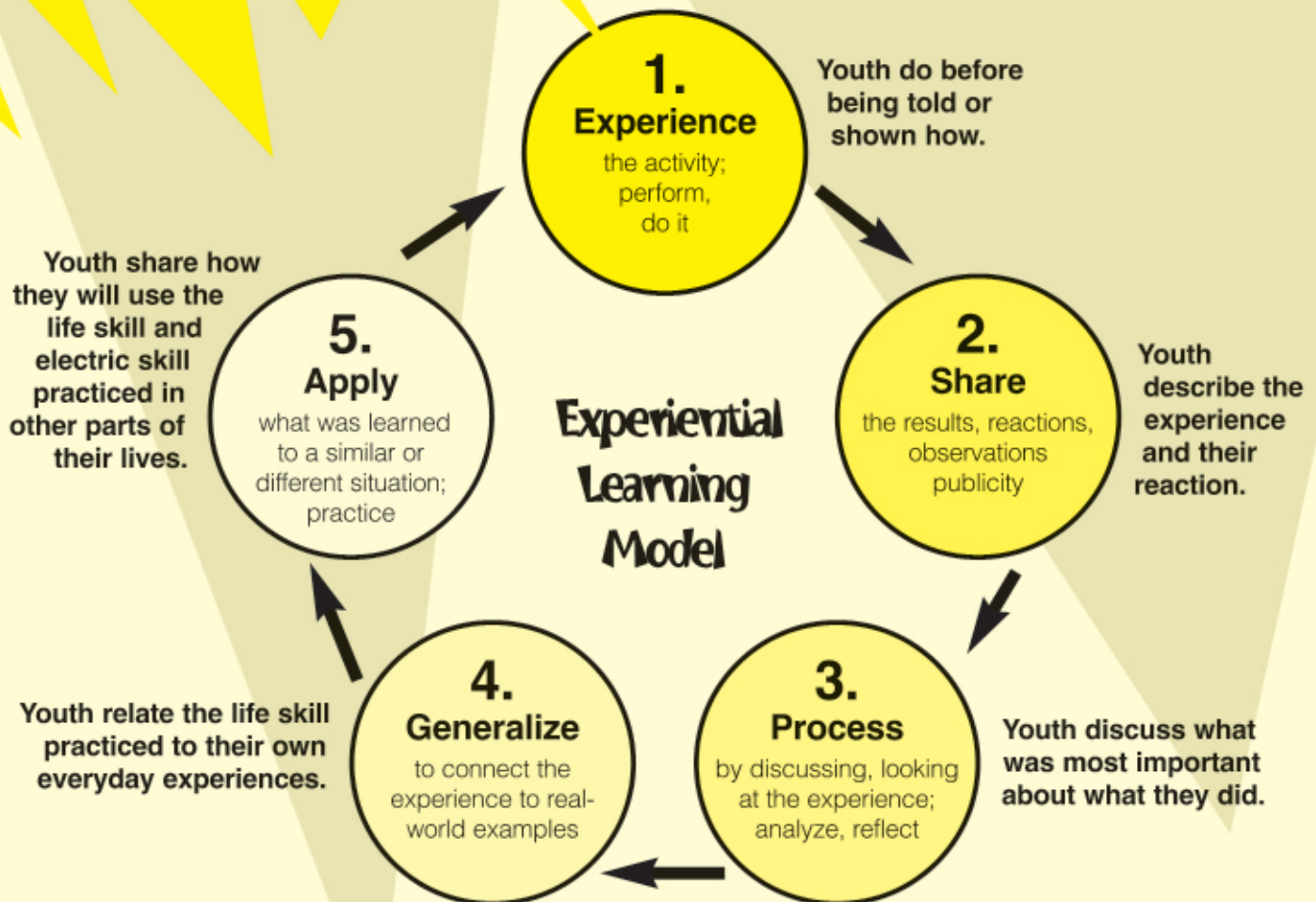
The Experiential Learning Process

Learning throughout the Electric Excitement Series follows a model known as the experiential learning process. Experiential learning requires personal participation and hands-on involvement (learning by doing) in the learning process. Youth learn by participating in the acquisition of new knowledge and skills.

Hands-on learning helps youth learn personal initiative, hard work, patience and deferred gratification. Although they may need to try something several times, do not be tempted to do a project for them. It is through trial and error, practicing and problem solving that the youth understands new information and skills, and feels pride in the personal ownership acquired through a hands-on experience.

The five steps in this learning model encourage the young person to try to do the activity before being told or shown how. The activity is the experience part of the cycle. Use the questions listed in the *Making Connections* section of each activity to encourage the young person to think about what he or she has learned from the experience. The reflect and application questions ask the youth to **share** what they did; **process** what was most important about the experience; **generalize** the life skill and electric skill practiced to their own lives; and think through how they could **apply** the life skill or science process skill to a new situation.

To fulfill the experiential learning process, you must complete all the steps, including the review questions in *Making Connections*. The experiential model enhances learning and adjusts to a wide variety of learning styles.



Pfeiffer, J.W., & Jones, J.E., "Reference Guide to Handbooks and Annuals" © 1983 John Wiley & Sons, Inc. Reprinted with permission of John Wiley & Sons, Inc.

Developing Life Skills

Planning and Organizing

Importance of the life skill

Youth who can plan and organize are able to set goals, build teamwork with others, assign tasks, create enthusiasm, work efficiently without supervision, communicate with peers and leaders, meet deadlines and show self-confidence.

Ideas for developing the life skill

Give youth experience in planning and organizing individual and group activities, demonstrating, setting up skillathons, nurturing other youth, learning cooperatively, creating and managing community projects, working with people who are different from themselves, assessing results and communicating.



Making Decisions

Importance of the life skill

Youth with this skill learn to recognize how personal values influence their own decisions and those of others, to develop an individual decision-making process, to set priorities, to make informal decisions and to evaluate their own decisions.

Ideas for developing and practicing the life skill

Give youth experience in identifying their own values that influence decisions – identifying problems, gathering information, comparing and selecting alternatives, judging and presenting oral reasons, debating and making real decisions and anticipating the results of actions that have significant consequences.



Communicating with Others

Importance of the life skill

Youth who have learned to communicate well with others are able to exchange ideas and information clearly and minimize confusion for themselves and others. Their personal relationships tend to be satisfying as they share feelings honestly, resolve conflict in healthy ways and can both give and receive support from others as situations change.

Ideas for practicing the life skill

Give youth experience in communicating in a variety of ways: verbal and nonverbal (body language) through art, music, drama and more. Encourage public as well as personal communication. Offer opportunities for exchanging ideas, labeling and sharing feelings, encouraging those different from themselves and participating in cooperative decision making.

Youth Learning Characteristics

Grades 3–5

Active" is the word for this group! Activities should encourage physical involvement, as 9 to 11 year old boys and girls are anything but still and quiet.

Hands-on involvement with objects is helpful. Children this age are still fairly concrete thinkers and will pay attention if they are both seeing and doing things. They also need many opportunities to share their thoughts and reactions with others.

Children at this stage are just beginning to think logically and symbolically, and are beginning to understand abstract ideas. As they consider an idea, they think it is right or wrong, great or disgusting or, fun or boring. There is very little middle ground.

The role of the leader is critical at this stage. These children look to adults for approval, and follow rules primarily out of respect for adults. Individual evaluation by adults is preferred over group competition, where only one can be the best. Comparison with the success of others is difficult for these children because it erodes self-confidence. Instead of comparing children with each other, build positive self-concepts by comparing present to past performances for the individual.

This is also the age of the "joiners." Boys and girls like to be in organized groups of others similar to themselves. They

generally are concerned with immediate self reward. The satisfaction of completing a project often comes from pleasing the leader or parent rather than from the value of the activity itself.

Nine, ten and eleven year old children have a strong need to feel accepted and worthwhile. School and other pressures are demanding. Success should continue to be emphasized. Youngsters want to know how much they have improved and what they should do to be better next time. Individual evaluation and encouragement from an adult can have remarkable results.



Grades 6–8

This developmental stage varies widely among young teens. Growth spurts beginning with adolescence occur at a wide range of ages, with girls usually maturing before boys. These rapid changes in physical appearance may make some teens uncomfortable. Faster developing teens may feel thrust into a more adult world they didn't choose. Slower developing teens may be uneasy about their lack of changes.

Young teens move from concrete to more abstract thinking. Playing with ideas is as much fun as playing sports. Ready made solutions from adults are often rejected by young teens in favor of finding their own solutions. Leaders who provide supervision without interference will do well with this age group.

Small groups provide the best opportunity for young teens to test ideas. Justice and equality become important issues. Opinions of peers become more important than those of parents or other adults. Teens enjoy the social interaction and acceptance they receive in groups.

As puberty approaches, young teens begin a roller coaster ride of hormones and emotions. This time period seems to present the biggest challenge to a young person's self concept. These youngsters face so many changes that they hardly know who they are. Young teens begin to test values and seek adults who are accepting and willing to talk about values and morals. Adults can help by providing self-discovery activities that lead young teens to self-knowledge.

Continue to avoid comparing young people with each other, and be careful not to embarrass them. They want to be a part of something important and have opportunities to develop responsibility.



Youth Learning Characteristics

Grades 9–12

Most teens of this age are aware of their special abilities and talents, and have usually adjusted to the many post-puberty body changes. Mid-teens tend to be wrapped up in themselves and their peer group rather than family, teachers and other adults. Relationship skills are usually more developed. Dating increases and acceptance by members of the opposite sex is of higher importance.

Mid-teens begin to think about the future and make realistic plans. Their vocational goals influence the activities they select. Teens set goals based on their personal needs and priorities. Any goals set by others are generally rejected. As they master abstract thinking, they can imagine new things in ways that sometimes challenge adults.

These teens can generally initiate and carry out tasks without supervision. They can help younger members plan and complete their projects. They should be encouraged to take on this role. A leader can be helpful by arranging new experiences in areas of interest to teens, but must be sure to allow for plenty of input. The leader should play the role of advisor/coach for independent workers.



Special Acknowledgements:

The concept for several activities in this guide originated in the 4-H Animal Science Series. We appreciate their permission to adapt them for this Electric Series.

Generating Electric Excitement

Electricity project meetings offer exciting settings for youth in developing electrical, as well as life skills. Clubs and groups that plan their year's program together find that everyone stays more involved and interested each time the group meets. This activity has been designed to help your group make plans that everyone will want to support. You will find activities for involving your group in the planning process. A list of possible electrical meeting topics is on page 34. Before meeting with younger youth, you may want to talk to the parents to see what they feel their children need and how your leadership can help so that the planning meeting can be a profitable experience for all.

Power Up

At the planning meeting, ask the youth and their parents to discuss what they would like to learn about electricity and what they would like to do as a group. Suggest looking through the electricity activity guides and the list of meeting topics for additional ideas. Your role is to create a situation in which the youth (and their parents) can develop both electric and life skills. Helping a group plan a year's program or just one meeting takes patience and the ability to "sit on one's hands" while the members work together. Here is a technique for generating ideas and arriving at decisions.

Plugging In

Have everyone review the topics in the appropriate electricity activity guide. Then ask each person to write ideas for group meetings and supportive activities (field trips, tours, community service projects, etc.). Sometimes youth can generate more ideas by working together in groups of two or three, with one person writing down the ideas. Allow five or ten minutes for brainstorming.

Have each person share his/her ideas in round robin fashion. One person or group shares an idea, then the next and so on until all ideas have been recorded on a blackboard or a large sheet of paper. List the ideas quickly without discussion. After all the ideas are listed provide time for the person who suggested the idea to clarify or explain it. Others can add support, questions or criticism. After a short discussion, move to the next idea.

| | |
|------------------------------|---|
| What Group Will Do: | <i>Plan a one-year program of group projects and activities</i> |
| Life Skill: | <i>Planning, organizing and communicating</i> |
| Electric Skill: | <i>Planning electric activities</i> |
| Success Indicator: | <i>Complete planning a year's program</i> |
| Target Audience: | <i>Grades 3 to 12</i> |
| Time: | <i>1 hour</i> |
| Suggested Group Size: | <i>3 to 20</i> |



marker

From all of the ideas generated and discussed, have each individual rate the items in order of their preference on a separate sheet of paper. You may want them to indicate their top five or ten choices. If ten choices were selected, the top choice would receive a ten and the last choice a one.

Read each idea and have all members furnish their rankings. Add up the numbers. The items with the highest score are those that the majority are most interested, and should be considered as the activities for the year. Allow time to discuss the choices as they relate to the group's overall goals. From the decisions made, make up the list of topics for the year's program.

Sharing Responsibility

Now that the group has decided what it wants to learn more about, you will want to be sure that everyone shares in the responsibility of seeing that it happens. Allow as many members (and families) as possible to volunteer for specific job(s) during the year, such as, recreation, demonstrations, organizing field trips, refreshments and hosting the main program. If the group is large, the team approach is encouraged.

Completing the Program

Write an outline so everyone can see the plan taking shape. An example of one possible format follows. After the program is completed, make copies for each family. You might include a list of everyone's name and phone number.

Closing the Circuit

After the group has decided on their goals, years activities and meeting criteria, take the time to discuss the questions provided under *Making the Connection*. Talk about the ways that brainstorming, group cooperation and discussion aid in decision making.

Electricity Meeting Calendar

Name of Group _____ Name of helper/leader _____

Group goals for the year _____

1. All members complete at least one-half of their achievement programs

2. Plan and conduct a community service project
3. Involve each family in activities

| Meeting Date, Time & Place | Meeting Topic and Planned Activity | Who Is Responsible | What to do Before Next Meeting |
|---------------------------------------|------------------------------------|--------------------|---|
| March 1 7 p.m. Vang Family Home | Building a burglar alarm | Junior Leaders | Install your burglar alarm at home. Come to next meeting and report where you installed it. |



Meeting Ideas!



Making Connections

Share With Your Helper

- How did you make the plan for the year?
- How did you feel about our planning session?
- How was everyone involved?

Process What's Important

- Why are decisions made through discussion more often accepted than those made by voting?
- Why is it important for youth, parents and leaders to work together on planning activities?

Generalize To Your Life

- What life skills do you practice when planning together?
- How does making a plan help you manage your time and your schedule?
- How will this experience help you plan family experiences?
- How will it help you plan in other areas of your life?

Apply What You Learned

- How will the way you plan your week or year change as a result of this experience?



Conducting an Electric Skillathon

The youth in your group are interested in testing their electric skills and working together to solve problems. An Electric Skillathon is a great way for them to perform a wide variety of electric skills and to discover new areas of interest. The Electric Skillathon works well at project meetings, group meetings, in the classroom or at a mall or fair.

An Electric Skillathon is a series of learning stations at which teams are presented with realistic situations and tasks to do. The teams attempt to complete the task before being told or shown how. The operator at each station follows with questions to help the teams build on their experiences.

Completing these five tasks will help your group organize an Electric Skillathon:

1. Decide on the stations topics, considering time and resources available.
2. Make up a realistic situation and task sign for each station so participating teams do not require additional directions.
3. Decide who will be in charge of each station.
4. Decide what equipment and supplies will be needed at each station.
5. Delegate responsibility for gathering supplies.

Power Up

Organizing an Electric Skillathon is an excellent activity for youth to practice developing their planning skills. People and materials need to be organized, decisions made and signs prepared. To help guide the planning committee, some of the tasks to be considered are listed under Station Idea Starters. A series of stations can be set up using almost any of the general areas listed under Electric Project Meeting Ideas on page 34.

What Group Will Do:

Plan, conduct and participate in an Electric Skillathon

Life Skill:

Planning and organizing

Electric Skill:

Developing electric skill and knowledge

Success Indicator:

Participates in an Electric Skillathon

Target Audience:

Grades 4 to 12

Time:

10 minutes per station

Suggested Group Size:

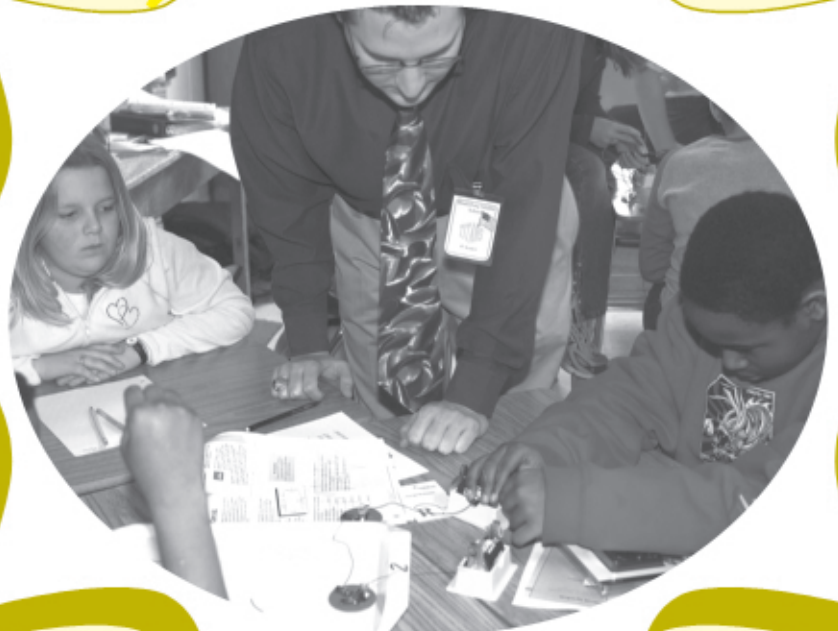
8 to 40



Station signs, situation and task signs, materials necessary for the team to perform the tasks at each station

Plugging In

Once the stations are prepared, begin the skillathon. Depending on the size of the group and the number of stations, form the youth into teams of two to four. Start each team at a different station. The members of a team work together to complete the tasks outlined. Allow about eight minutes at a station and then have the teams rotate to the next station. After each team has visited each station follow with questions about each station and the overall activity. The questions that follow will help the youth reflect on what they have learned by planning, conducting and participating in a skillathon. Follow up with the *Making Connections* questions at the completion of this activity.



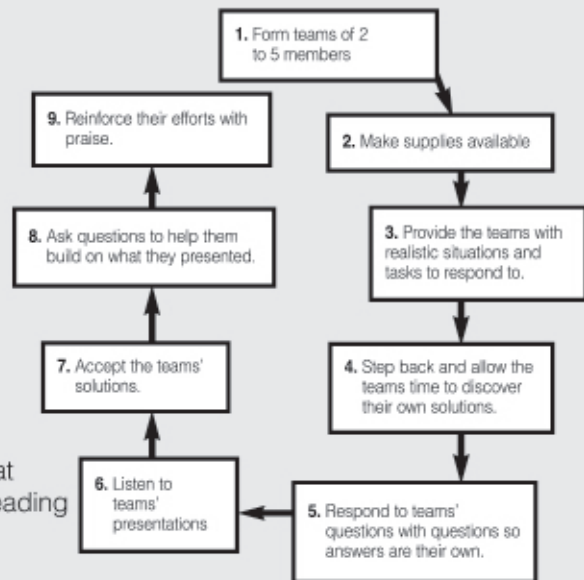
The Station Facilitator

The role of the station facilitator is very important. This person has the following responsibilities:

1. Become familiar with the topic.
2. Develop several questions to ask.
3. Allow the team members time to discover for themselves how to accomplish the task, before giving hints or telling or showing them how.
4. Facilitate the learning situation for each team in the following manner.

Setting Up Stations

Each station should have an 8 1/2- x 11-inch standup sign that clearly indicates the situation and task of the station. After reading the sign, the teams should be able to start solving the task immediately without coaching by the facilitator.



Station Idea Starters

What's on a Nameplate?

Situation: You want to know how much energy an appliance needs to operate.

Your task: Given these electrical appliances, identify watts and amps of each.

Materials: Approximately 5–10 different electrical devices with nameplates, answer cards with corresponding information.

Identifying Various Electric Symbols

Situation: When building electrical projects, you must be able to recognize certain symbols.

Your task: Identify the codes on this poster board.

Materials: Poster board with symbols appropriate for youth's knowledge level (use symbols from Electric Excitement Series Books 2, 3 and 4), answer cards with the correct identification for each code.

Classifying Circuits

Situation: You must determine the type of circuit to build.

Your task: Look at the diagrams and label the circuits as parallel or series.

Materials: Posters or flash cards with various circuit diagrams (use parallel and series circuits from Electric Excitement Series Book 1 The Magic of Electricity); answer cards with the words PARALLEL or SERIES for each appropriate diagram.

Stripping a Wire

Situation: In order to connect two pieces of coated wire, you must first expose the bare wires.

Your task: Using any of the tools provided, strip a 1-inch piece of coating from the wire.

Materials: Coated wire, wire cutter, wire stripper, knife, ruler.

Demonstrate the Use of a Volt-Ohm Meter

Situation: You need to decide which extension cords are live.

Your task: Using the volt-ohm meter, test the extension cords.

Materials: Volt-Ohm meter, four extension cords with only the ends showing (at least one cord not plugged into a wall socket).

Identifying Tools and Their Uses

Situation: You are ready to start an electric project and need a few tools.

Your task: Match the name card and function card with the proper tools.

Materials: Assortment of tools, cards with the tools name on them, and cards with the tools use on them.



Conduct an electric skillathon at a county fair or in a classroom.

Magnetic Materials

Situation: You are working at a re-cycling plant and want to use a large magnet to separate out the recyclable materials.

Your task: Identify which of these products can be separated out.

Materials: Various household items that will and will not be attracted to a magnet (pop can, soup can, plastic milk jug, glass jar, newspaper, etc.).

Selecting a Stereo

Situation: You are purchasing a new stereo and want to choose the most functional one for the money.

Your task: Identify wattage consumption from a 110V line, wattage rating for each speaker, and how many different inputs and outputs (i.e. aux, mic, tv) are possible.

Materials: Owners manual for a stereo (could also use manual for VCR, camcorder, etc.).

Steps of Soldering

Situation: You need to connect two pieces of wire to make a strong conducting connection.

Your task: Given two pieces of wire, twist and solder the joint.

Materials: Soldering iron, pieces of wire, solder, paste flux, wet cloth and a pair of alligator clips on a stand to hold the wires while soldering.

Labeling Home Electrical Supplies

Situation: You go to the hardware store for supplies and need to know the difference in products and how they are used.

Your task: Match the name card to the electrical item.

Materials: Approximately 10 to 20 items including: different types of switches, receptacles, fuses, hand tools, light bulb sockets, wall plates, etc. and corresponding answer cards for each item.

Flashlight Troubleshooting

Situation: You have two identical flashlights, but "flashlight A" doesn't work.

Your task: Determine what is wrong with "flashlight A" and make it work.

Materials: Two flashlights, one doesn't work (possible problems: bad bulb, one or more dead batteries, corroded surface, etc.).

Reading and Calculating the Bill

Situation: You are interested in knowing how many cents you spend per kilowatt hour.

Your task: Using the electric bill, calculate cents per kilowatt hour.

Materials: Residential electric bill, paper, pencil, calculator.

Adding Amps on a 120V Circuit

Situation: You continually overload a 15 amp circuit.

Your task: Decide which appliances you can use at one time without exceeding circuit capacity.

Materials: Nameplates of different appliances or written cards with wattage for each item (i.e. microwave, toaster, hair dryer, light bulb, etc).

Hint: 80% of circuit rating is considered a full load.

Operating Cost

Situation: You want to determine how much it costs to run five different electrical devices for one hour.

Your task: Using the answer in the previous exercise decide how much it would cost to run these appliances.

Materials: Nameplates for five different appliances or load information written on paper, answer to the previous exercise or a cost/kilowatt hour, paper, pencil and calculator.



Making Connections

Share What Happened

- What did you do to organize the skillathon?
- How did it feel solving a problem at each station?
- How did you work as a team?

What's Important

- What makes a skillathon a good activity to practice solving problems?

Generalize To Your Life

- What is your usual way of solving a problem?

Apply What You Learned

- How could you improve your problem solving in the future? Who or what might help?

