Using Challenge-based Learning Strategies to teach **Basic Electricity Concepts and Skills to Youth**

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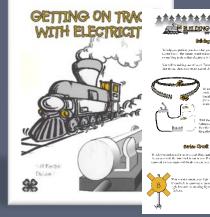
Challenge-based Learning is:

- collaborative
- hands-on
- students working with other students, their teachers, and experts in their communities and around the world

to develop deeper knowledge

1. Electricity for Youth I Manual

Paper-based



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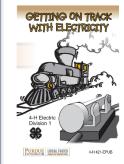
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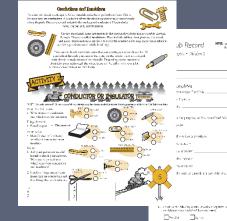




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1. Electricity for Youth I Manual (continued)

• Editable, video enhanced PDF





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2. Electricity for Youth I CD



3. Teacher resource

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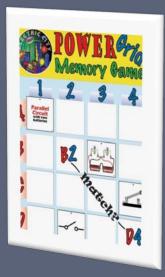
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Lesson plans

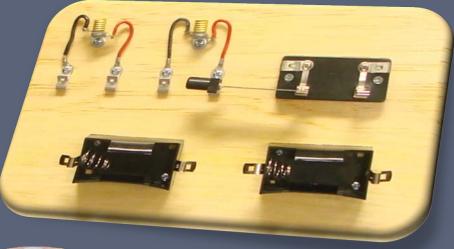
State education standards

Hands-on activities





4. Wiring board

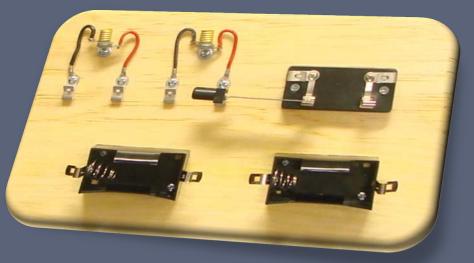








The school-based electric curriculum is designed as an exploratory activity set in the context of a "challenge."



For example, the student(s) are given a kit and told "make light." In teams of two they experiment to accomplish that challenge. Other challenges would follow.

Facilitator Guide We use electricity in many different ways to accountlish many different everylay tasks. Jorlay we are exited to start looking at just how electricity works and how we can be safe when working with electricity. Be sure to pay dose attention takes has an electronomy and the following day(s) and will be when her were her what you be read hole to complete a fun and exciting hands on project DOY 1 (continued) Series - Brightess Light (with switch) Materials Needed Grade 5 An "Percek Gig" (D in exclosioner A computer for each student A copy of the "Clean's Giv Worksheet" for each student () Electric City English/ fathematics Science (Interactive CD) What is electricity? guage Art Studie: N/A N/A Docesium N/A N/A N/A 2. Circuits 3. Conductors and 1. Distribute an "electric Oity" CD to cash stude N/A N/A N/A N/A 5.1.2 N/A N/A N/A N/A N/A N/A N/A English/ **Classroom Activities** Science uage Arts Studies 1. Hake Light 2. Turn Dif the Light N/A N/A N/A N/A N/A N/A 3. Brightest Leght N (A. N/Λ N/A N/A N/A 4. Series Test 5. Conductor N/A N/A Insulators 6. Parallel Circuit N/A N/A 7. Voltage N/A N/A Standards 8. Compare and Contrase 9. Remov Matching N/A N/A Terra tree's filence: the same computer. If a student has started a switch (a issue) but does not consider the issues bayre baggin out, neglob will have to start that issues from the bagging when they return. Students will only be able to be but is to compute the fill, or so the the recent, if days are be some computer. Face 6 of 53 Pres 19 of 51 East 43 of 52 INTRODUCTORY IN-SCHOOL ELECTRIC CURRICULUM APPENDIX A - Preferred Sources for Replacement Parts For 3⁴.5th Grade Elementary Stadents (All prices current as of time of initial publication) Facilitator Guide JOHT BULKS (Note: only use the same model built in usin an any one essentimentar body) Radio Shack Model 14 (2.47 volt 200m) Radio Shack Catalont 222 Infer# 272-1132 (@52.20/ar.) Mouser Electronics PM14 (2:47 with 800 mA) House Perfit GOLD MID MID CO to 1 + Memory 2 3 A Parallel s that easily give up their electrons to Detected — ω_{T} indefinition and any off the field of a one, that each gives a 3 set devices a transmission of the set of the se Mouver Flexibur's Indiech? Mittel 222 (2.25 visit .254) Mittel Paris: 606-CM222 (8.51 ea.) TEST LEADS rives) in a dissift in a light half-would be an example of how conductors are used. Newark Electronics 5 Lee travic 501280 Newark Partt: 828:2355 (@54.15;big. of 13) incalater - any material made up of the kind of alones that do not easily give up their electrons to of a current flow. Insulators are as important to a circuit's proper specabox as an conductors, insulators help keep alactrical current on the intended path. They prevent accidenta PURDUE short circuits between wires and/or components. In heter vehage type circuits, they prevent a Amazoni curc Elenco - L & Standard Aligator Lead Set (@ 56.95/pkg. of 15) into contact with the energized parts of a crout that could shock a person Examples of insulators are: glass, air, rubber, rylan, and some minerals such as mice VENDOR INFO Page 32 of 52 Filament Liams) - the part of a light hulp that peaks up to gave off light when oursett mass A filament is made up of many bray loads of wire (assilt/mode of the metal tungsts node a gins housing. All air has been removed from inside their outing as that the filam Euton www.anaont.com Moure Dectoris - www.mouser.com - 1400-366/373 Www.at.REDCholler.www.meesh.com - 1400-468/9275 sale shock- www.radoshock.com - caf a store in your area. 2-ge-49 of 32

1. Brief Introduction – Open the Mind

- What would it be like today if we did not have electricity?
- What could you not do?
- What do you plan to do tonight after school? Could you do those activities if you did not have electricity?



"An open mind leaves a chance for someone to drop a worthwhile thought in it."

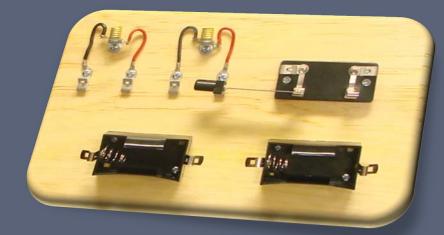
--Mark Twain

• What are some of the devices you have today that you would not be able to use if you did not have electricity?

Provide basic background information
 Utilize the "Electric City" CD



 Break class into teams of 2 or 3.
 Distribute wiring board and materials





2.2 volt bulbs



Analog Voltmeter

D cell batteries

Alligator test leads

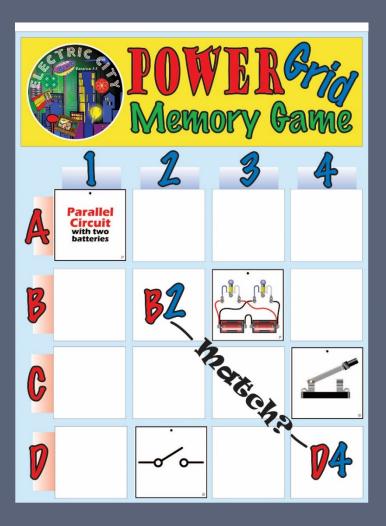
4. Ask "challengebased" questions.

> For example, "make light."



5. Insert "gametype" activities.

> For example, conductor/insulator tester or the matching game.





6. Engage electrical industry representatives

Feedback/Evaluation

Tested in two schools

- Urban setting (Greenfield, IN) one class
- Rural setting (Hancock County, IN) two classes. One class had seven special education students
- Fifth grade classes
- 6-day program

Feedback/Evaluation

Feedback from teachers

- "You have a very good curriculum that is well designed."
- "This was a neat way to begin the unit because kids love working on computers!" ---comment in reference to using the highly interactive CD for basic knowledge.
- "My kids were eager to participate and really loved the "hands-on" aspect of the program"

Future Plans

Future Plans

- Distribute as a kit
 - Classroom kit designed for 24 to 36 students. Approximately \$500.
 - Individual kit designed for use in a homeschool setting. Approximately \$50.

Thank You

Questions