

# S.T.E.M. RESOURCES

## KELVIN® ENGINEERING IN SCHOOL



Find KELVIN® New Standards® S.T.E.M. Labs on pgs. 2-11.

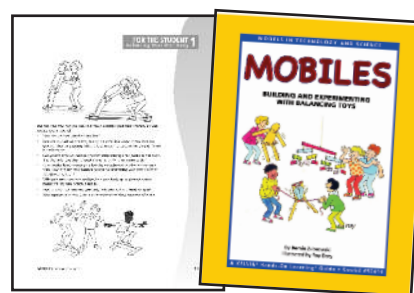


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Lesson Guides  
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Find KELVIN® Storage Units on pg. 20.



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Part of Catalog #321,  
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Build 20 Models  
from 1 Kit!



842545



### KELVIN® New Standards® S.T.E.M. Lab: Cars

Focused around the book, *Car Models that Zoom: Creativity in Motion*, by Ed Sobey Ph.D., this lab provides students the tools, guidance, and freedom to explore car designs. Students learn about gears, motors, propulsion, solar, propellers, and more. Basic wheeled car designs eventually advance to more complex motorized solar cars. Activities incorporate materials that can be found in the student's environment such as cardboard boxes, plastic bottles, plastic plates and cups.

Lab w/ **Black/White Book & Parts ONLY** (No Glue Gun, Multimeter or Bin)

842539 .....\$54.95 or \$49.95 ea./10+

Lab w/ **Full Color Book**, Glue Gun, Multimeter, Parts & Bin (Shown Above)

842545 .....\$75 or \$69.95 ea./10+



Lab w/ **Full Color Book** (842545) is packed in a storage box with a Glue Gun so students can start right away!



**KELVIN® New Standards® S.T.E.M. Lab:  
Land Transportation**

An entry level lab that helps students investigate things that move on the ground. Connect lessons about force, motion, friction and Newton's Laws with hands-on activities.

Students can design their own display board (like sample shown) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included. Gr. 4-7.

Includes:

- Corrugated Plastic Display Board
- Penny Racer Track
- [10] Penny Racer Kits
- Economy Foam Cutter (assembled)
- [5] Balloon Racer Kits
- [3] Recycled Bottle Car Kits (bottles not included)
- [5] Balloon Hovercraft Kits
- [5] Solar Racers Kits

Lab w/ Track and [26] Kits  
842493 .....\$275

Find More KELVIN® New  
Standards® S.T.E.M. Labs  
at [www.kelvin.com](http://www.kelvin.com)



**KELVIN® Science Fair Pack for Transportation - 8 Kits to Explore**



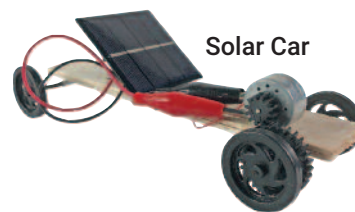
Universal Platform Car



Rubber Band Racer



Balloon Racer



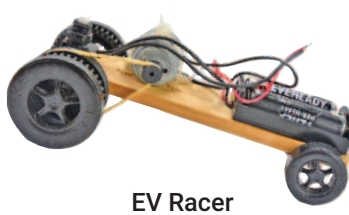
Solar Car



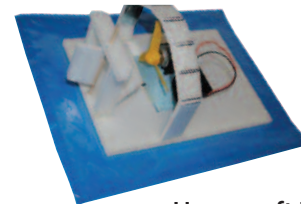
GR Cruiser



Gear Box Car



EV Racer



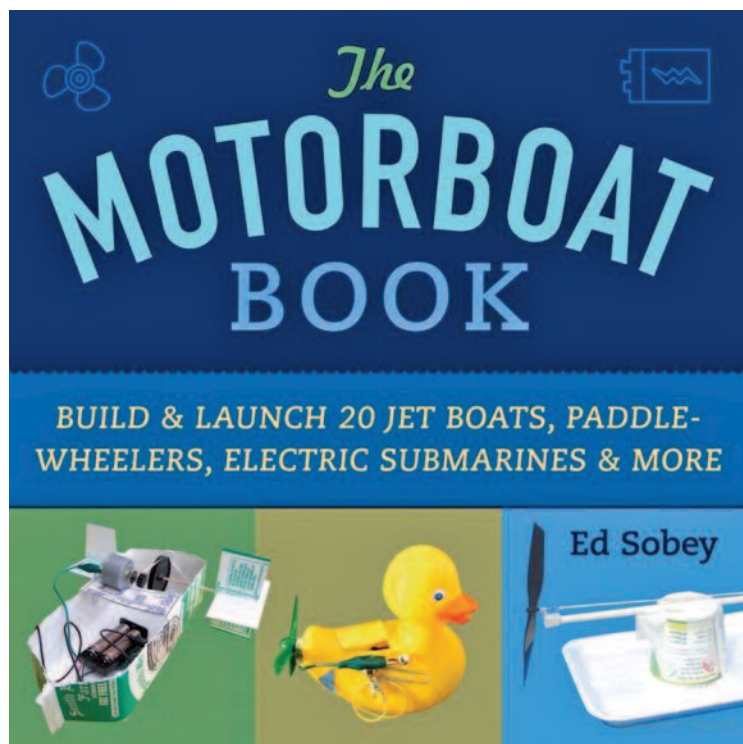
Hovercraft Racer

These selection of kits, with related instructions, are ideal for exploring land transportation at home or school. Single kits include: Universal Platform Car, Solar Car, EV Racer, Balloon Racer, Gear Box Car, GR Cruiser, Rubber Band Racer, and the Hovercraft Racer.

In addition, parts are supplied for more open-ended designs. These parts consist of a Motor Holder, Propeller, Gear, Pulley, Battery Holder, Motor, [2] Foam Pieces, and a Corrugated Board.

842592 KELVIN® Science Fair Pack for Transportation - [8] Kits & Parts .....\$85

## KELVIN® New Standards® S.T.E.M. Lab: Boats



Student Examples



Using *The Motorboat Book*, this lab explores how to build more than 20 different boat models and six submarines through step-by-step instructions and photos. Electric motors, balloons, gears, water jets, belt drives, chemical reactions, steam, and even gravity are used to propel models over water. In addition, author Ed Sobey PhD., Includes: instructions for building accessories like a working fog horn or an "ocean" to test boats.

**Lab w/ Full Color Book & Parts**

842549 .....\$69.95 or \$59.95 ea./3+

**Cool Melt Glue Gun w/ Glue Sticks**

842552 .....\$14.95



## KELVIN® New Standards® S.T.E.M. Lab: Water Transportation



From buoyancy to hydrodynamics introduce students to the principles that govern the design of water vehicles. Using a series of hands on learning by doing activities, students design, build and test boats and submersibles. Students can design their own display board (like sample above) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included.

**Basic Lab**

Includes: Reusable Corrugated Plastic Display Board, [4] Basic Buoyancy Kits, [4] Rubber Band Powered Pontoon Boat Kits, [4] Basic Submarine Kits, [4] Motor Boat Kits and instructions. Grades 6-12.

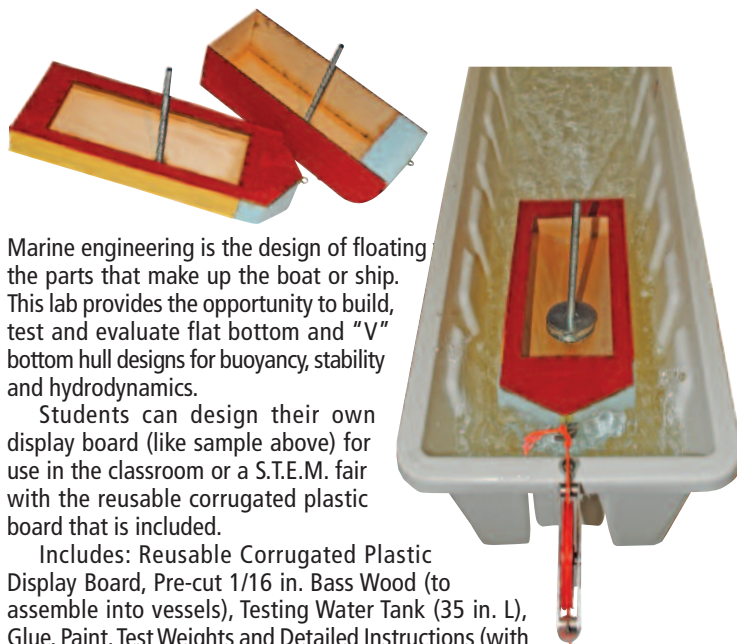
842497 Lab - [16] Kits &amp; Instructions .....\$175

**Advanced Lab**

Includes: Reusable Corrugated Plastic Display Board, [3] Basic Buoyancy Kits, [3] Adv. Sub Kits, [4] Solar Boat Kits, [2] Kre8® Sea Explorer Kits, [2] Super Capacitor Hovercraft Kits and instructions. Grades 7-12.

842498 Advanced Lab - [14] Kits &amp; Instructions .....\$325

## KELVIN® New Standards® S.T.E.M. Lab: Marine Engineering Gr. 8-12



Marine engineering is the design of floating the parts that make up the boat or ship. This lab provides the opportunity to build, test and evaluate flat bottom and "V" bottom hull designs for buoyancy, stability and hydrodynamics.

Students can design their own display board (like sample above) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included.

Includes: Reusable Corrugated Plastic Display Board, Pre-cut 1/16 in. Bass Wood (to assemble into vessels), Testing Water Tank (35 in. L), Glue, Paint, Test Weights and Detailed Instructions (with background material).

842526 Lab w/ Water Tank, Bass Wood &amp; Instructional Manual .....\$195



**KELVIN® New Standards® S.T.E.M.  
Lab: Aeronautics & Flight Gr. 4-7**

Students will learn about flight principles from a variety of activities. Build and test gliders and lift by forming a glider wing and control flight by adjusting wing flaps. Set the dihedral wing angle and wind the propeller that provides thrust for a balsa plane. Assemble double rotors to fly the helicopter simulator.

Students can design their own display board (like sample right) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included.

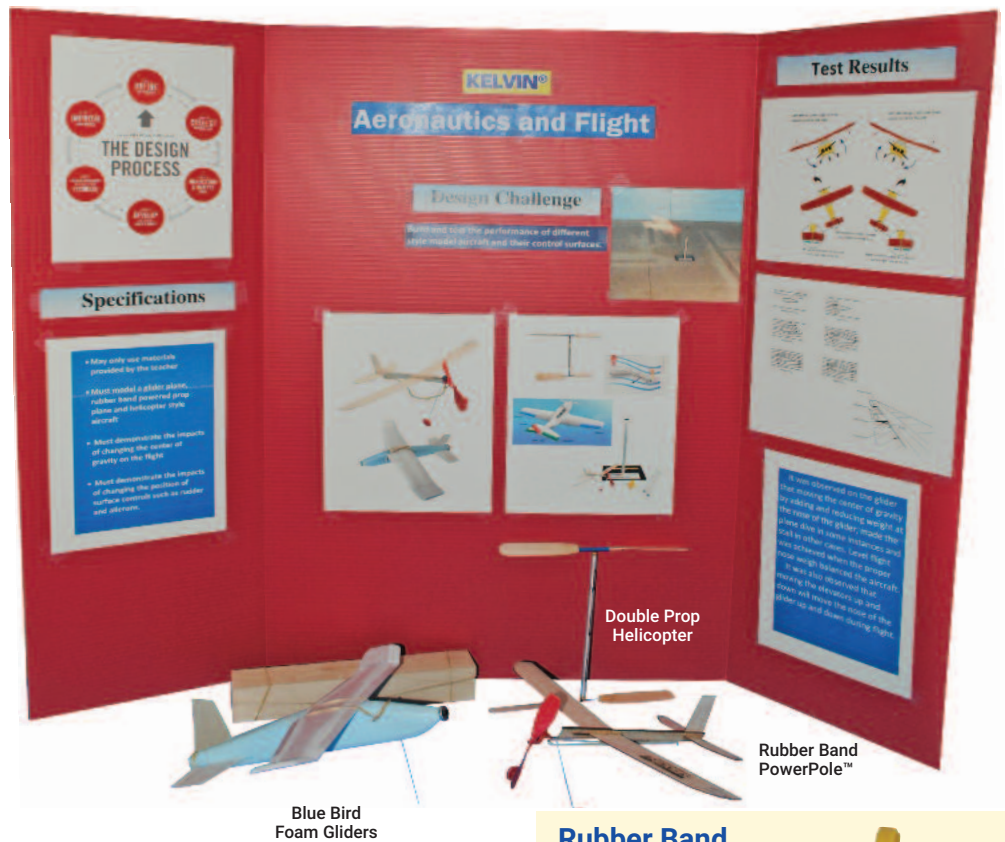
Includes: Reusable Corrugated Plastic Display Board, [5] Blue Bird Foam Glider Kits, [10] Rubber Band Powered Plane Kits, [5] Double Prop Helicopter Kits, Wing Forming Jig and Abrasive Paper. Extra parts and an instruction manual complete the lab. All kits require assembly with hand tools.

842484 Lab .....\$165  
842485 Class Pack - [3] 842484 PLUS 1 Board .....\$395

**Advanced Lab**

Includes: Basic Lab (842484) **PLUS** Rubber Band PowerPole™ (fly balsa planes tethered to the pole), Reusable Corrugated Plastic Display Board and **BONUS** Rubber Band Propeller Winder.

842487 Lab w/ Rubber Band Propeller Winder .....\$195  
842488 Class Pack - Lab x 3 PLUS Add. Prop Winder..\$525

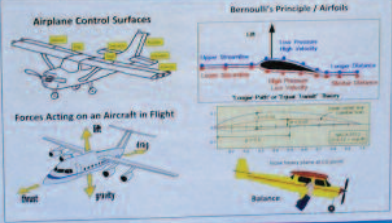


**KELVIN® New Standards® S.T.E.M.  
Lab: Aerospace Gr. 7-12**

**Aeronautics  
and Flight**

Aeronautics is the study of the science of flight. Aeronautics is the process of designing airplanes and other flying machine. There are four basic areas that aeronautical engineers must understand in order to be able to design flying machines. These areas include aerodynamics, propulsion systems, control systems and structural systems.

Aeronautical engineers are problem solvers. They must have a good grasp of science, technology, engineering and mathematical concepts and be able to apply these concepts to problems their designs may encounter.



**Rockets and Helicopters**



Rocket and helicopter flight, what seems to be magic in the eyes of most people, can be explained through scientific and technological observation and experimentation. KELVIN® kits offer these opportunities through hands-on STEM based activities. From designing and launching paper rockets to building and testing props to changes in fin design.

Extend flight studies to include aerospace technology and flight control. Students can design their own display board (like sample above) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board.

Lab includes: [12] Alpha III™ rockets, rocket engines, launcher, launch pad, altitude finder, [12] Delta Dart plane kits, [12] Flip Glider kits and [5] Double Propeller Helicopters, and reusable corrugated plastic display board.

842491 Lab .....\$495

Kits may require soldering, assembly, shaping & sanding of wood, balsa or foam. ⚠ **Warning:** Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).  
[www.kelvin.com](http://www.kelvin.com) • KELVIN®, 280 Adams Blvd., New York 11735, USA • Copyright © Kelvin L.P. • Prices shown are for educational institutions.





Find More KELVIN® Kre8®  
Kits & Parts in the  
Architecture & Design  
chapter on pgs. AD 2-9.

## Engineering, Modeling and Creating with Kre8 Systems

### The Engineering Design Process

- The word "process" refers to a step by step procedure used to accomplish a desired goal.
- For example, brushing your teeth is a process.
  1. First you get the brush and toothpaste.
  2. Then you wet the brush.
  3. You apply a specific amount of toothpaste to the brush.
  4. Then you brush the front of your teeth and the back in some order.
  5. The last steps would be rinse your mouth and the tooth brush.

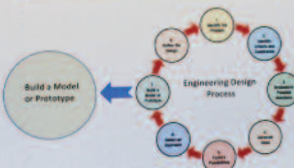
The word "design" means to decide upon the look and functioning of a building or product for a specific purpose. To draw, sketch, create, invent, map out and plan the making of this item.

Engineering is the use of science and math to design or make things. People who do engineering are called engineers. Engineers also use their skills to solve technical problems.

#### The Engineering Design Process (NASA)



### Modeling a Design Idea



Modeling an idea can be done in many ways. A model is a representation of something using words, numbers or building a physical item to describe how the product works. Computer modeling, mathematical modeling, scientific and physical model are all modeling techniques.

A prototype is a 3D physical model that represents a manufactured product so designers and engineers can visualize and test the design.

Kre8 rods and connectors are a perfect system for modeling and testing design your ideas.

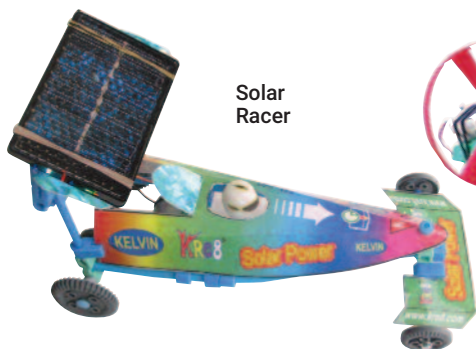
### Kre8 Modeling System Kits



Mars  
Rover



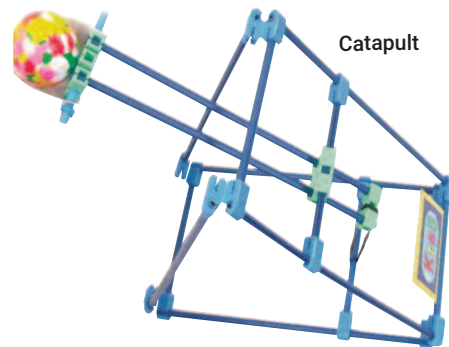
Solar  
Racer



Jet Car



Catapult



## KELVIN® New Standards® S.T.E.M. Lab: Kre8® Gr. 4-7

The ideal lab for young engineers in teams of two. KELVIN® Kre8® products are built from a unique building system consisting of tubes and connectors. The system can be used to model structures, vehicles and mechanisms. The tubes are cut to size using the included snips and snapped into position using different connectors. Parts are included to mount motors, gears and wheels.

Students can design their own display board (like sample above) for the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included. Requires Kre8® Tube Cutter or snips (see pg. AD2).

Lab includes: [4] ready to build kits (Jet Car, Solar Car, Mars Rover, Catapult), as well as the open-ended S.T.E.M. Maker kit to model student-designed objects. Also comes with a reusable corrugated plastic display board, [2] snips and instructions.

842476 Lab - [5] Kits & Manual .....\$120 Retail - SPECIAL \$95

### Class Pack

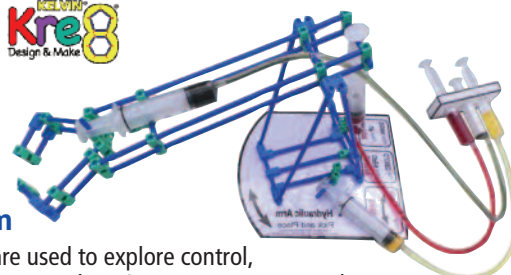
Includes: Lab (842489) plus [1] Reusable Corrugated Plastic Display Board and ★ BONUS Kre8® Robotic Arm (see right).

842480 Pack - [3] 842476 & BONUS Robotic Arm.....\$360 Retail - SPECIAL \$285

BONUS PRODUCT  
included with  
842480



### KELVIN® Kre8® Hydraulic Robotic Arm



Three syringes are used to explore control, hydraulics, leverage, and motion. To operate, open the gripper, move the arm above the load, swing the arm around, lower the load and release it. Requires Kre8® Tube Cutter or snips (see pg. AD 2).

283767 Kit.....\$39.95 or \$32.95 ea./3+

Kre8® kits can be assembled in regular classrooms. Optional Kre8® cutter (283653, pg. AD2) can be used to score and snap tubes to length. Use snips (480009, pg. AD2) to cut sheet materials and light blue tubes. Kits require proper hand tools, soldering, advanced assembly and adult supervision. Kre8® is a registered trademark of KELVIN L.P.

**KELVIN® New Standards® S.T.E.M. Lab:  
Beams & Triangles™ Gr. 4-7**

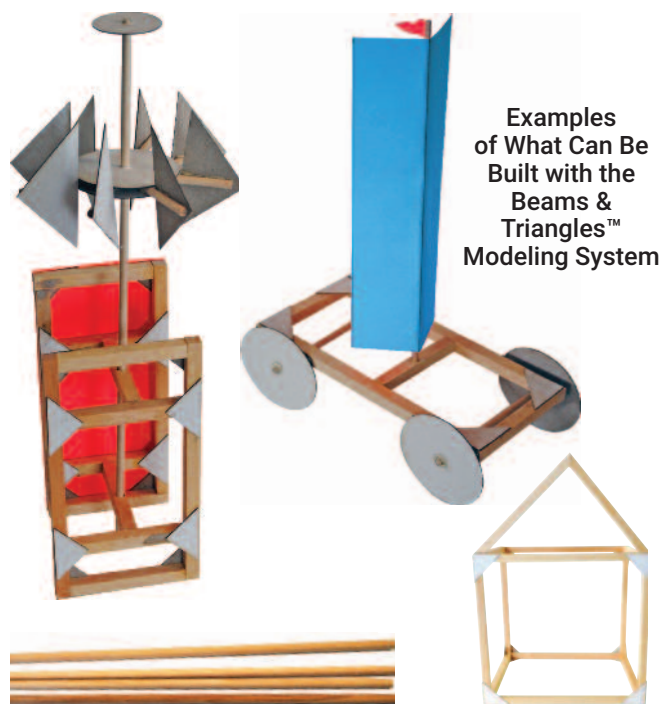
Students can design and build structures, bridges, vehicles and mechanisms with this unique assembly system. Extra parts and an instruction manual complete the lab. Cut, join and assemble wood beams using specially designed tools, holding jigs and materials. This lab is perfect for the young engineer and builder. Each lab provides enough materials to construct many items depending on size. Assign teams of two students each to investigate the kits. Students design their own display board or project portfolio for use in the classroom or S.T.E.M. fair. Requires assembly with hand tools and teacher assistance.

Includes: [2] cutting jigs, [2] mini saws, [10] joining jigs, [5] gear making jigs, [50] wood beams (3/8 x 3/8 x 24 in. and 3/8 x 3/16 x 24 in.), glue, cardstock wheels, dowel rods, cardstock triangles, axle mounts and clamps. Detailed instructions also included.

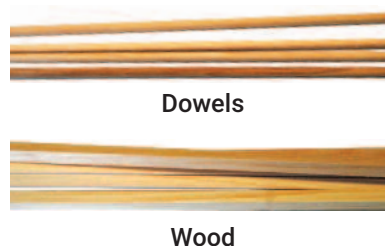
842475 Lab w/ Tools & Parts .....\$195

**Class Pack** Lab x 2 - plus ★ BONUS Hand Drill, Drill Press and Clamp-On Vise.

842479 Class Pack - Lab x 2 PLUS Additional Hand Tools.....\$395



**Examples  
of What Can Be  
Built with the  
Beams &  
Triangles™  
Modeling System**



**Dowels**

**Wood**

**Find More Beams  
& Triangles™ in the  
Architecture &  
Design chapter  
on pgs. AD 10-11.**

**BONUS PRODUCTS  
included with 842479**

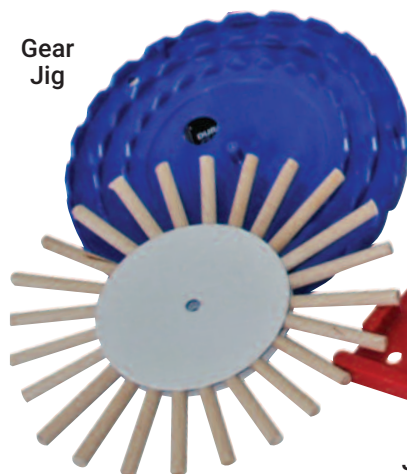
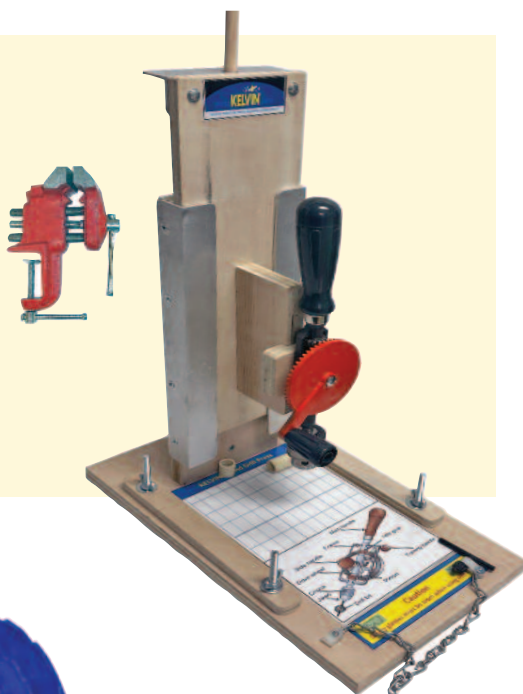
**KELVIN® Drill Press**  
950301, \$295 or \$285 ea./3+

**Hand Drill**  
w/ [3] Drill Bits.

950311, \$49.95

**Clamp-On Work Vise**  
w/ 3 in. jaw opening

540033, \$29.95  
or \$27.95 ea./5+



**Gear  
Jig**

**Joint Jig**

**KELVIN® Gear Jig** (990197)

Build different gear combinations. On one side build: 4-, 8- or 16-teeth gears and on the other build 6-, 12- or 24-teeth gears.

**Joint Jig** (390444)

Holds beams or dowels rods (up to 3/8 x 3/8 in. ) in place at 45° or 90° angles as they are glued and drying.



**Cardstock Triangles**



**Cardstock  
Axle Mounts**



**Cardstock  
Wheels**



**Cutting Jig &  
Jr. Hacksaw**

**Cutting Jig** (390447)

Cuts 30°, 45° or 90° angles in wood up 3/8 x 3/8 in. thick.

**Jr. Hacksaw** (980042)

Use for cutting of beams and rods.



**Activity Guide**



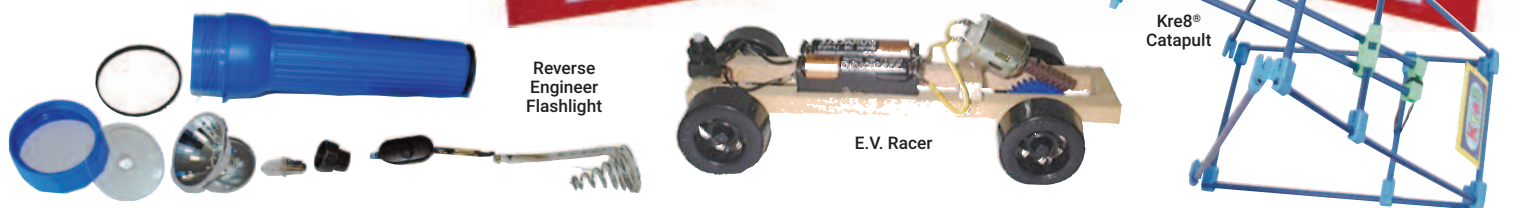
### KELVIN® New Standards® S.T.E.M. Lab: Basic Mechanical Engineering Gr. 4-7

Have students explore Mechanical Engineering through hands-on design and build activities. Topics include simple machines, friction, mechanical advantage, the Design Engineering Process, measuring and ratio calculations.

Students can design their own display board (like sample above) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included.

Lab includes: Reusable Corrugated Plastic Display Board, [8] Kre8® Catapult Kits, [5] E.V. Racer Kits, [3] Simple Machine Labs and [10] Reverse Engineering Flashlight Kits.

842492 [23] Kits.....\$245



### KELVIN® New Standards® S.T.E.M. Lab: Mechanical Engineering Gr. 6-12

Students, in teams of two, select three challenges from a list provided. Enough materials are provided for five teams to build 15 models total. Students can design their own display board for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included.

Lab includes: pulleys, cams, gears, wheels, cardstock wheels, kre8® parts, dowel rods, cardstock, printed grid paper, design problem cards, spray glue, fasteners, string, reusable corrugated plastic display board, and instructions. Requires assembly with hand tools. Teachers will need to supply glue and hand tools (such as a ruler, scissors, awl, hole punch, utility knife, etc.

842489 Lab .....\$95

#### Class Pack

Includes: Lab (842489) plus [1] Reusable Corrugated Plastic Display Board and ★ BONUS S.T.E.M. Mechanical Tool Pack 7.

842478 Pack - [3] 842489 Labs w/ Tool Pack 7 .....\$295



★ BONUS w/ Class Pack 842478

### KELVIN® S.T.E.M. Mechanical Tool Pack

Includes: Awl, Hole Punch, Plastic Ruler, Utility Knife, Scissor, Mini Cool Glue Gun with Slugs, and Safety Edge Cutting Guide.

842312 .....\$29.95

### KELVIN® Hands-On Science® Lab: Simple Machines Gr. 4-7



Students can experiment with Hands-On Science® activities to learn about simple machines like gears, pulleys, wheels levers, and inclined planes. Covers subjects like mechanical advantage, rotational direction, angle, force, wedges, lifting loads, and friction belts.

#### Lab w/ Plastic Work Board

Includes: enough materials for one student to complete experiments including: your choice of laser cut plastic work board or cardstock template only (design your own version - work board is not included with this version), gears, pulleys, string, rubber bands, spring scale, protractor, screws and instruction book.

841743 Lab w/ Plastic Work Board .....\$65

841752 Lab w/ Cardstock Template .....\$22.95 or \$19.95 ea./10+

#### Class Pack w/ Cardstock Template

282198 Pack - [3] 841752 Labs.....\$185





## KELVIN® New Standards® S.T.E.M. Lab: Work, Machines & Gears

Discover how the application of gears help machines perform work with speed and power. Students, in teams of two, will assemble gear trains, calculate gear ratios and predict gear directions. They will also experiment with gear train designs to help solve speed and torque problems.

Students can design their own display board (like sample above) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included.

Lab includes: [5] EV Racers Kits, [2] Gear Box Car Kits, [3] Advanced Gear Sets, [3] Spring Scales, [3] Pulley Ratio Training Boards, [3] Gear Ratio Training Board, and Reusable Corrugated Plastic Display Boards.Gr. 7-12.

842474 Lab .....\$95

### Class Pack

Includes: Lab (842474) plus a Reusable Corrugated Plastic Display Board and ★ BONUS [3] E.V. Racer Kits (841016, see below).

842481 Pack - [3] 842475 Labs PLUS ★ Bonus .....\$295

**KELVIN® Air Motor Car**

Kit includes: wheels, axles, motor, motor holder, straw, battery holder, propeller, switch, wood for base.

841208 Kit...\$5.95 or \$5.45 ea./10+ or \$5.25 ea./25+  
841419 Bulk Pack of 30 .....\$4.95 Per Kit \$148.50

Bulk Pack Per Kit Price As Low As **\$4.95**

**KELVIN® E.V. Racer**

Kit includes: motor, wheels, axles, gear set (4 gears per set), AA battery holder, switch and wood base.

Kit for AA Alkaline Batteries Requires [2] AA batteries.  
841016 Kit .....\$7.95 or \$6.95 ea./10+ or \$6.35 ea./25+  
841416 Bulk Pack of 25 .....\$5.95 Per Kit \$148.75

Kit w/ [2] AA NiCad Batteries  
840851 Kit .....\$6.95 or \$6.75 ea./10+ or \$6.45 ea./25+

Bulk Pack Per Kit Price As Low As **\$5.95**

★ BONUS PRODUCT 841016 is included w/ Above Class Pack 842481

### KELVIN® E.V. Racer

Kit includes: motor, wheels, axles, gear set (4 gears per set), AA battery holder, switch and wood base.

Kit for AA Alkaline Batteries Requires [2] AA batteries.

841016 Kit .....\$7.95 or \$6.95 ea./10+ or \$6.35 ea./25+

841416 Bulk Pack of 25 .....\$5.95 Per Kit \$148.75

Kit w/ [2] AA NiCad Batteries

840851 Kit .....\$6.95 or \$6.75 ea./10+ or \$6.45 ea./25+

### KELVIN® Universal Car Platform

Design and add a car body from foam, cardboard, etc.

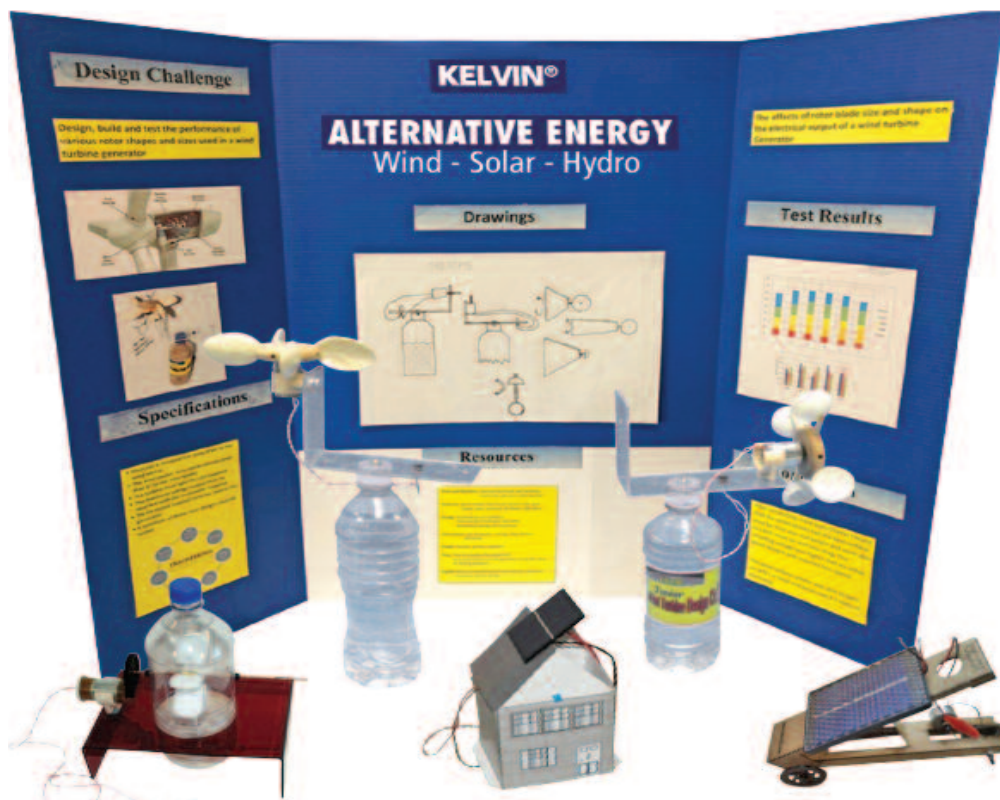
Each kit includes: wood (1-1/2 x 6 in.), wheels, axles and straws. Shaping, hot gun gluing and assembly required.

842439 Kit .....\$4.95 or \$4.45 ea./10+

841417 Bulk Pack of 100 .....\$2.95 Per Kit \$295







### KELVIN® New Standards® S.T.E.M. Lab: Alternative Energy Gr. 6-12

Explore different aspects of alternative energy - **wind**, **hydroelectric** and **solar** in teams of two students. Additional parts are included, so they can apply their knowledge with their own designs. Students can design their own display board (like sample above) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included.

Lab includes: Reusable Corrugated Plastic Display Board, [2] Wind Turbine Kits, Hydroelectric Kit, Solar House Fan Kit, Solar Car Kit, Extra Parts and Instructions. Requires assembly with hand tools, a blower fan and running water access.

842472 Lab w/ [5] Kits, Extra Parts & Manual .....\$95

#### Class Pack

Includes: Lab (842472) plus [1] Reusable Corrugated Plastic Display Board and ★ **BONUS** [2] 50LE Multimeters.

842473 Pack -[3] 842472 Labs **PLUS** ★ **BONUS** .....\$295

### KELVIN® New Standards® S.T.E.M. Lab : Web Servers



Activities provide a step-by-step guide for installing and configuring a HTTP, FTP and PHP enabled server. The Internet Information Services (IIS) included with Windows is a reliable, powerful and a scalable web server. When configured, it provides concurrent connections for up to 10 users. When a FTP server is installed, the system becomes remotely accessible for uploading and downloading files. With PHP extensions, students will be able to utilize this scripting language option.

Lab includes: Laptop, Internet Information Services (IIS) Software, FTP Server Application Software, PHP Scripting Language Extension, and Installation Instructions, Windows.

841707 .....\$2,995



#### KELVIN® 50LE Multimeter w/ Buzzer

**Features:** buzzer, square wave output, low battery indicator, overload protection. **Measures:** AC/DC Volts, AC/DC Amps, Ohms, and Resistance.

**Tests:** Diode, Transistor, and Continuity. Includes: 9V battery, holster, test lead, and manual. Measures 124 x 70 x 26 mm with 49 x 16 mm LCD display.

990177 .....\$6.95 or \$6.45 ea./25+ or \$5.95 ea./50+

★ **BONUS PRODUCT** w/ Alternative Energy Class Pack 842473

### KELVIN® New Standards® S.T.E.M. Lab: Pneumatics Gr. 7-12



Pneumatics and hydraulics is the use of compressed fluids to increase mechanical advantage and make work easier. This lab uses hands on activities to introduce the science and technology of pneumatic and hydraulics design and control. Students model existing systems, experiment with compressed fluids and design their own devices.

Students can design their own display board (like sample right) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included.

Lab includes: Reusable Corrugated Plastic Display Board, [4] Balloon Hovercraft Kits, [4] Balloon Racer Kits, [4] Basic Submarine Design Kits, [3] Dump Truck Kits, [3] Economy Robotic Arm Kits, Syringes, Tubing and Instruction Manual.

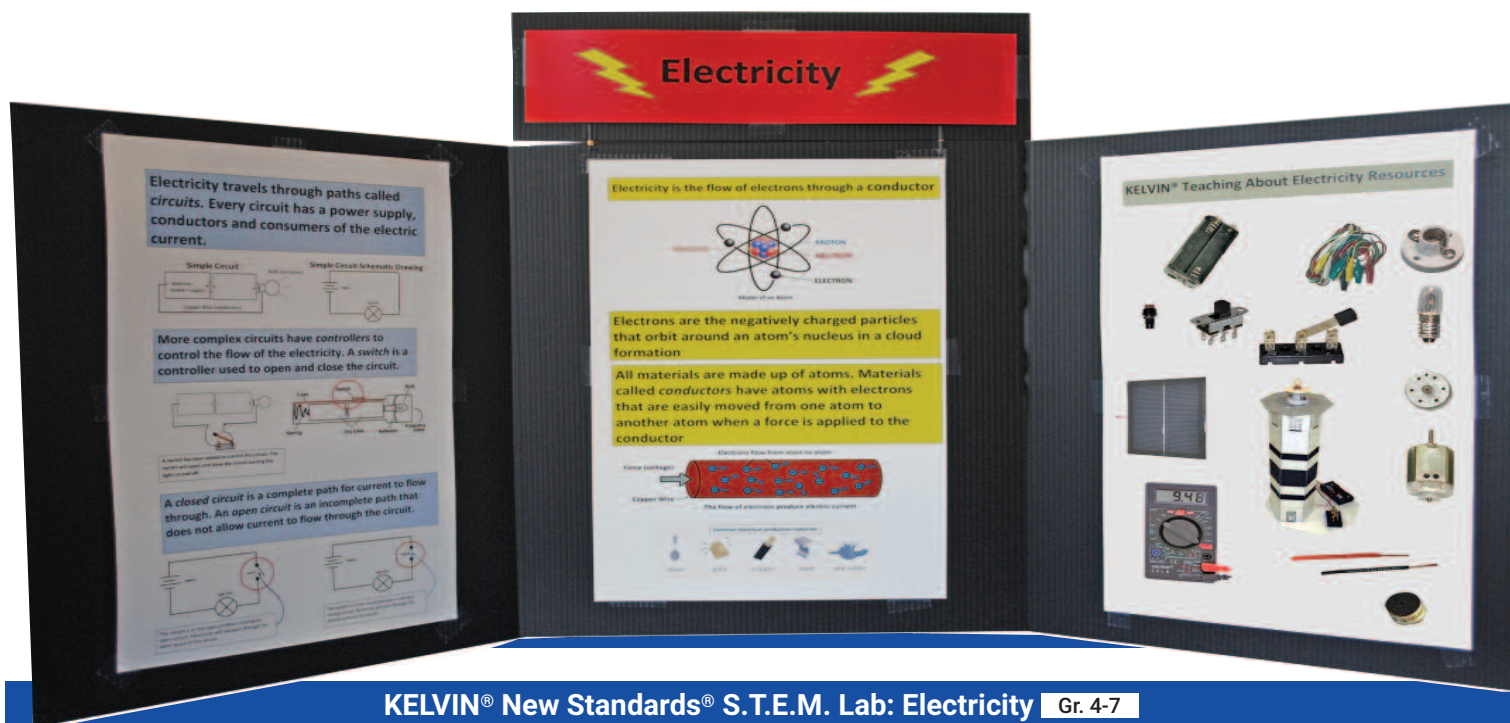
842495 [18] Kits, Extra Parts & Manual .....\$155

#### Advanced Lab

Includes: Reusable Corrugated Plastic Display Board, [4] Kre8® Robotic Arm Kits (pg. AD 9), [4] Grabber Arm Kits, [3] Dump Truck Kits, [3] Submarine Design Challenge Kits, [3] Economy Robotic Arm Kits, Syringes, Tubing and Manual.

842496 [17] Kits, Extra Parts & Manual .....\$295

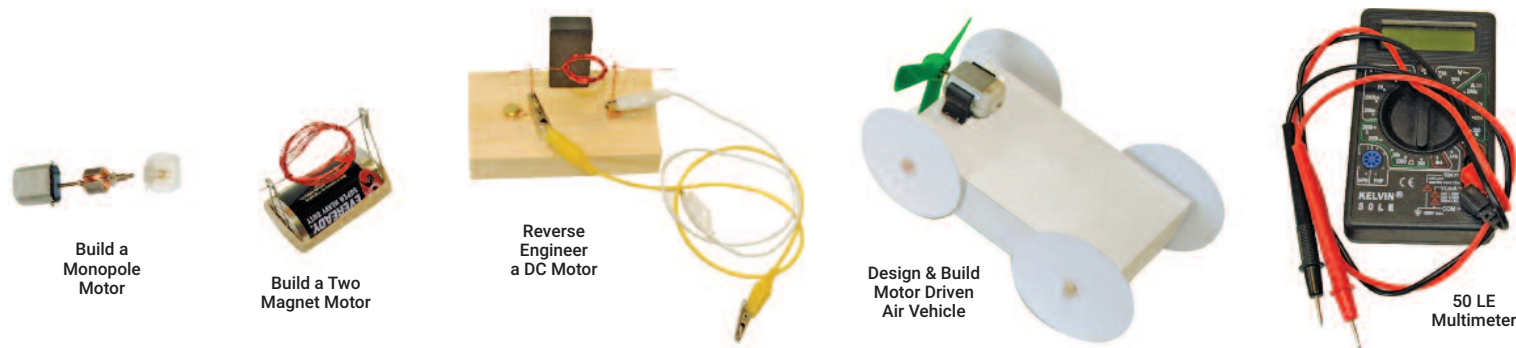




**KELVIN® New Standards® S.T.E.M. Lab: Electricity Gr. 4-7**

Learn through hands on activities the basics of electricity and electrical circuits. Students will combine electrical components to create simple circuits and solve simple electricity design problems. Students can design their own display board (like sample above) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included.

Lab includes: Reusable Corrugated Plastic Display Board, [20] Light House Kits, [10] Switches, Wires, [10] Bulbs, [10] Sockets, [10] Buzzers, Jumper Cables, [10] Battery Holders and Motors. Requires assembly with hand tools and batteries.  
842494 Lab w/ [20] Kits & Extra Parts .....\$245



**KELVIN® New Standards® S.T.E.M. Lab: Motors Gr. 7-12**

Hands-on activities (for teams of two students) includes: single magnet motors, electromagnets, reverse engineering DC motors, motor driven air powered carts and more. Students can design their own display board (like sample above) for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board that is included.

Lab includes: Reusable Corrugated Plastic Display Board, [5] Monopole Magnet Motor Kits, [5] Two-Magnet Motor Kits, [5] Air Car Kits, [8] DC Motors, Battery Holders, Magnets, Cardstock Wheels, Wood, Axles, Pliers, Cardstock (Pre-Cut & Scored), Motor Mounts, 50LE Multimeter, Alligator Jumper Cables, Propellers, Copper Wire, Magnet Wire, Solid Wire, [2] Compasses, Abrasive Paper, Nails, Rubber Bands, Wood Blocks and Instructions. Requires assembly with hand tools and batteries (AA & D).

842486 Lab w/ [15] Kits, 50LE Multimeter & Extra Parts.....\$135

**Class Pack**

Includes: Lab (842486) PLUS [1] Reusable Corrugated Plastic Display Board, [10] Kre8® Motor Kits and ★ BONUS [3] Kre8® Motor Kits (see top left).

842368 842486 Lab + [10] Kits & ★ BONUS [3] Kre8® Motor Kits.....\$295

★ BONUS PRODUCT included w/ Adv. Motors Lab (842368)

**KELVIN® Kre8® DC Motor**

Kit includes: tubes, slit rods, collars, clip connectors, [2] magnets, steel rods, copper wire, metal bearing, fuse, reed switch, base, bag and sand paper. Requires battery.

842081 Kit .....\$15.95 or \$14.95 ea./5+ or \$13.95 ea./10+  
283736 Bulk Pack for 20 .....\$12.50 Per Kit \$250



**KELVIN® New Standards® S.T.E.M. Lab: Advanced Motors**

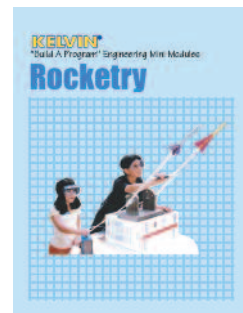
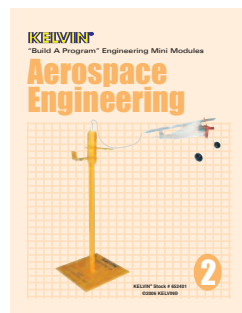
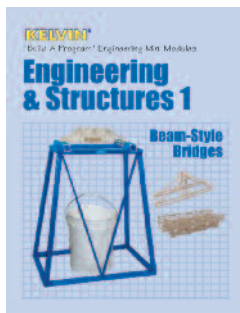
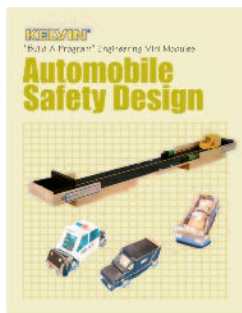
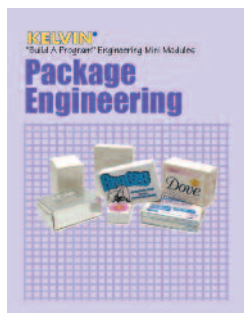
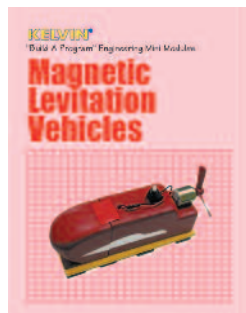
Explore additional motor types like generators and sturg motors. Students can design their own display board for use in the classroom or a S.T.E.M. fair with the reusable corrugated plastic board (included).

Lab includes: Corrugated Plastic Display Board, [30] Motor Generator Kits, [15] Sturg Motor Kits and [5] KELVIN® 50LE multimeters.

842376 Lab w/ [45] Kits & [5] 50LE Multimeters .....\$295 Class



# KELVIN® “Build A Program” Engineering Mini Modules



## Magnetic Levitation Mini Module 1

Design, model and test a maglev. Module includes: Maglev See-Thru Track (8 ft. L), foam cutter, economy 1-lane timer, maglev magnets, foam and grid paper.

841644 .....\$995

## Magnetic Levitation Mini Module 2

Design, model, and test a self-propelled maglev. Module includes: [2] Maglev Tracks, aluminum railings (8 ft. long), Kel-Timer™, foam cutter, power supply, project motors, propellers (3 in. dia.), balloons, nose hook propellers, polystyrene, maglev magnets and grid paper.

841645 .....\$1,395

## Package Design Mini Module1

Design, model and evaluate a package design. Module includes: design portfolio, package fabricating material, tools, card stock and [25] package design kits

841646 .....\$495

## Auto Safety Design Mini Module 1

Design and test safety systems that protect egg passengers during crash simulations. Includes: KELVIN® Krasher™, car bases, grid paper, balloons, bubble wrap, syringes and plastic tubing

841680 .....\$995

## Beam Style Bridges Mini Module1

Design, fabricate, evaluate a model beam bridge. Module includes: L.I. Structure Tester, triple beam balance, cardstock, grid paper, wood glue, tape, balsa, pins, wax paper, and craft knives.

841679 .....\$1,195

## Aerospace Engineering Mini Module 2

Understand how forces can be used to control flight. Activities include Flying with the PowerPole Flight Trainer. Includes: Wright Bros. Trainer, PowerPole™, variable power supply, paper-backed glider kits (1 per student) and guide.

841643 .....\$695

## Rocketry Design 1

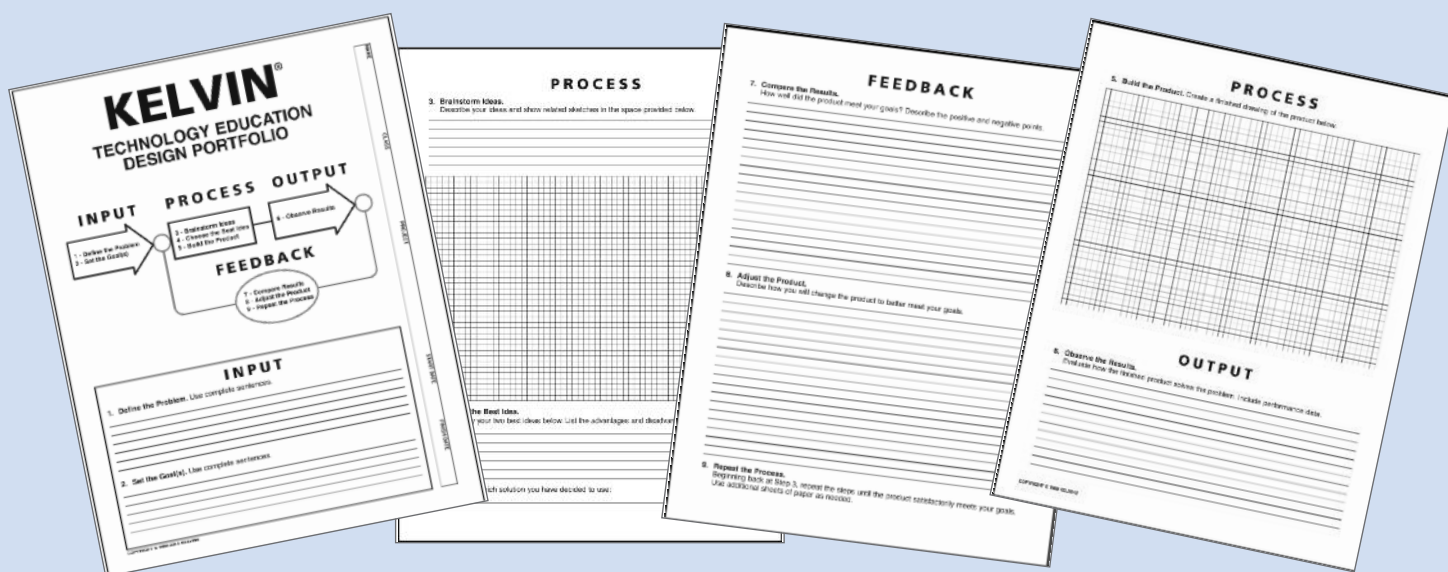
Includes: dual paper launcher, portable air compressor, pre-printed body tube, foam, grid paper.

841648 .....\$995

## Rocketry Design 2: Solid Fuel Rockets

Includes: launch pad, launch controller, body tubes, engine tubes, engine hooks, fins, balsa, parachute materials and launch lugs.

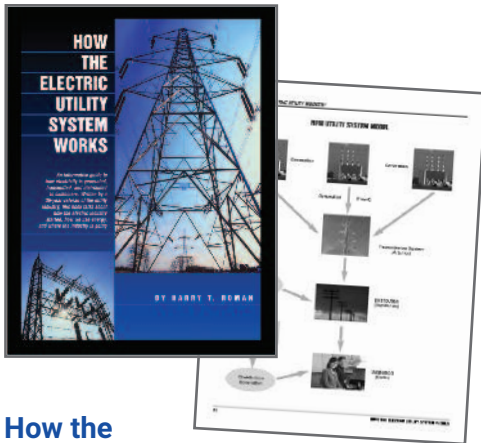
841649 .....\$795



## KELVIN® Design Portfolios

Design portfolios encourage students to use the problem-solving method (input, process, output & feedback) when planning and designing projects. Each portfolio consists of 4 pages for students to fill out.

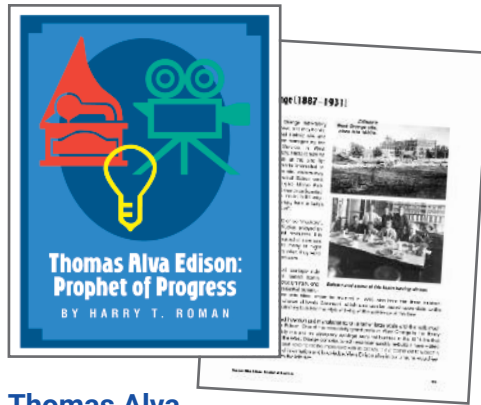
651030 100/pkg. ....\$25



### How the Electric Utility System Works

An informative guide to how electricity is generated, transmitted, and distributed. Covers how the electric industry started, how we use energy, and where the industry is going.

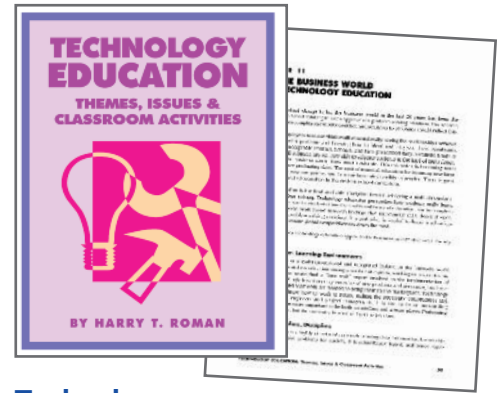
652497 Booklet .....\$14.95 or \$13.95 ea./6+



### Thomas Alva Edison: Prophet of Progress

Re-live the excitement of the world's greatest inventor as he completely changed our world. Much of what we take for granted today was the brainchild of the great Mr. Edison. Learn how his inventive world was so similar to technology education, and what it teaches us today for the classroom.

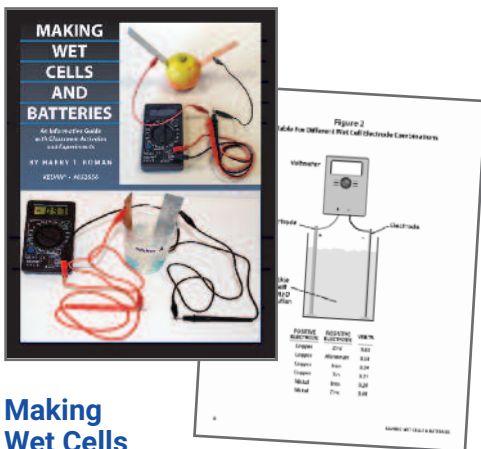
652338 Booklet .....\$14.95 or \$13.95 ea./10+



### Technology Education: Themes, Issues and Classroom Activities

Take a tour of the many issues and themes of technology education today. This book surfaces a variety of valuable tech ed topics for you and your students to discuss; and presents a wealth of practical activities for your classroom.

652337 Booklet .....\$14.95 or \$13.95 ea./10+

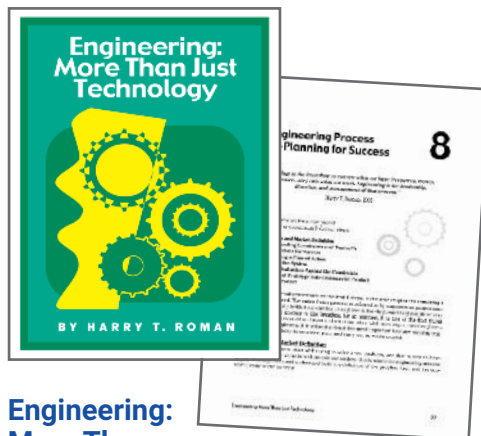


### Making Wet Cells and Batteries

The chemistry and materials in wet cells and batteries are all around us. Understanding how wet cells work, helps us understand rust and corrosion; and why batteries behave the way they do and eventually need replacement.

Includes: fun information and simple experiments. Wait until you see what you can use to make wet cells and batteries!

652656 Booklet .....\$14.95 or \$13.95 ea./10+

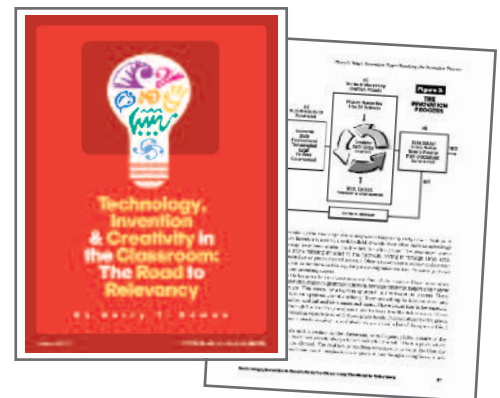


### Engineering: More Than Just Technology

Learn how engineering and technology education are intimately related, both historically and in the practical world. Understand the engineering process as discussed through actual examples given by the author in his own career.

Explore values of an engineering education, the fields of engineering available today, and how to prepare for a challenging and well-paying job in it.

652336 Booklet .....\$14.95 or \$13.95 ea./10+



### Technology, Invention & Creativity in the Classroom: The Road to Relevancy

Designed to stimulate creative thinking and integrated problem solving, this book provides the basics for unleashing creative potential in students. Loaded with real-world information and techniques for integrating the curricula; and a superb way to bring heads and hands together in the classroom. Learn how inventor's invent and move their products.

652295 Booklet .....\$14.95 or \$13.95 ea./10+

652335 Workbook .....\$14.95 or \$13.95 ea./10+

Experience the world of creativity, invention, technology education and engineering through the eyes of a nationally recognized engineer, inventor, and technology educator.

#### Meet The Author

Harry T. Roman's books will help you bring the excitement of these topics to your classroom. His easy-to-read books are loaded with real-world experiences, classroom exercises, and design challenges; and have been time-tested through many in-service seminars he has given to teachers in grades 6-12. Harry helped implement the technology education movement in New Jersey. His work is read by thousands of technology educators across the nation.

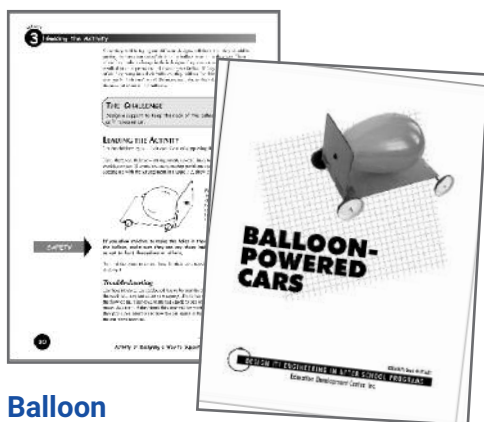
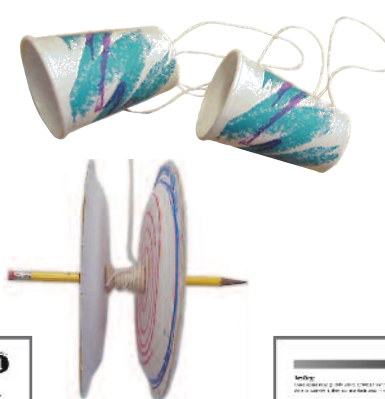
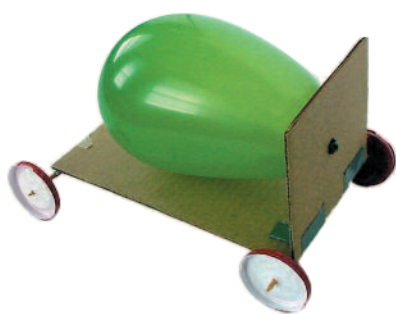






## DESIGN IT! LESSON GUIDES

A series of introductory engineering experiences with instructions for each project as well as implementation suggestions for extended projects. Suitable for after-school programs and elementary school students (ages 8–12). Funded by the National Science Foundation and developed by the Education Development Center, Inc.



### Balloon Powered Cars

There is more to this project than just making an inflated balloon move a car. Engineering involves designing a way to support the balloon and get it to work consistently. Match the power requirements of the car with the right balloon. Nozzles can be designed and tested.

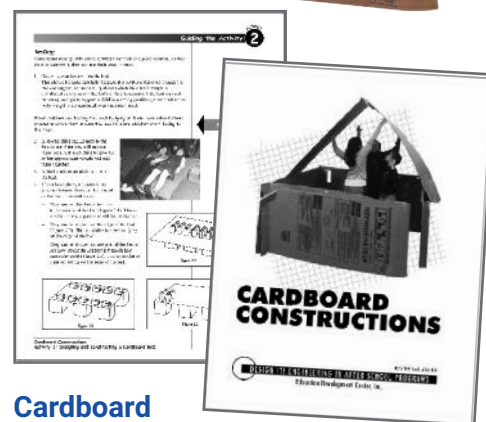
651659 Guide .....\$9.95 or \$8.95 ea./10+



### Rubber Band Powered Cars

Using cardboard, dowels, plastic plates, and rubber bands, students can build their own cars, and learn in a direct way the engineering concept of optimization by testing different sized rubber bands and different diameter plates as wheels. 55 pg. Guide.

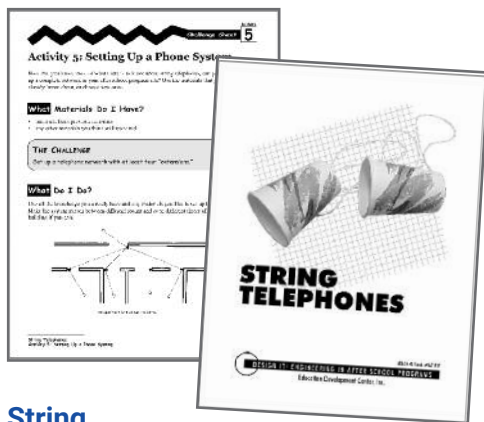
651663 Guide .....\$9.95 or \$8.95 ea./10+



### Cardboard Constructions

How strong a stool can students construct from a small cardboard box? Will it support an adult? Building on this experience, students build a bed using a large piece of cardboard supported by small boxes. In the final activities, large modular houses are constructed from refrigerator boxes.

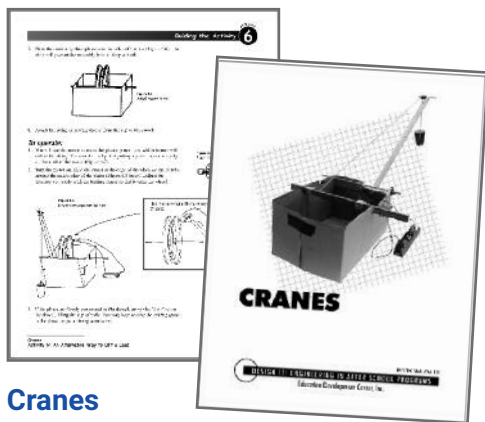
651814 Guide .....\$9.95 or \$8.95 ea./10+



### String Telephones

Using paper cups & string, discover principles that govern the simplest form of a string telephone. Refine this model with other materials and get messages to go around corners.

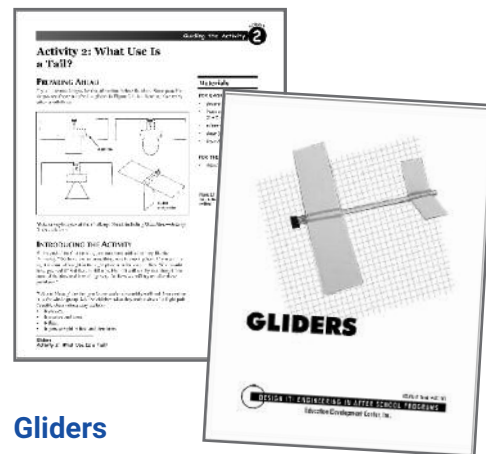
651817 Guide .....\$9.95 or \$8.95 ea./10+



### Cranes

Using a cardboard box as the body, yardstick as a boom, and small electric motor as the power source, students make a working model of a crane. Use different ways of attaching string to the shaft of the motor so that it can lift varying amounts of nails in a cup.

651813 Guide .....\$9.95 or \$8.95 ea./10+



### Gliders

Construct simple planes from paper. After testing designs for tails, bodies and wings, construct a rubber band launcher. This allows for a more consistent way of evaluating all of the variables. 64 pg. Guide.

651661 Guide .....\$9.95 or \$8.95 ea./10+

## Design It! Implementation Guide

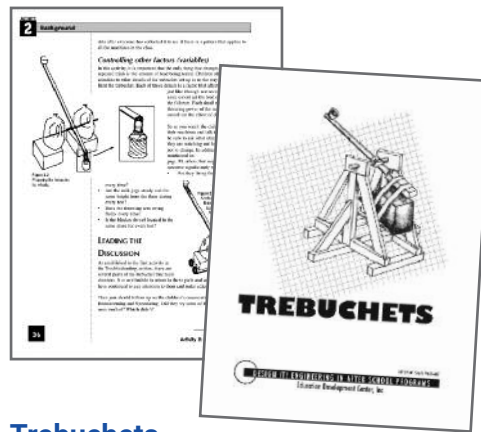
An introduction to the *Design It!* series and a resource for teachers using the program for the first time. The guide covers managing and structuring an effective classroom environment and gives a sense of context and procedures needed to effectively engage students.

651665 32 pages .....\$6.95

## Complete Design It! Series Set

Implementation Guide PLUS ALL 14 projects (Balls and Tracks, Pinball, Trebuchets, Gliders, Paper Bridges, Rubber Band-Powered Cars, Balloon Powered-Cars, Cardboard Constructions, Cranes, Blinking Lights, String Telephones, Straw Rockets, Sand and Water Clocks and Spinning Toys).

651916 .....\$139.95



## Trebuchets

Start with a working design of an ancient throwing machine similar to catapults and slingshots. The challenge is to improve on the design by testing and adjusting the different parts of this device.

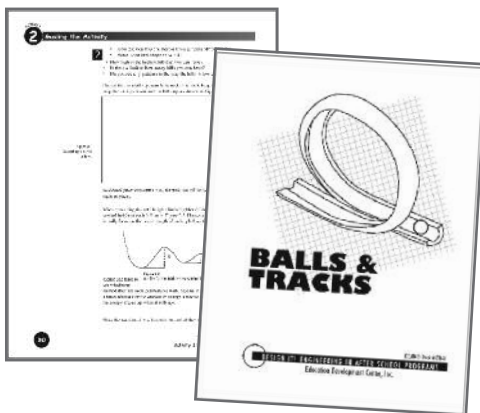
651667 Guide .....\$9.95 or \$8.95 ea./10+



## Sand & Water Clocks

Students use flowing sand and water in connected soda bottles to try to make accurate and consistent sand and water clocks that measure out 30-second, 60-second, or even longer time intervals.

651669 Guide .....\$9.95 or \$8.95 ea./10+



## Balls and Tracks

Using flexible pipe insulation, marbles, and a few other simple materials, students recreate small-scale models of amusement park rides and sporting events, such as the ski jump.

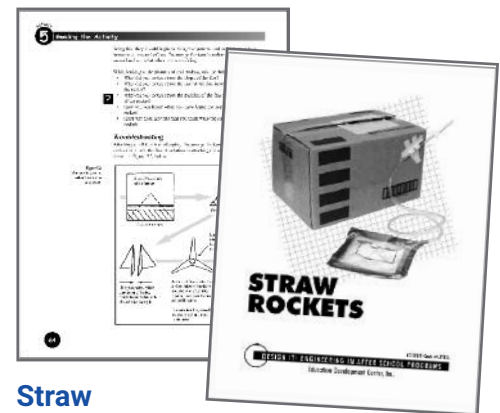
651666 Guide .....\$9.95 or \$8.95 ea./10+



## Spinning Toys

Plates, dowels, rubber washers, and tuna fish cans become homemade tops and yo-yos. Uncover the principles of balance and spin to make long spinning tops and regular or "sleeper" yo-yos.

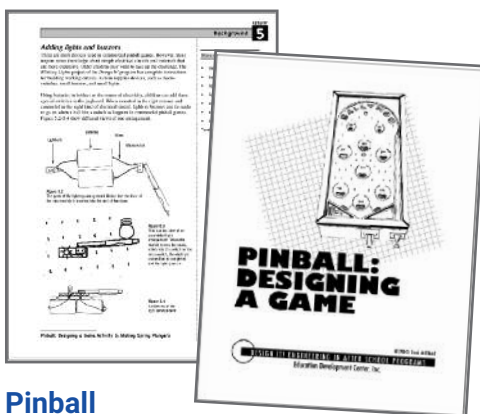
651815 Guide .....\$9.95 or \$8.95 ea./10+



## Straw Rockets

Launch the outer straw like a toy rocket by blowing. By using a sandwich bag propulsion system, students test different kinds of fins while trying to refine their toy rockets so that they will hit targets consistently.

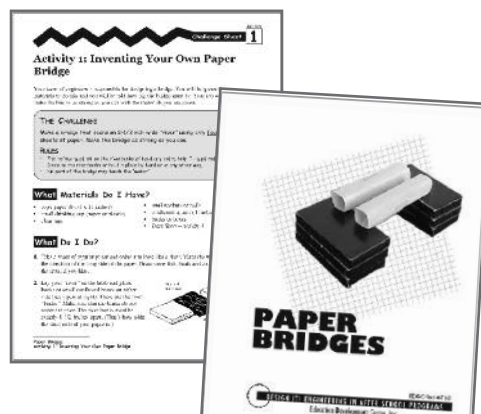
651816 Guide .....\$9.95 or \$8.95 ea./10+



## Pinball

Build pinball games complete with bumpers, traps, flippers and plungers. Students assign their own numbers to their traps and decide where they should be, and test different methods of launching the ball.

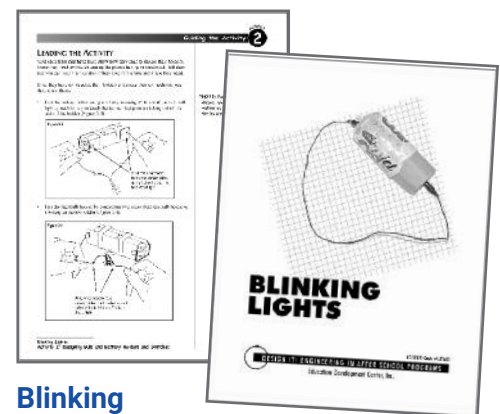
651660 Guide .....\$9.95 or \$8.95 ea./10+



## Paper Bridges

Make strong structures with limited materials. Students perform more and more difficult challenges to uncover many simple principles of bridge building.

651668 Guide .....\$9.95 or \$8.95 ea./10+



## Blinking Lights

Your students are challenged to design a flashlight from a soda can, cardboard, battery and wires. A rotary switch can also be designed, which is used to control a model traffic light system.

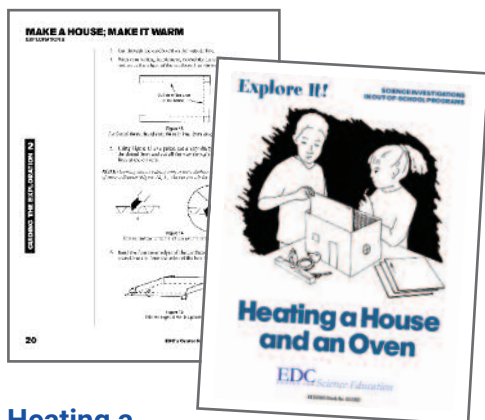
651658 Guide .....\$9.95 or \$8.95 ea./10+





## EXPLORE IT! LESSON GUIDES

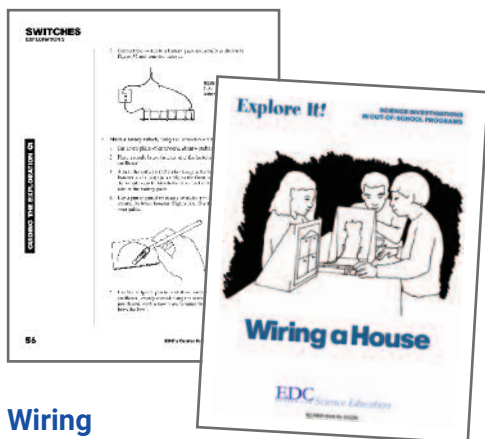
A series of introductory science experiences with instructions for each project as well as implementation suggestions for extended projects. Suitable for after-school programs and elementary school students (ages 8–12). Funded by the National Science Foundation and developed by the Education Development Center, Inc.



### Heating a House & an Oven

By finding different ways to insulate a cardboard "house" warmed by a 40W light bulb, children explore the difference between the heat and temperature. Using a 100W bulb, they turn the house into an "oven" that can bake cookies.

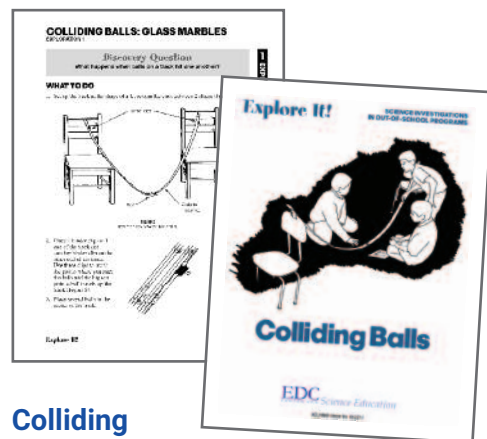
652282 Guide .....\$9.95 or \$8.95 ea./20+



### Wiring a House

Children discover some of the principles of practical wiring and electrical circuitry by installing lights and switches in the rooms of a cardboard house. They follow electrical "pathways" to explain why some light bulbs shine differently.

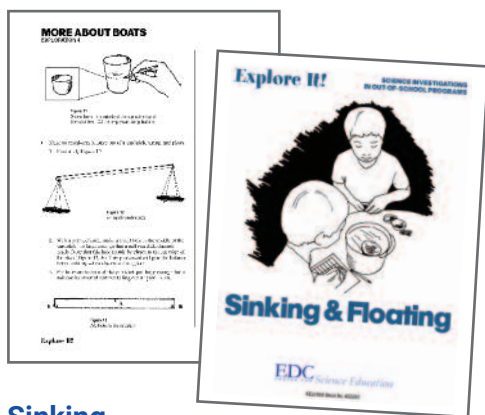
652286 Guide .....\$9.95 or \$8.95 ea./20+



### Colliding Balls

Using a piece of molding as a track and a set of different kinds of balls, children experiment to see what happens when the balls collide with each other, through which children gain some sense of how objects exchange energy.

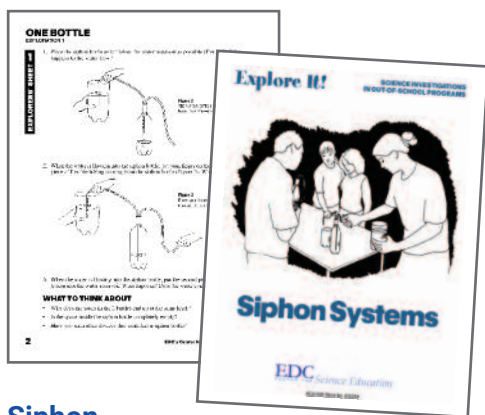
652277 Guide .....\$9.95 or \$8.95 ea./20+



### Sinking & Floating

Children explore the buoyancy of common objects and make boats from a variety of materials, gaining a sense of the contribution of the material and shape will sink or float. They repeat their experiments with other solutions to see how the type of liquid makes a difference in how things float.

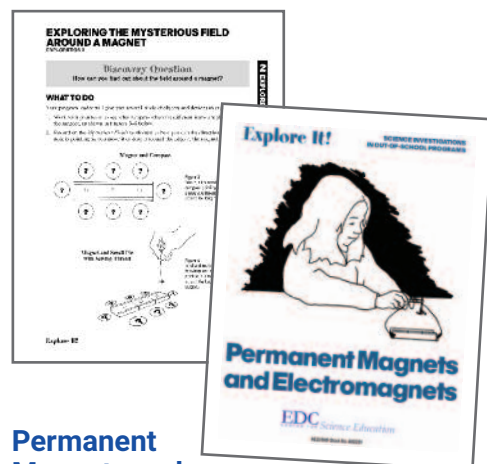
652283 Guide .....\$9.95 or \$8.95 ea./20+



### Siphon Systems

Using an arrangement of plastic tubing and a special connector, children transform a soda bottle into an interesting device for exploring how water flows through a closed or open system. Connecting multiples of bottles allows analyzing what happens to the air and water pressure.

652284 Guide .....\$9.95 or \$8.95 ea./20+



### Permanent Magnets and Electromagnets

Children explore the properties of permanent magnets, such as how to make their magnetic fields visible. Making fun gadgets help determine the properties of electromagnets.

652281 Guide .....\$9.95 or \$8.95 ea./20+

## Explore It! Series Implementation Guide

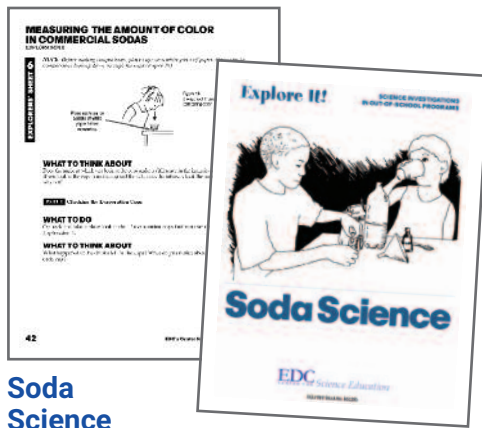
Designed to serve as an introduction to the Explore It! series, this guide covers aspects of managing and structuring each exploration by providing suggestions for effective practices that engage the children in a productive and satisfying experience.

652345 Guide .....\$9.95 or \$8.95 ea./20+

## Complete Explore It! Series Set

All 13 projects (Soda Science, Heating a House, Wiring a House, Exploring Food, Cake Chemistry, Bubbles, Colliding Balls, Magnets, Sinking & Floating, Measuring Ourselves, Siphon Systems, Balancing Toys, Balloons) plus a FREE Implementation Guide.

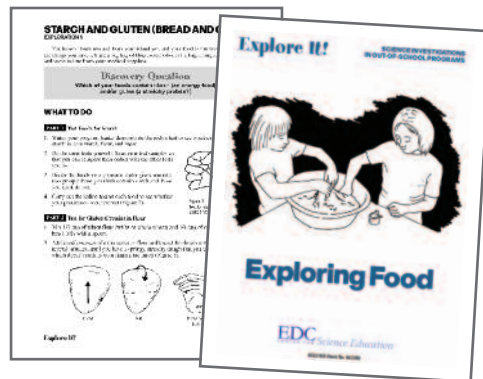
652562 Guide .....\$139.95



## Soda Science

Children can make up their own soda recipes while practicing the mathematical operations of ratio and proportion. Then, they analyze a real soda to compare how the ingredients in the commercial version compare with theirs.

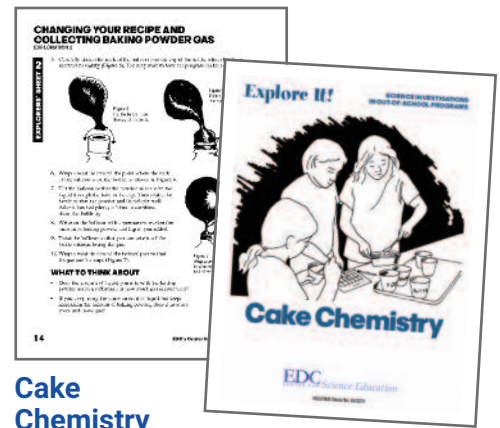
652285 Guide .....\$9.95 or \$8.95 ea./20+



## Exploring Food

Marooned on a desert island with a limited food supply, children investigate the properties and make-up of common foods. Investigations of water, fat and the roles of starch and gluten in flour all contribute to the overall question of what is a "balanced" diet.

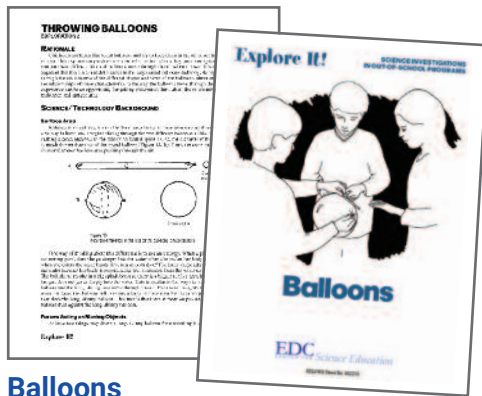
652280 Guide .....\$9.95 or \$8.95 ea./20+



## Cake Chemistry

What are the ingredients in a recipe that cause a cake to rise? Is the same gas produced when using baking powder, baking soda, or yeast? These are some questions pursued in this exploration while, at the same time, getting to eat experiments!

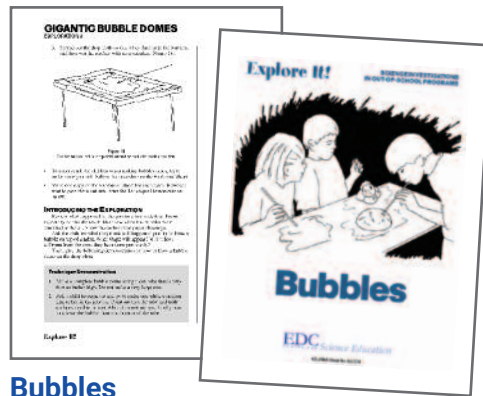
652279 Guide .....\$9.95 or \$8.95 ea./20+



## Balloons

Different sizes and shapes of inflated balloons can be launched in a variety of ways with the result being different trajectories and different distances traveled. Children learn about the phenomena of action-reaction and the properties of air pressure.

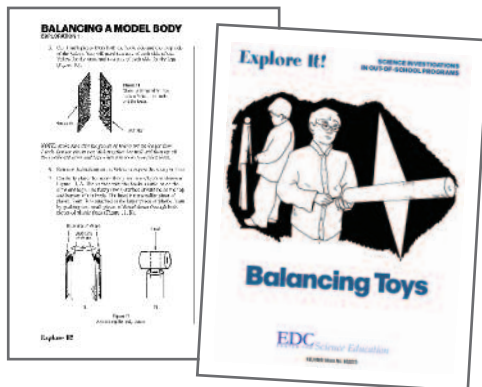
652276 Guide .....\$9.95 or \$8.95 ea./20+



## Bubbles

Floating giant bubbles (3 feet in diameter), small bubble domes on a table top, and soap film in frames are ways to observe some of the more obvious properties of bubbles (such as their round shapes) as well as subtle properties (such as surface tension).

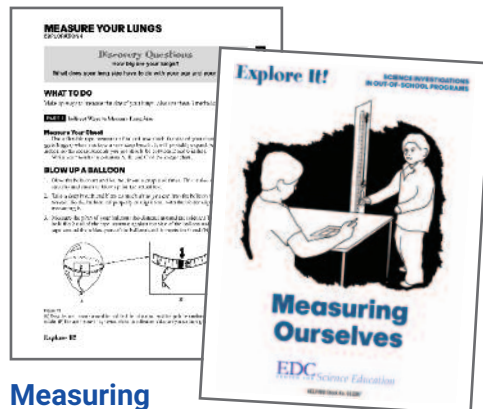
652278 Guide .....\$9.95 or \$8.95 ea./20+



## Balancing Toys

Children transform a pool noodle into a model of a person, a plane, and a boat, and then manipulate them to see how they balance. They also build simple mobiles to explore other kinds of balancing arrangements to understand about equilibrium.

652275 Guide .....\$9.95 or \$8.95 ea./20+



## Measuring Ourselves

Children measure their own bodies in a variety of ways to learn more about their basic physical make-up and to observe both the consistency and variation of body shape, size, and strength among their peers.

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## KELVIN® Competition Certificates

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## Competition Medals

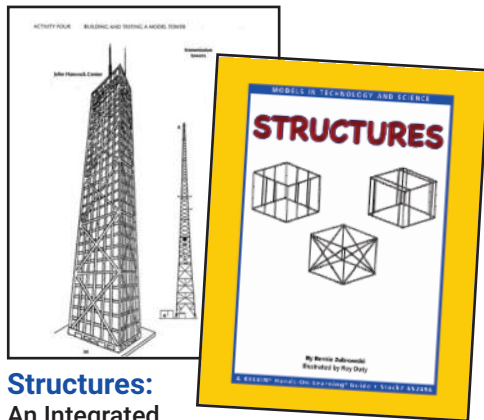
Each set Includes: three 2 in. diameter medals: one each of gold, silver and brass colors. Each medal has a decorative ribbon.

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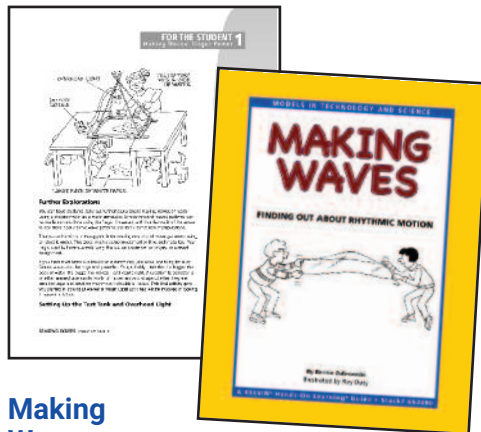
# MODELS IN TECHNOLOGY & SCIENCE



## Structures: An Integrated Engineering Investigation of Houses, Bridges & Towers

Working with drinking straws and paper clips student meet the challenge of building a model house with drinking straws and paper clips. They test their houses to determine how much weight it can hold before it collapses. The findings from this first challenge are applied to building bridges and towers with same kind of materials. An inquiry is carried out on different truss designs. These projects provide a context for introducing the concepts of force, tension, compression and static equilibrium.

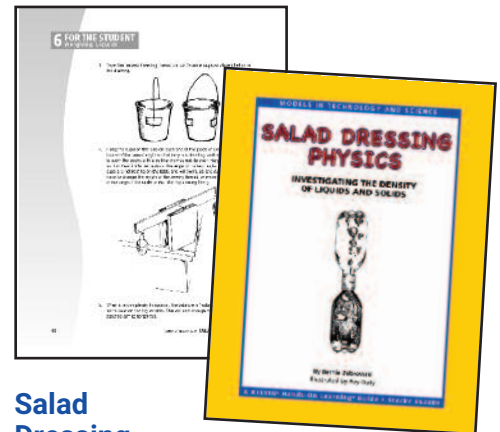
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## Making Waves: An In-Depth Investigation of Rhythmic Motion

The focus of this investigation is on mechanical waves. Students explore how waves can be made in tanks of water, with frames of soap film, with Slinkies, and a vibrating doorbell. A model for studying wave motion is made from dowels and tape to investigate wave movement in a more systematic manner. Plus, various characteristics and properties of waves are introduced as student move through these explorations.

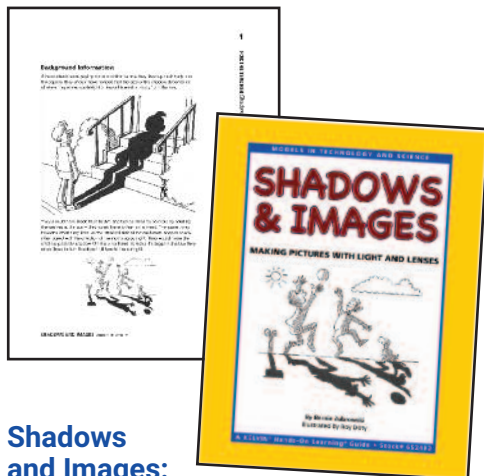
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## Salad Dressing Physics: Investigating The Density of Liquids and Solids

The movement of different liquids is observed in a set of mystery bottles. Students carry out solubility tests and weigh equal volumes of the liquids to identify what the liquids are. These experiences are used to introduce the concept of density. A second set of bottles each having a liquid and several balls of different densities is also investigated. A homemade Lava Lamp is made from mineral oil and two kinds of rubbing alcohol.

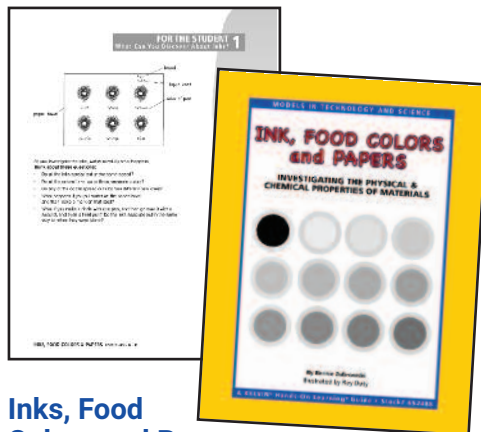
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## Shadows and Images: An In-Depth Investigation of How Images Are Formed

Students first explore ways that different objects cast shadows with different kinds of light sources. Then they explore in a systematic manner the relationship of the shape of the object and the shadow it creates. Glass jars and then lenses are used to observe how light it bent to form images. These explorations can be used to introduce the concept of refraction and the properties of lenses.

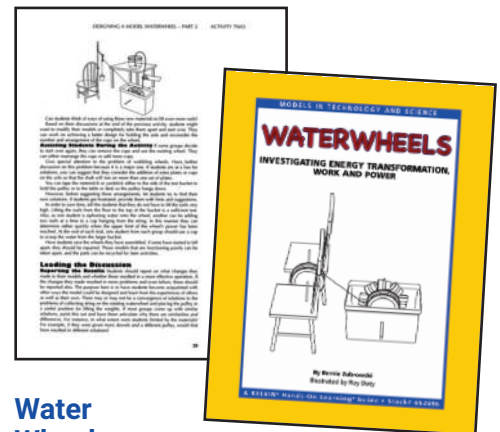
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## Inks, Food Colors and Papers: Investigating The Physical & Chemical Properties Of Materials

Water based pens are tested with water and other kinds of liquids by placing these liquids on marks made on paper. Chromatography is used to refine these observations. A similar process is carried out with permanent pens. These experiences are used to introduce the concept of solubility and physical change. Bleaching of the inks and the changing of the inks of special pens is used as a context for introducing chemical change.

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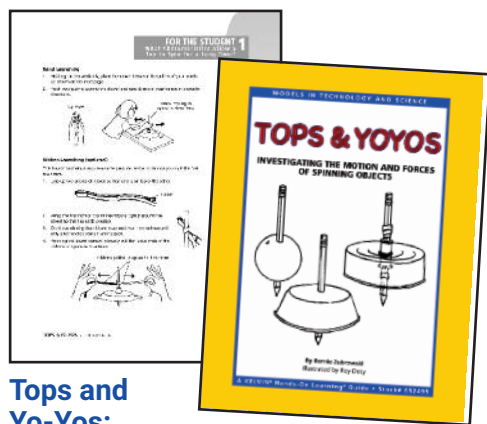


## Water Wheels: An Integrated Engineering Project Investigating How Work and Power are Generated

Given plastic plates and cups, buckets, and a few other materials students construct model water wheels to see how much weight their model can lift when water is poured on the cups attached to the wheel. Students will carry out a systematic inquiry of how different variables associated with the model determines its lifting capacity. This experience is used to introduce the concepts of work, power, momentum, torque, potential & kinetic energy.

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# MODELS IN TECHNOLOGY & SCIENCE



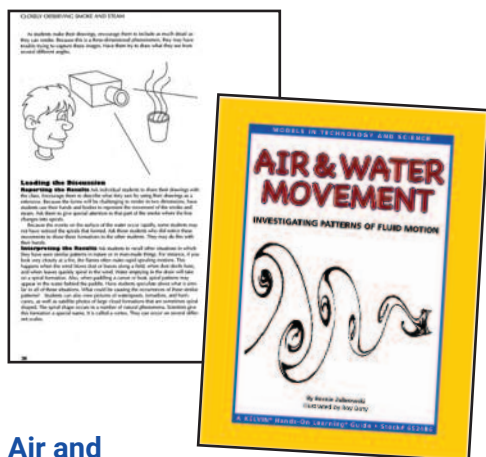
## Tops and Yo-Yos:

### An In-Depth Investigation of the Forces and Motion of Rotating Objects

A set of tops is made from plastic plates and dowels are first launched with a special rubber band device as well as a mixer. A systematic inquiry is then carried out to determine what characteristics of the tops affect how long they spin. A similar process is carried out with yo-yos made from the same materials.

These explorations provide experiential context for introducing the concepts of rotational motion, torque, rotational inertia, potential and kinetic energy.

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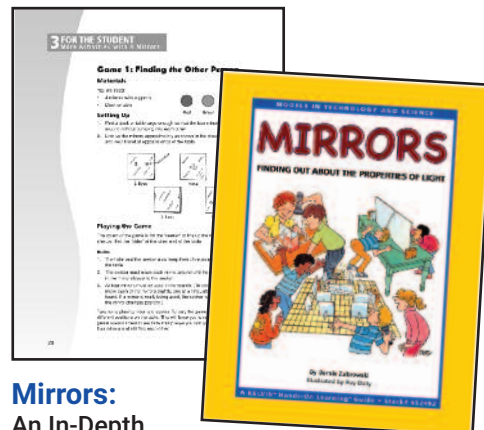
## Air and Water Movement:

### An In-Depth Investigation of Patterns of Fluid Motion

Students map air currents outdoors and indoors. Then they explore the patterns made when different shaped objects are moved through water having a special liquid that makes these patterns visible.

These explorations provide the experiential context for helping students understand phenomena such as cloud movement, currents in rivers and oceans as well as the design of planes and cars.

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## Mirrors:

### An In-Depth Investigation of the Reflection of Light

Regular mirrors are investigated through several challenges and games. The tracing of reflected light rays is carried out to help students understand how images are formed. Pieces of plexiglass are used to investigate the transmission and reflection of light. Flexible Mylar is used to investigate how curved surface reflect light. These experiences provide context for introducing properties of light such as reflection, transmission as well as a way of modeling what happens to light in these situations.

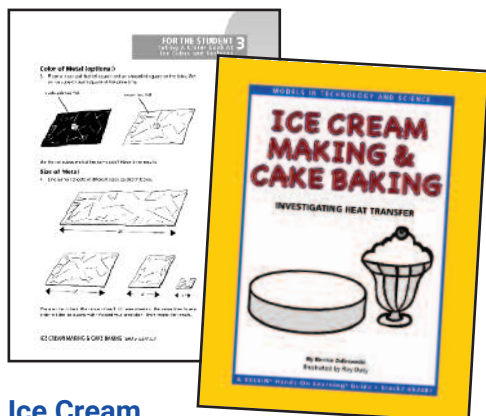
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## Meet The Author

Bernie Zubrowski has spent much of his professional life devising ways to educate young people about science, both while they're at school and when they are out in the world, away from the classroom. He has contributed to many of EDC's landmark science curricula, including Elementary Science Study and the African Primary Science Program. He has directed several projects, including Explore It! Science Investigations in Out-of-School Programs.



In his years with Boston's Children's Museum, Bernie designed exhibits that traveled to science centers across the United States. His 16 books—with titles like Siphons and Water Pumps and Blinkers and Buzzers—and 12 curriculum guides have influenced museum designers, educators, and parents throughout the world.

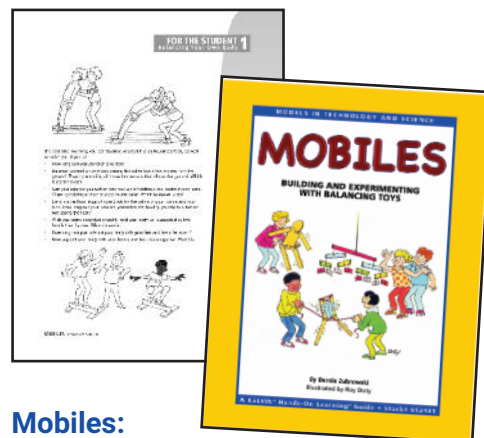


## Ice Cream Making & Cake Baking:

### An In-Depth Investigation of Heat Transfer

Students carry out simple tests of different kinds of containers to determine what is the best kind for making ice cream. They then gather data on cooling rates of hot water in a selected container surrounded by three different cooling solutions. A cardboard box oven is constructed to study convection and radiation. Collected results are used to make ice cream in a container and bake a cake in the cardboard oven. These experiences provide the context for introducing conduction, convection, radiation, and phase change.

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## Mobiles:

### An In-Depth Investigation Of Balancing Toys And Static Equilibrium

Students first balance their body and models of a human body. They experiment with balancing pieces of different shaped cardboard in a vertical and horizontal orientations. They end up constructing mobiles that provide a context for introducing and discussing static equilibrium and torque.

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