

"Educational programs of the Kentucky Cooperative Extension Service serve all people regardless of race, color, age, sex, religion, disability, or national origin."

## OVERVIEW OF 4-H SCIENCE PROGRAM

### Now under 4-H Science, Engineering & Technology (4HSET)

Science standards have historically set the course for science literacy in the United States for formal K-12 educators. The Science Guidelines for Nonformal Education were developed to help youth educators and volunteer leaders understand the importance of nurturing the skills necessary for a scientifically literate society. The Science Guidelines for Nonformal Education draws directly from Benchmarks for Science Literacy, published by the American Association for the Advancement of Science (AAAS, 1993), and the National Science Education Standards, published in January 1996 by the National Research Council. These guidelines serve as the foundation for the Kentucky 4-H Science program.

#### Subject Matter Content:

**I. Physical Science:** The study of natural laws that pertain to nonliving bodies.

Youth will be able to use and understand: (by grade level)

- properties of objects and materials (K-4)
- position and motion of objects (K-4)
- light, heat, electricity, and magnetism (K-4)
- properties and changes of properties in matter (5-8)
- motions and forces (5-8)
- transfer of energy (5-8)
- structure of atoms (9-12)
- structure and properties of matter (9-12)
- chemical reactions (9-12)
- motions and forces (9-12)
- conservation of energy and increase in disorder (9-12)
- interactions of energy and matter (9-12)

Examples of 4-H projects where this subject matter is taught: energy.

**II. Life Science:** The study of living things.

Youth will be able to use and understand: (by grade level)

- the characteristics of organisms (K-4)
- the life cycles of organisms (K-4)
- organisms and environments (K-4)
- structure and function in living systems (5-8)
- reproduction (5-8)

regulation and behavior (5-8)  
populations and ecosystems (5-8)  
the cell (9-12)  
the molecular basis of heredity (9-12)  
the interdependence of organisms (9-12)  
matter, energy, and organizations in living systems (9-12)  
the behavior of organisms (9-12)

Examples of 4-H projects where this subject matter is taught: animal science, Project Wet, horticulture.

**III. Earth and Space Science:** The study of the earth's structure and its solar system.

Youth will be able to use and understand: (by grade level)

the properties of earth materials (K-4)  
objects in the sky (K-4)  
changes in earth and sky (K-4)  
the structure of the earth system (5-8)  
earth's history (5-8)  
earth in the solar system (5-8)  
energy in the earth system (9-12)  
geochemical cycles (9-12)  
the origin and evolution of the earth system (9-12)  
original and evolution of the universe (9-12)

Examples of 4-H projects where this subject matter is taught: weather, aerospace, model rocketry.

### **Space Science/Aerospace Resources**

**Jann Burks**

**Extension Specialist for 4-H Youth Development**

**Torey Earle, Agent At-Large for 4-H SET (West Region)**

**4-H Literature**

**Aerospace** - Soaring Above and Beyond Aerospace Adventures - Published by the 4-H Cooperative Curriculum System. Through fun and challenging learn-by-doing activities, youth develop important life skills as they discover the world of kites, hot air balloons, gliders, remote control airplanes and space shuttles.

**Rockets Away!** - Great activity if you do 4-H model rocketry programs with 4-H'ers. Designed by Dr. Bob Horton at The Ohio State University, it is designed to educate youth in math, engineering, aerospace, and physics through the exploration of rocketry science. Printed materials, computer technology, and hands-on experiments allow youth to design their own 2-liter rocket on the Internet (be certain to visit the "Design Zone" link). Age: 4-8th grade.  
Student Manual

Teacher Manual

Both available from National 4-H Council, Sourcebook.

<http://www.ag.ohio-state.edu/~rockets/>

### **Model Rocket Kits**

Estes/Rocket Age Enterprises, Inc.

9 Lance Rd.

Lebanon, NJ 08833

908-439-3559

Pitsco

1-800-835-0686

[www.pitsco.com](http://www.pitsco.com)

### **Web Sites**

#### **National Network for Science and Technology**

<http://www.ets.uidaho.edu/4-H/nnst/>

(part of Children, Youth, and Families Education and Research Network - CYFERNet -

[www.cyfernet.org](http://www.cyfernet.org)

#### **Four-Fold Model for Evaluation from Purdue University**

<http://www.four-h.purdue.edu/fourfold/>

**Find Out Why?** replaced National Science and Technology materials printed by National Science Foundation. Copies of their six publications are available by downloading from their web site and I have a few color originals in my office. Age: Grade 2-3.

[www.nsf.gov/findoutwhy](http://www.nsf.gov/findoutwhy)

**PCs in Space** - free software to download from the web or order a free CD on earth and space science with a math emphasis.

<http://pcsinspace.hst.nasa.gov/space/>

#### **Science Lesson Plans**

<http://www.forlessonplans.com/>

**Space Camps** in AL, FL, and CA - camps for 9-18 year olds. Also have extended weekend Parent/Child camps.

[www.spacecamp.com](http://www.spacecamp.com)

**The Space Place** - NASA's web site for children. Programs are offered at Planetarium at ECU and Land Between the Lakes. Be sure to check out the "For Teachers Only" section too. They will send quarterly activity sheets that relate back to this site. Sheets will be placed on the State 4-H Web Site>4-H Information>Program Resource Guide>Science links. Age: Grades 4-8.

Some activities can be adapted for Grades 9-12.

<http://spaceplace.jpl.nasa.gov>

**Toys in Space** @ Iowa State University 4-H Web Site

Level 1 - Grade 1-5

Level 2 - Grade 6-12

<http://www.exnet.iastate.edu/Pages/y4h/e-set/tis/>

### **Catalogues with Science Related Information**

National School Products

101 East Broadway

Maryville, TN 37804-2498

1-800-251-9124

AIMS Multimedia

9710 DeSoto Ave.

Chatsworth, CA 91311-4409

[www.aims-multimedia.com](http://www.aims-multimedia.com)

Scott Foresman-Addison Wesley

1-800-552-2259

[www.sf.aw.com](http://www.sf.aw.com)

Nashville's Media Services

526-B Third Ave. South

Nashville, TN 37210

888-523-5234

Educational Resources

1-800-624-2926

[www.edresources.com](http://www.edresources.com)

Nature Watch

POB 372108

Reseda, CA 91337-2108

2001 Sourcebook from National 4-H Council

Dorling Kindersley Family Learning

7800 Southland Blvd. Suite 200

Orlando, FL 32809

### **Books**

*Resource to Support Science Education through the CES:*

Science Guidelines for Nonformal Education - designed to help extension educators and

volunteer leaders understand the importance of nurturing skills necessary for a scientifically literate society. It is compatible with Benchmarks for Science Literacy and the National Science Education Standards, and includes sections on scientific inquiry, content guidelines for the major 4-H project areas, and learning to teach in nonformal settings. This information will be especially useful to staff who are working closely with schools on enrichment programming because it identifies connections between 4-H science and technology activities and school science standards.

*Nurturing Scientific Literacy Among Youth Through Experientially Based Curriculum Materials*  
This publication formalizes the process for developing experientially based non-formal science teaching. It is based on Kolb's definition of experiential education. It includes organizing content along an experiential path, identifying instructional methodology and science life skills necessary to teach the content, using an experiential facilitation process to guide the learner through the content, and delineating post-unit assessment techniques. It was developed by the National Network for Science and Technology at The Ohio State University.

**Life Skills Taught** Through Various 4-H Science Projects Include:

Structuring

- \*Predicting
- \*Hypothesizing
- \*Evaluating
- \*Defining Operation
- \*Making Assumptions
- \*Using Scientific Tools

Investigation

- \*Ordering
- \*Controlling Variables

Focusing

- \*Categorizing

Investigation

- \*Using Space and Time Relationships

Exploring

- \*Observing

Grounding

- \*Inferring
- \*Grounding

Recording

- \*Comparing and Measuring
- \*Using Numbers

- \*Graphing
- \*Reducing Error
- \*Making Models

Communication

- \*Applying
- \*Communicating to Others

Science Ethics

### **Other examples of 4-H Science Projects:**

**In-Touch Science: Chemistry and Environment & Plants and Engineering** - designed for 3<sup>rd</sup> through 5<sup>th</sup> graders. Each publication contains 10 paired activities - five in one discipline and five in another field of study. Children do the activities and then search for the science connection.

**SERIES:** A teen-led science education program developed for use in informal education settings and designed to provide instructional experiences that focus on science literacy and the application of science and technology to everyday life. Curriculum develops skills in using the process of science for problem solving and decision making. Cross-age learning and community service aspects of program strengthen adult/youth partnerships as well as youth leadership skills. Unit topics include: Chemicals, Earthquake Safety, Agriculture, Oak Woodlands, Pests, Recycling, Sciencing with Snails, and Watersheds.

A related resource is The Space Place, a fun, fact and activity site developed by the staff at JPL. The Space Place brings Space Science and Technology to the classroom. Most of the activities can be adapted for grades 4-8. Some may also be of interest to grades 9-12. Visit the Space Place at: <http://spaceplace.jpl.nasa.gov>

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[Return to Index](#)