

4-H Youth Development State Initiatives and Trends 2016-2020

Core Curriculum: Science, Engineering & Technology

Major Initiative: Engaging in discovery, exploration, and understanding in science, engineering and technology.

Specific issue description: Youth will learn scientific research techniques, responsible practices and innovative technologies that positively address science, engineering and technology issues in Kentucky and globally. Through the Land Grant University and Extension system, 4-H can expand its impact and extend its reach in science, engineering and technology (4-H SET) by providing opportunities for hands-on scientific learning and discovery in 4-H clubs.

Long Term goals/outcomes:

- Youth will utilize the scientific method to solve problems in their daily life.
- Youth will choose a career path in science, engineering or technology subject matter.
- Youth will utilize the scientific method in decision-making.

Intermediate goals/outcomes:

- Youth will use and apply the skills gained from 4-H science, engineering and technology.
- Youth will demonstrate and share new abilities in science, engineering and technology with others.
- Youth will practice scientific methods learned in 4-H SET programs.
- Teens will mentor younger 4-H'ers in science, engineering and technology programs.

Short-term goals/outcomes:

- Youth will increase interest and engagement in 4-H science, engineering and technology.
- Youth learn new skills in 4-H science, engineering and technology programs.
- Youth will be introduced to careers in science, engineering, and technology.
- Teens participate in science, engineering and technology 4-H programs to acquire new skills.

Indicators:

- Number of youth who use knowledge and skills from 4-H science, engineering and technology in daily life.
- Number of youth who follow scientific methods when making decisions..
- Number of youth who do SET activities outside of school.
- Number of youth who create a display or object related to SET and can explain what they have learned.

Role of 4-H Youth Development Program – Inputs – *what are the existing and new resources related to this issue that can be used at the county level.*

- Host National Youth Science Day (NYSD) experiments during National 4-H Week every October
- SET Teen Boards-State
- Biotechnology in-service (2015-16)
- Aerospace in-service (2015-16)
- SERIES: Fundraising For SET Programs, workshop (2015)
- Bicycle Safety-review of curriculum and in-service training
- ATV Curriculum-review and application at county level
- Automotive program to be developed for teens.
- The Car teens program will be used as a resource for developing program for safe teen driving.

- Tractor Curriculum will be reviewed with enhanced program options at county and state level.
- Small engines program will be defined and in-service training will be offered. .
- Lawnmower and safety to be developed.
- Computer Technology for Kids program to be developed.
- Hour of Code Program-to be piloted (2015)
- Micro-truck and Tractor Pulling Program- in process of being developed (2017 is target date)
- TecXite-December 2015

Existing resources from Core Curriculum-

Aerospace:

Aerospace Adventure Series:

Pre-Flight

Youth learn how to talk like an astronaut, find out how an airplane works and have fun at the same time. (20 pages) Intended user: youth in grades K-2

Source: National 4-H Supply Service

N4-HSS 06842 \$4.95

Lift Off

Youth lift off as they fly kites, participate in airplane contest, launch rockets, explore space, make a glider, construct a straw rocket and experience disorientation (40 pages) Intender user: youth in grades 3-12

Source: National 4-H Supply Service

N4-HSS 06843 \$4.95

Reaching New Heights

Youth soar as they learn to fly an airplane, launch a rocket, conquer space and become an astronaut or pilot. Controlling flight direction and experiencing shuttle technology add to the fun. Youth make a shuttle on a string, a Japanese kite, a hang glider and a control panel of an aircraft. (40 pages) Intender user: youth in grades 3-12

Source: National 4-H Supply Service

N4-HSS 06844 \$4.95

Pilot in Command

Youth create their own altitude tracker, determine the most fuel efficient routes between airports and make a box kite. Youth also explore pilot certification requirements, evaluate past and present navigation systems, and learn about airport issues in their community or state. (40 pages) Intender user: youth in grades 3-12

Source: National 4-H Supply Service

N4-HSS 06845 \$4.95

Aerospace Helper's Guide

This helper's guide provides group oriented experiences that will keep youth coming back for more. Many activities are included in this guide for hands-on experiential group fun—such as an aerospace quiz bowl, skillathons and an airport field day. (40 pages) Intender user: volunteer working with a group of youth in grades 3-12

Source: National 4-H Supply Service

N4-HSS 06846 \$4.95

SET of 506881 \$23.95

Rockets – An Educator's Guide

From NASA - The activities and lesson plans contained in this educator guide for grades K-12 emphasize hands-on science, prediction, data collection and interpretation, teamwork, and problem solving. The guide also contains background information about the history of rockets and basic rocket science. Intended user: Grades K – 12. Source: NASA Educator web site:

www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Rockets.html - 3mb

NASA EG-2003-01-108-HQ Download free

ATV Safety:

KY ATV Safety Posters & Brochures:

Posters and brochure shared by Arkansas 4-H. Posters in several sizes, color for display and use with adults and youth in promoting positive safety when using and riding ATV's.

- 1) Checking Your ATV
- 2) ATV Fit Guidelines
- 3) ATV Safety Gear
- 4) ATV Safety Brochure

Source: Free download from 4-H Agent Resource Guide, ATV

Biotechnology:

A Crime, A Clue and Biotechnology

Youth learn about complex scientific and technological issues related to biotechnology. This guide includes learning activities in fingerprinting, crime scene evidence collection, DNA, genes/heredity, biotech careers, bioethics, mock trial and practical applications for biotechnology (making cheese, bread, & ice cream). (320 pages) Intended user: volunteer working with youth ages 12-14. Copy on Kentucky Agent Resource Guide. Source: Iowa State Extension Service; each county was given a copy in Summer 2007; contact Jann Burks for copies. Curriculum can be ordered from Iowa State University Extension Distribution Center, 119 Kooser Drive, Ames, IA 50011. Phone,(515) 294-5247. www.extension.iastate.edu/Publications/PG97021.pdf.

Contact pubdist@iastate.edu

Iowa State CES 4H-950 \$15.00

Free download – KY 4-H Agent Resource Guide

Science Sleuths, 60 Activities to Develop Science Inquiry and Critical Thinking

Authors: Pam Walker & Elaine Wood. All hand-outs, instructions included in paperback format.

Science Sleuths is an easy-to-use guide that will help you teach youth how to unravel forensic science mysteries while improving their critical thinking skills. Forensic science is an ideal vehicle for teaching the nature of science as well as basic science concepts. In addition, forensic science relies heavily on science process skills, manipulative skills, laboratory skills, and interpersonal skills, all emphasized by the National Science Education Standards. Kentucky's Science Standards now includes forensic sciences.

Source: Paperback, found online, cost varies based on purchase site.

Online book sites (i.e. Amazon, etc.) Cost between \$15.00 – \$25.00.

Electronics/Electricity:

Electric Excitement Series:

Magic of Electricity

Electricity is everywhere. Youth explore why certain things insulate from electricity better than others, the effect that magnetism has on various substances, how to build a flashlight, build and test a compass, build

an electromagnet and electric motor. (40 pages) Intended user: youth in grades 4-12

Source: National 4-H Supply Service

N4-HSS 06848 \$4.95

Investigating Electricity

Decoding circuit diagrams, sending messages by Morse code and building three-way switches are featured. Youth build circuits and test voltages, build a rocket launcher and a burglar alarm as they practice decision making and communication. This unit is designed for youth who understand magnetism, electron flow and circuit design. (40 pages) Intended user: youth in grades 4-12

Source: National 4-H Supply Service

N4-HSS 06849 \$4.95

Wired for Power

Youth build on skills learned in Levels 1 and 2 plus learn some new ones, such as measuring electrical usage, replacing electrical switches and determining electrical loads. Youth also evaluate different light bulbs and test for electrical power. (40 pages) Intended user: youth in grades 4-12

Source: National 4-H Supply Service

N4-HSS 06850 \$4.95

Entering Electronics

Youth learn about diodes, transistors, LEDs, photocells, SCRs, ICs and amplifiers. This guide is designed for intermediate to advanced learners. An understanding of DC circuits, voltage, amperage, current flow, polarity and some soldering is needed. (44 pages) Intended user: youth in grades 4-12

Source: National 4-H Supply Service

N4-HSS 06851 \$4.95

Electric Excitement Helper's Guide

This helper guide has a number of exciting group activities that keep members coming back for more. It includes a variety of group activities that can be organized quickly and conducted with a group of 3 to 15 youth. Youth learn how to conduct an electric skillathon, quiz bowls, electric bingo and how to calculate amperage. (40 pages) Intended user: volunteer who work with youth in grades 4-12

Source: National 4-H Supply Service

N4-HSS 06852 \$3.95
SET of 5 06882 \$23.95

Energy:

Science of Energy Kit: National Energy Education Program (N.E.E.D.)

Youth conduct experiments to explore different forms of energy and how energy is transformed from one form to another. Groups of youth master the concepts at 6 learning stations then teach others about the energy transformations at their stations. The stations include transformations in kinetic and potential energy, heat, light, motors, batteries, and magnets. Also included are teacher demonstrations and reinforcement activities. The resources are written at 5th and 8th grade reading levels. Intended user: Volunteers working with youth in grades 4-8 and 7-12

Source: National Energy Education Development Program, Order from www.need.org . Kit may be purchased or rented. Set of consumables may be ordered to replace those used.

NEED Guide \$3.50
NEED Science of Energy Kit \$400.00
NEED Rent Sci of Energy Kit \$150.00
NEED Consumables \$35.00

Electroworks Kit

Youth explore the basic concepts of atomic structure and electricity through hands-on experiments. Experiments include static electricity, batteries, magnets, electromagnetism, and circuits. The kit comes with a detailed teacher guide, class set of student guides, and most of the equipment needed to conduct the experiments. Materials not included are readily available in the classroom or home. Intended user:

Volunteers working with youth in grades 4-12

Source: National Energy Education Development Program; Order from www.need.org ; Kit may be purchased or rented.

NEED	Guide	\$5.00
NEED	Electroworks Kit	\$350.00
NEED	3-wk Rental of Kit	\$150.00
NEED	Set/30 student guides	\$50.00

The Power of Wind (grades 6-8) (Descriptions under Natural Resource section)

Are you looking for something to spark engineering and science interest among middle school kids? The activities in The Power of the Wind curriculum involve young people in the engineering design process as they learn about the wind and its uses. Youth work with members of a team to design, create, build, and test a wind powered device. The device must solve a problem and requires the designers to balance options and constraints. Participants are guided to make adjustments and retest until the vehicle or machine solves the original problem. Grades 6-8.

The Power of the Wind Activities involves young people in the engineering design process as they learn about the wind and its uses.

N4-HSS

Youth Guide	08383	\$5.50
Facilitator Guide	08384	\$5.50
Set of 2	08385	\$9.65

Engineering:

Bicycle Group

Help children learn about bike safety tips ranging from fitting a helmet to adjusting brakes. Activities are designed for youth bicycle enthusiasts and volunteers starting a bicycle club as well as for improving an existing bike program. Service Learning Set of 3 Bicycle - Set of 3 - Activities in this series are designed for youth bicycle enthusiasts and volunteers starting a bicycle club as well as for improving an existing bike program. Grades 3-12.

Source: National 4-H Supply Service

N4-HSS	08337 set of 3	\$13.10
--------	----------------	---------

Bicycle - Don't Get Stuck: Fix It DVD

For ease of use, the preventive maintenance and repair tips shown in the video are color coded so youth can quickly locate just the segment needed. Eleven different segments from fitting a helmet to adjusting brakes are featured.

N4-HSS	08399	\$10.00
--------	-------	---------

Bicycle Group - Helper's Guide

Designed to provide engaging & fun group activities for cycling enthusiasts. Contains information & activities related to basic bicycle handling, traffic skills & bicycle events & activities the whole group will enjoy.

Source: National 4-H Supply Service

N4-HSS	08336	\$4.95
--------	-------	--------

Bicycle 1 - Bicycling for Fun

Youth learn advanced skills as they explore their surroundings. Guide includes activities that will last a lifetime. Youth choose a bike that's right for them & practice bike maintenance & road rules to make their ride safe & fun.

Source: *National 4-H Supply Service*

N4-HSS 08334 \$4.95

Bicycle 2 - Wheels in Motion

This guide includes activities that will last a lifetime. Youth choose a bike that's right for them and practice bike maintenance and road rules to make their ride safe & fun.

Source: *National 4-H Supply Service*

N4-HSS 08335 \$4.95

Geospatial Sciences (GPS/GIS):

Exploring Spaces, Going Places

Multiple levels and the helper's guide are on one CD.

Source: National 4-H Supply Service; entire series available only on CD, not in printed form

N4-HSS 08358 set of 4 \$15.00

Robotics:

4-H Robotics: Engineering for Today and Tomorrow - Gr 4-12

This curriculum focuses on basic physical science concepts related to robotic systems, the scientific inquiry process, engineering design process, technology tools used for learning and communications, and the exploration of science, engineering and technology careers. The curriculum is comprised of three tracks:

Virtual Robotics

(DVD), Junk Drawer Robotics (Books), and Robotics Platforms (DVD).

Source: *National 4-H Supply Service*

N4-HSS 08436 Robotics Curriculum Set \$44.95

Junk Drawer Robotics Track (3 Facilitator Guides and 1 Youth Notebook)

Youth are challenged to build robots from everyday items. None of the levels require or use computers.

Youth will use their Robotics Notebook to record their learning experiences, robotic designs and data from their investigations.

Junk Drawer Robotics--Give Robotics a Hand—Level 1

Youth explore and learn about robot arms. Concepts covered include pneumatics, arm designs, and three-dimensional space. Big ideas include form and function, scientific habits of mind, and engineering design (78 pages). Intended user: youth

Source: National 4-H Supply

N4-HSS 08431 \$7.95

Junk Drawer Robotics--Robots on the Move—Level 2

Youth learn about robots that move with legs, wheels and underwater. Concepts covered include friction, basic electrical power and motors, engineering constraints, gear systems, and buoyancy. (76 pages)

Intended user: youth

Source: National 4-H Supply

N4-HSS 08432 \$7.95

Junk Drawer Robotics--Mechatronics—Level 3

Youth will explore sensors and analog and digital systems. This level introduces simple electronic

components; youth will build basic circuits to see how the components work. They will investigate basic elements of programming and instructions for robotic computer control. (92 pages) Intended user: youth

Source: National 4-H Supply

N4-HSS 08433 \$9.95

Robotics Platforms Track DVD

Youth will use commercial robotics kit to explore the world of robots. The activities developed for this track can be used with a variety of commercial kits, including NXT, and Vex. As participants experience each module, they will develop scientific knowledge and technological understanding that will enable them to master the challenge presented at the culmination of the level. As they progress through the activities, the Robotics Notebook will help youth to keep a record of the progress and serve as an important learning tool. DVD includes pdf of Facilitator's Guide and Youth Notebook.

N4-HSS 08434 \$9.95

4-H Robotics Youth Notebook

There is one Robotics Notebook for the three levels of the Junk drawer Robotics curriculum. The notebook encourages youth to think and act like scientists and engineers. In their notebook, they will record their ideas, collect data, draw designs, and reflect on their experiences. It also provides specific information for the challenges. Each youth should have his or her own Robotics Notebook. Intended user: youth

N4-HSS 08435 \$6.95

4-H Robotics Facilitator Material Kit

This kit contains the hands-on materials needed for the facilitator of a group working on the Junk Drawer Robotics curriculum. Save hours of shopping and purchase a ready-to-use reusable kit for facilitators!

Source: National 4-H Supply

N4-HSS 08438 \$149.00

4-H Robotics Level 1 Material Kit (for 10 youth)

This kit contains the hands-on materials needed to complete level one of the Junk Drawer Robotics curriculum. The kit includes basic materials as well as the not-so-common materials needed to complete each activity. Save hours of shopping and purchase a ready-to-use kit! This materials kit is designed to accommodate ten (10) youth.

Source: National 4-H Supply

N4-HSS 08437 \$199.00

4-H Robotics Magic of Electricity Material Kit (for 5 youth)

Save hours of shopping and purchase a ready-to-use kit! This kit includes all the basic and not-so-common materials for [Level 1 of the Electricity curriculum](#). This kit contains the hands-on materials used to study electrical circuits, magnetism, and electromagnetism. Youth will make series and parallel circuits, create an electromagnet, build a galvanometer, and make a working electric motor. Material kits are designed to accommodate up to five (5) groups of students. Grades 4-5. Curriculum books must be purchased separately.

Source: National 4-H Supply

N4-HSS 83505 \$150.00

Science (General):

Contact: Jann Burks

Science Discovery Series:

Science Discovery (Level 1)

Youth develop science skills as they explore whales, rocks, and minerals, water quality, trees and recycling. (76 pages) Intended user: volunteers working with youth in grades 3-5

Source: National 4-H Supply Service
N4-HSS 07914 \$10.00

After School Agriculture Series:

Acres of Adventures 1

Adults and older youth will enjoy using the 40 lesson plans to quickly engage youth in topics of agriculture and life sciences while expanding your collection of fun-filled after-school science activities. Learn-by-doing agriculture activities within the following units: Plant Detectives, Mystery Agriculture, All about Agriculture, Fast Food Agriculture. This curriculum was designed for use in after-school childcare settings but can be used in clubs camps, classrooms, etc. (100 pages) Intended user: volunteers working with youth in grades 3-5

Source: National 4-H Supply Service
N4-HSS 08330 \$9.95

Acres of Adventures 2

This group activity guide provides ready to use lesson plans that will quickly involve youth in experiential activities related to the following units: Insect Invasion, Farm Physics, Agriculture Gone Wild, and Frontier Living. This curriculum was designed for use in after-school childcare settings but can be used in clubs camps, classrooms, etc. (100 pages) Intended user: volunteers working with youth in grades 3-5

Source: National 4-H Supply Service
N4-HSS 08331 \$9.95
N4-HSS Set of 2 08332 \$17.95

Small Engines:

Small Engine Series:

Crank It Up

Youth focus on basic small engine knowledge, study external engine parts, discover tools of the trade and learn about the concepts behind what makes small engines work. They explore the uses of small engines and safety issues. (40 pages) Intended user: youth in grades 3-12

Source: National 4-H Supply Service
N4-HSS 08186 \$4.95

Warm It Up

Youth explore the internal parts of engines; learn about engine sizes, compression ratios, seasoning their engines and safety issues. Youth also learn about occupational possibilities and starting their own businesses. (40 pages) Intended user: youth in grades 3-12

Source: National 4-H Supply Service
N4-HSS 08187 \$4.95

Tune It Up

Youth tear down and rebuild an engine, use diagnostic tools, research rules and regulations about using small engine machines and select replacement engines. (40 pages) Intended user: youth in grades 3-12

Source: National 4-H Supply Service
N4-HSS 08188 \$4.95

Small Engines Helper's Guide

The helper's guide includes group activities, helpful hints for each activity in the three youth guides and additional small engine project meeting ideas. (40 pages) Intended user: volunteers working with youth in

grades 3-12

Source: National 4-H Supply Service

N4-HSS	08189	\$4.95
N4-HSS	08190 set of 4	\$19.50

Contacts:

Jann Burks, Extension Specialist for 4-H Youth Development

Torey Earle, Agent-at-large for Science, Engineering and Technology

Chuck Stamper, Special Projects Coordinator

Tanya Dvorak, Extension Specialist for Program and Staff Development