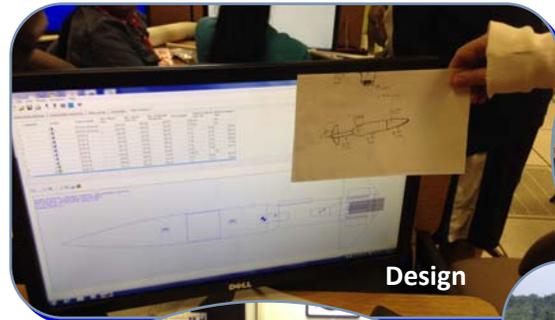
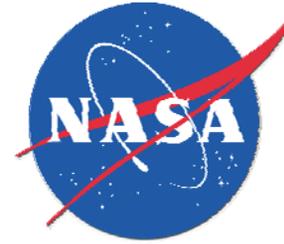


NASA's Independent  
Verification and Validation  
Program



*Promoting Science, Technology,  
Engineering, and Mathematics for  
Educators, Students, and the Community*

**Educational Opportunities**

# NASA IV&V Educator Resource Center



*Providing formal and informal educators the training and tools to promote Science, Technology, Engineering, and Mathematics (STEM) education.*



Through a grant with Fairmont State University, the NASA IV&V Program's Educator Resource Center (ERC) provides resources and training opportunities to inspire the next generation in STEM fields. Educators are encouraged to visit the ERC to explore the available NASA publications, attend high-quality trainings, and borrow valuable classroom kits. The ERC supports state and national STEM initiatives and is engaged with the WV Department of Education in designing new STEM standards. The ERC is the Global Learning and Observations (GLOBE) partner for WV and hosts teacher institutes every summer to support student centered climate research.



## Professional Development

The ERC provides workshops using NASA materials to enhance current curriculum in areas such as Earth and space science, mathematics, engineering, and technology. The ERC conducts over 150 workshops for 1,500+ formal and informal educators each year at the NASA IV&V Facility, at schools across West Virginia or via distance learning tools.



## Student Workshops

The ERC hosts on-site programs for groups of up to 18 public, private, or home-school students in grades 5-8. All programs include engaging, hands-on activities and interacting with a NASA scientist or engineer via video conferencing or a personal visit, and a field trip or tour in the technology park.



## Student STEM Competitions

The ERC coordinates the FIRST® LEGO® League (FLL) tournament for West Virginia hosted at FSU each year, the ERC trains educators and students on the Team America Rocketry Challenge (TARC), and are the WV coordinators for the Real World Design Challenge (RWDC).

With support from numerous partners the ERC has provided team-based summer camps for coaches and their students, sponsored new FLL teams, hosted sanctioned TARC rocket launches, provided VEX robotics trainings, and coordinates all aspects of the RWDC annual competition.



Real World  
Design Challenge

VEX  
ROBOTICS  
COMPETITION

## Multi-Million Dollar Equipment Loan Program

With partnerships, grants, and sponsorships, the ERC operates with over 50 classroom kits which certified educators borrow for **FREE**. The kits help rural West Virginia students overcome the digital divide and gain valuable hands-on experience with the latest and most engaging STEM tools. In order to borrow the kits, you must first attend a training workshop for the kit(s) you are interested in and become certified. Following certification, kits may be borrowed for two weeks at a time. A Google Calendar is used to display the availability of the kits, and may be viewed here:

<https://www.google.com/calendar/embed?src=ivv.nasa.gov%40gmail.com>

Training workshops are often displayed on this calendar as well. You may also request a training workshop in your area. ERC staff will gladly travel anywhere in the state to host workshops when a minimum of 10 educators are willing to attend.

Descriptions for the workshops/kits are discussed in detail in this booklet.

There are currently 29 topics available:

- Afterschool Universe
- Basic Rocketry
- Dinosaurs
- Echo the Bat
- Engineering Design Challenge: Launch Structures
- Engineering Design Challenge: Thermal Protection Systems
- GLOBE: Soils
- GLOBE: Surface Temperature
- GLOBE: Water Quality
- GPS
- Haptics
- Hydroponics
- Kindernauts
- Living and Working in Space
- Making the Invisible Detectable
- Mars
- Model Rocketry
- Museum in a Box
- NEED: Hydrogen
- NEED: Science of Energy
- NEED: Solar Energy
- NEED: Wind Energy
- Planetary Geology
- Probeware (GLX)
- LEGO NXT Robotics Kit
- Space Weather
- STARLAB
- Viewing the Universe with Telescopes
- WeDo Robotic Explorations (LEGO WeDo's)

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**To request a workshop in your area, register for a workshop, check on equipment availability, or inquire about student programs, contact the ERC:**

Program Manager:	Todd.Ensign@ivv.nasa.gov	304-367-8438
Education Specialist:	Pam.Casto@ivv.nasa.gov	304-367-8436
Office Manager:	Alicen.Patton@ivv.nasa.gov	304-367-8251
Student Programs:	Jaime.Ford@ivv.nasa.gov	304-367-8379
Equipment Loan:	Jennifer.See@ivv.nasa.gov	304-367-8215

**NASA IV&V ERC, 100 University Dr., Fairmont, WV 26554**

[www.nasa.gov/centers/ivv/education/educators.html](http://www.nasa.gov/centers/ivv/education/educators.html)

# Museum in a Box

## Educator Workshop

Time: 2 hours

The Museum in a Box program brings the physical sciences of flight to students in grades K-12. Great for educators at museums, science centers and schools, Museum in a Box provides exciting hands-on/minds-on lessons with an aeronautics theme to inspire future scientists, mathematicians and engineers.



**Suggested grade level:** K-12

**Kit contents:**

- Chamber

**Number of kits available:** 1



## Science and Math Content Standards

### Utilized with This Kit

- **Science as Inquiry:** abilities necessary to do scientific inquiry
- **Unifying Concepts and Processes:** evidence, models, and explanation; change, constancy, and measurement
- **Physical Science:** motions and forces
- **History and Nature of Science:** Science as the human endeavor

# Basic Rocketry

## Educator Workshop



Time: 3 hours

Educators will learn the history of rocketry, how to build and launch 4 types of rockets, how rockets and rocket racer cars can be used to teach Newton's Laws, how to use the engineering design process to improve rocket performance, and how to meet many math and science standards using the kit.

**Suggested grade level:** K-12

### Kit contents:

- Straw rocket launcher
- Water bottle rocket launcher
- Stomp bottle rocket launcher
- Bicycle pump
- Rocket Educator Guide
- *October Sky* DVD and *Rocket Boys* book



Studying “action and reaction” with rocket racers.

**Number of kits available:** 2

### Science and Math Content Standards Utilized with This Kit

- **Unifying Concepts and Processes:** form and function; change, constancy and explanation;
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Physical Science:** Position and motion of objects; properties and changes of properties in matter, motions and forces, transfer of energy
- **Science and Technology:** abilities of technological design
- **History and Nature of Science:** historical perspectives
- **Measurement and Data:** represent and interpret data
- **Statistics and Probability:** summarize and describe distributions

# Model Rocketry

## Educator Workshop

Time: 6 hours

Model rockets capable of achieving heights up to 300 meters are designed and built by educators as they learn the principles of rocketry including Newton's Laws of Motion, center of gravity, center of pressure, trajectory, use of altimeters, and much more. RockSim software is used to design and test rocket stability and performance. Educators also receive information on model rocketry competitions such as the Team America Rocketry Challenge.



**Suggested grade level:** 5-12



### **Kit contents:**

- Custom 5 rocket launcher
- Igniter with safety key
- Two altitude tracking stations (clinometers, 50meter tape, calculators)
- Model Rocketry Educator Guide

**Number of Kits available:** 1

### **Science and Math Content Standards Utilized with This Kit**

- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Unifying Concepts and Processes:** change, constancy and explanation; evidence, models, and explanation; form and function
- **Physical Science:** properties and changes of properties in matter, motions and forces, transfer of energy
- **Science and Technology:** abilities of technological design
- **Measurement and Data:** represent and interpret data
- **Statistics and Probability:** summarize and describe distributions

# Robotic Explorations/LEGO WeDo's

## Educator Workshop

Time: 4 hours

This kit and workshop has two components. The first component is composed of ten activities that explore what a robot is and isn't, what robots do on earth and in space, and much more. The second component is the LEGO Education WeDo Robotics Construction Set. Educators use the WeDo's to introduce young students to STEM, literacy, and social studies through robotics.

Key Learning targets are:

- Working with simple machines
- Designing and creating a working model
- Creative problem solving
- Writing stories

**Suggested grade level:** K-6

### **Kit contents:**

- Robotic Explorations with 2 tubs of 10 activities
- 10 LEGO Education WeDo Robotics sets
- 10 laptops
- Teacher Guide with suggested questions, activities and extensions



Students explore a hydraulic robotic arm after using a mechanical arm.

**Number of Kits available:** 2

## Science and Math Content Standards Utilized with This Kit

- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Unifying Concepts and Processes:** change, constancy and explanation: evidence, models, and explanation.
- **Physical Science:** motions and forces, transfer of energy
- **Science and Technology:** abilities of technological design; science and technology in local Challenges
- **Measurement and Data:** represent and interpret data
- **Statistics and Probability:** summarize and describe distributions

# Robots And Ratios

## Educator Workshop

Time: 6 hours

Educators learn to program LEGO robots using MINDSTORMS NXT-G software. Proportional mathematics involving ratios and fractions is an important math component of this workshop. A variety of sensors such as sound, light, and touch are used to create programs that allow the robot to move autonomously through a particular environment.

Within the classroom, afterschool program, or club program such as Scouting and 4-H, students work as teams to enable their robot to solve tasks and challenges. The ERC Robotics Kits use hands-on activities to keep students actively engaged as they learn math, science and 21st Century skills. Workshop participants will be provided with additional resources and information such as how to start a robotics

**Suggested grade level:** 5-12



### **Kit contents:**

- 9 robots with sensors
- 9 laptops with software and video training
- Extra parts case

**Number of Kits available:** 3

### **Science and Math Content Standards**

#### **Utilized with Robots and Ratios**

- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Science and Technology:** abilities of technological design
- **Unifying Concepts and Processes:** change, constancy and explanation
- **Fractions:** apply understandings of multiplication and division to multiply and divide fractions
- **Measurement and Data:** convert like measurement units within a given measurement system
- **Geometry:** solve real-world and mathematical problems involving angle measure and area

# STARLAB

## Educator Workshop

Time: 4 hours

The STARLAB portable planetarium is a multi-disciplinary educational tool designed to motivate students to learn about Astronomy, Earth Science and Life Science. During the workshop educators will be presented with ideas to turn the students into the teachers when inside the dome, pre and post dome activities, as well as how to setup, operate and take down the dome.



**Suggested grade level:** K-12

**Kit contents:**

- Inflatable dome
- Fan with extension cord
- Projector
- Native American Mythology Teacher manual with activities and operational guide
- 17 cylinders which can be checked out 6 at a time

**Number of Kits available:** 3

**Cylinders Available:**

- \* African Mythology
- \* Biological Cell
- \* Earth
- \* Egyptian Mythology
- \* Ocean Currents
- \* Starfield
- \* Greek Mythology
- \* Lewis and Clark
- \* Urban Starfield
- \* Maya Skies
- \* Weather
- \* Moon
- \* Plate Tectonics
- \* Constellations
- \* Radio Sky
- \* Solar Systems and Galaxies

### Science and Math Content Standards Utilized with This Kit

- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Unifying Concepts and Processes:** evidence, models, and explanation
- **Life Science:** the cell; structure and function in living systems
- **Earth and Space Science:** objects in the sky; changes in earth and sky; Earth in the Solar System; origin and evolution of the universe; structure of the earth system, Earth's history

# Viewing the Universe with Telescopes

## Educator Workshop

Time: 4 hours

Educators will learn to locate and view objects in the night sky by using a starfinder chart (planisphere), a Sky Scout, and both manual and computerized telescopes. Also included are activities for using the telescopes in the classroom in the daytime so that students are familiar with operational features before going out in the evening.

**Suggested grade level:** K-12

### Kit contents:

- 1 Celestron NexStar 4SE Computerized telescope with GoTo functions
- 1 Celestron WiFi GoTo Refractor Scope
- 10 Celestron Firstscopes
- 1 tripod
- 1 large tub with Celestron Power Tank power supply, astronomy books in a wide range of reading levels, starfinder charts, Celestron eyepiece and filter kit, and instruction manual

**Number of kits available:** 1



### Science and Math Content Standards Utilized with This Kit

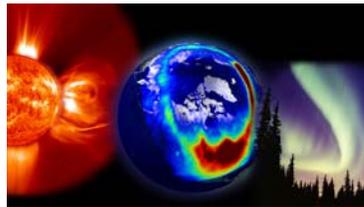
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Unifying Concepts and Processes:** change, constancy and explanation: evidence, models, and explanation,
- **Earth and Space Science:** objects in the sky; changes in the earth and sky; origin and evolution of the universe
- **History and Nature of Science:** science as a human endeavor; nature of scientific knowledge; historical perspectives

# Space Weather

## Educator Workshop

Time: 6 hours

Educators discover how students can download images of the sun taken by NASA satellites only minutes before, how to use a variety of solar telescopes to safely view sunspots, solar flares, and coronal mass ejections, and how to capture, edit, and share student created space weather forecasts online.



**Suggested grade level:** 5-College

### **Kit contents:**

- 1 Coronado Personal Solar Telescope for direct sun viewing
- 2 Sunspotters for indirect viewing
- 2 Solarscopes for indirect viewing
- 12 Apple iPads with Space Weather apps, Facetime, and iMovie



Creating an iMovie about the Sun

**Number of Kits available:** 3

### **Science and Math Content Standards Utilized with This Kit**

- **Unifying Concepts and Processes:** change, constancy and explanation: evidence, models, and explanation,
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Earth and Space Science:** objects in the sky; changes in earth and sky; Earth in the solar system;
- **Science and Technology:** understandings about science and technology

# Making the Invisible Detectable

## Educator Workshop

Time: 3 hours

Educators learn content and activities to teach students about the Electromagnetic Spectrum. At the workshop, teachers will make the invisible detectable during a five station activity. Topics covered include sources of electromagnetic radiation, how to detect electromagnetic radiation, how life on Earth is affected due to electromagnetic emissions, and the Electromagnetic Spectrum.



Participants will engage in hands– on activities including the use of a spectroscope to observe the emission spectrum of several gases. A fun poster activity, which can be used to introduce the topic to students, will also be provided.

**Suggested grade level:** 6-12

### **Kit contents:**

- Electromagnetic Spectrum Posters and Activity Sheet
- Class set of Spectroscopes
- UV light, heat lamp, UV fluorescent bead, and infrared thermometer for station activity
- H<sub>2</sub>, Ne, He, and N spectrum gas tubes
- Tour of the Electromagnetic Spectrum DVD



**Number of Kits available:** 1

### **Science and Math Content Standards Utilized with this Kit**

- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Unifying Concepts and Processes:** systems, order and organization
- **Physical Science:** light, heat, electricity and magnetism; properties of matter; transfer of energy
- **Earth and Space Science:** interactions of energy and matter.
- **Measurements and Data:** Convert like measurement units within a given measurement system

# Echo the Bat/Amelia the Pigeon

## Educator Workshop

Time: 3 hours

Bats, pigeons, and NASA satellites employ “remote sensing” to view the Earth. This workshop provides educators with ways to explore remote sensing and biodiversity with a constructivist approach. Activities are organized around three units: Understanding Light, Remote Sensing, and Biodiversity. Activities are provided in two formats, one for K-3 and one for 4–6 grade levels.

**Suggested grade level: K-6**



### Kit contents:

- Echo the Bat DVD
- Amelia the Pigeon CD
- Biodiversity Cards
- Origami Bats
- Set of Echo the Bat books
- Teacher Binder with background content and activities
- Materials to do many of the activities in the teacher binder

**Number of kits available: 1**

### Science and Math Content Standards Utilized with This Kit

- **Unifying Concepts and Processes:** form and function; change, constancy and explanation;
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Physical Science:** Light, heat and magnetism
- **Life Science:** Organisms and environments, populations and ecosystems; diversity and adaptations of organisms; behavior of organisms
- **Science In Personal and Social Perspectives:** changes in environments; environmental quality
- **History and Nature of Science:** historical perspectives

# NASA, Remote Sensing, and Dinosaurs

## Educator Workshop

Time: 3 hours

The Carnegie Museum's model dinosaurs and dinosaur part replicas form the basis to explore what we know about dinosaurs and how we know it. Activities include "What's In a Name?" "Bones," "Direct Hit At The K-T Boundary" and more.

**Suggested grade level:** K-8

### Kit contents:

- 18-20 Dinosaur models that are in proportional size to one another
- Dinosaur replica egg, claws, teeth, and other body parts
- Dinosaur coprolite
- A selection of books about dinosaurs, Paleontology video
- Information and activities about remote sensing and how these techniques led to the discovery of the Chicxulub Crater
- Fossils of organisms living at the same time as the dinosaurs
- Teacher binder with content and activities



**Number of Kits available:** 2

### Science and Math Content Standards Utilized with This Kit

- **Unifying Concepts and Processes:** change, constancy and explanation: evidence, models, and explanation, evolution and equilibrium
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Life Science:** organisms and life cycles; characteristics of organisms; organisms and environments; structure and function in living systems; diversity and adaptations of organisms
- **History and Nature of Science:** science as a human endeavor; nature of science; historical perspectives
- **Measurement and Data:** represent and interpret data
- **Statistics and Probability:** summarize and describe distributions

# Engineering Design Challenge

## Launch Platforms

### Educator Workshop

Time: 3 hours

The engineering design process used by NASA engineers forms the backbone of this workshop. Design and build a model thrust structure (the portion of the structure that attaches the engine to the rest of the spacecraft) that is as light as possible, yet is strong enough to withstand the load of a “launch to orbit” three times. Design, test, and redesign for the most success in launching a filled water bottle.



**Suggested grade level:** 5-8

**Kit contents:**

- Launch platforms
- Cut balsa wood
- Glue guns with glue sticks
- Water bottles
- Teacher guide with background content and activities

**Number of Kits available:** 2

### Science and Math Content Standards Utilized with This Kit

- **Unifying Concepts and Processes:** change, constancy and explanation: evidence, models, and explanation, form and function
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Physical Science:** properties and changes of properties in matter, motions and forces, transfer of energy
- **Science and Technology:** abilities of technological design

# Engineering Design Challenge

## Thermal Protection System

### Educator Workshop

Time: 3 hours

Educators learn the engineering design process used by NASA engineers. Space vehicles have thermal protection systems to protect against the heat of re-entry into a planet's atmosphere. Design and build a shield that withstands a propane torch!

**Suggested grade level:** 5-12

#### **Kit contents:**

- Ring stands
- Propane torch
- Materials to design a heat shield
- Safety goggles
- Infrared thermometer
- Teacher binder with background content, instructions, and handouts



**Number of kits available:** 2

#### **Science and Math Content Standards Utilized with This Kit**

- **Unifying Concepts and Processes:** form and function; change, constancy and explanation;
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Physical Science:** properties of objects and materials; light, heat and magnetism, transfer of energy; interactions of energy and matter
- **Science and Technology:** abilities of technological design

# Introduction to GPS

## Educator Workshop

Time: 3 hours

Handheld GPS units are used as tools to teach mathematics, geography, and science. Topics covered include the science behind the units—including how global positioning satellites are positioned in orbit, how signals are transmitted and received between satellites and ground stations and handhelds, how accuracy is determined and more. Other topics covered include how to use GPS units, geocaching, and an engaging lesson to determine the circumference of the earth.

**Suggested grade level:** 5-12

**Kit contents:**

- Case of 20 GPS units

**Number of Kits available:** 4



Many informal educators such as Scouting organizations and 4-H clubs use the GPS kits

### Science and Math Content Standards Utilized with This Kit

- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Unifying Concepts and Processes:** change, constancy and explanation: evidence, models, and explanation,
- **Science and Technology:** understanding about science and technology
- **Earth and Space Science:** objects in the sky

# Planetary Geology

## Educator Workshop

Time: 4 hours

General activities for scale of distance and volume in the Solar System as well as planet specific activities are provided. Also included are NASA missions information and activities. This kit is hands-on and constructivist oriented and can lead to a deep understanding of not only the formation but the continuing geological processes occurring in our Solar System.

### Kit contents:

- Mars Themis Activities
- Cratering pans with flour, cocoa powder, balls, measuring tapes, rulers and other tools
- 13 samples of meteorites and Exploring Meteorite Mysteries Guide
- Explore Jupiter's Family Secrets binder with activities
- Mars, Jupiter, and Moon binders with activities;
- DVD's, CD's, and books on Planetary Geology
- Posters of Mars, Jupiter, Saturn, Moons of Saturn and Jupiter
- Solar System Lithography Set
- Information on Solar System missions such as Juno, Cassini, Messenger, Dawn, and New Horizons



Exploring the topography of Mars

Number of kits available: 1

### Science and Math Content Standards Utilized with This Kit

- **Unifying Concepts and Processes:** form and function; change, constancy and explanation;
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Physical Science:** position and motion of objects; properties and changes of properties in matter, motions and forces, transfer of energy
- **Earth and Space Science:** objects in the sky; changes in earth and sky; Earth's history; Earth in the Solar System; origin and evolution of the Earth system
- **History and Nature of Science:** historical perspectives

# Afterschool Universe

## Educator Workshop

Time: 4 hours

AU is a 4 hour workshop that teaches about black holes, galaxies, composition and scale of the universe, and the lives of stars. These topics are covered using hands-on and kinesthetic modeling activities that keep students engaged and active participants in learning about the universe. AU is great for the classroom or afterschool programs.



**Suggested grade level:** 5-8



All materials are provided

### **Kit contents:**

- Materials to do all 12 sessions for 24 students
  - Modeling the Universe; Cosmic Survey; Telescopes; Invisible Light
  - Spectroscopes; Stars Part 1 and 2; Cosmic Connection to the Elements
  - Galaxies; Black Holes; Cosmic Quilt; Modeling the Universe Part 2

**Number of kits available:** 2

### **Science and Math Content Standards Utilized with This Kit**

- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Unifying Concepts and Processes:** systems, order, and organization; change, constancy and measurement; evolution and equilibrium
- **Physical Science:** position and motion of objects; properties and changes of properties in matter, motions and forces, transfer of energy
- **Earth and Space Science:** origin and evolution of the universe
- **History and Nature of Science:** historical perspectives

# Living and Working in Space

## Educator Workshop

Time: 3 hours

This workshop covers three topics: Food for Extended Stays off Earth, Working in Space, and Playing in Space. Learn to grow seeds in your classroom that have flown in space and compare the resulting plants to plants grown from seeds that remained on Earth. The seeds are grown in growth chambers that keep all variables constant, except of course what happened to the seeds before being placed in the hydroponic chamber. This workshop teaches the principles of growing food without soil and offers many other ideas for plant study in the classroom. Posters, gloveboxes, and activities are provided for studying how astronauts safely work on tasks outside of a spacecraft. Also provided is a kit that compares how toys work in the gravity of Earth compared to the microgravity of outer space.



**Suggested grade level:** K-12

### **Kit contents:**

- Cinnamon basil seeds that were flown to outer space
- Cinnamon basil seeds that remained on Earth
- Hydroponics chamber
- Toys in Space kit
- Space Food Kit

**Number of kits available:** 1

### **Science and Math Content Standards Utilized with This Kit**

- **Unifying Concepts and Processes:** form and function; change, constancy and explanation;
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Life Science:** characteristics of organisms; life cycles of organisms; regulation and behavior
- **Science and Technology:** abilities of technological design
- **History and Nature of Science:** historical perspectives

# NEED Energy Kits

## Educator Workshop

Time: 3 hours

The Energy Series Workshops are based on materials and teacher/student guides from the National Energy Education Development Project ([www.need.org](http://www.need.org)).

**Science of Energy:** this is first in the series and builds the foundational knowledge of energy types and transformations through hands-on activities.

**Hydrogen:** Learn NEED's H2 Educate materials, generate H<sub>2</sub>, build and run fuel cell cars and more.

**Solar:** Enable learners to explain the differences in series and parallel circuits, construct photovoltaic arrays, and understand PV as an energy source.

**Wind:** Use activities from the Kid Wind Project to dispel myths about wind energy and electricity and learn to conduct your own "Spin Off" competition.

**Suggested grade level:** 5-12

### NEED Energy Kits available:

- Science of Energy
- Solar Energy Kit
- Wind Energy Kit
- Hydrogen Fuel Cell Kit



**Number of kits available:** 1 of each

### Science and Math Content Standards Utilized with This Kit

- **Unifying Concepts and Processes:** form and function; change, constancy and explanation
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Physical Science:** Position and motion of objects; properties and changes of properties in matter, motions and forces, transfer of energy
- **Science and Technology:** abilities of technological design
- **History and Nature of Science:** historical perspectives
- **Measurement and Data:** represent and interpret data

# The GLOBE Program

## Educator Workshop

Time: 3-6 hours

GLOBE is a worldwide partnership of teachers, students, and scientists working together to provide opportunities for student to use research quality observations in their studies and to contribute their environmental observations for research scientists and other GLOBE students to use.



Using Infrared Thermometers to study surface temperatures.

**Suggested grade level:** K-12

### **GLOBE Workshops available:**

- Elementary GLOBE
- Cloud types, cloud cover, and contrails
- Soil moisture, profiles, bulk density, etc.
- Water Quality using LaMotte Kits
- GLOBE, Probes, and GIS using Pasco Probeware
- Surface Temperature and GIS
- MUCH MORE!



GLOBE Water Quality Backpack Kits

**Number of kits available:** 1 of each

### **Science and Math Content Standards Utilized with This Kit**

- **Unifying Concepts and Processes:** form and function; change, constancy and explanation;
- **Science As Inquiry:** abilities necessary to do scientific inquiry
- **Science and Technology:** abilities of technological design
- **Measurement and Data:** represent and interpret data

# Kindernauts

## Educator Workshop

Time: 3 hours

Educators enable students to suit up and explore space as NASA astronauts with this kit. Workshop participants will interact in multiple activities that enable students to learn about the solar system, rockets, and careers.

**Suggested Grade Level:** Kindergarten and Pre K



### Kit Contents:

- Junior Space Suits
- Floor Puzzles
- Books about Space
- Giant, Cardboard Rocket Ship
- Many space activities

**Number of Kits Available:** 2

### Science and Math Content Standards Utilized with this Kit

- **Science As Inquiry:** abilities necessary to do scientific inquiry.
- **Unifying Concepts and Processes:** Systems, order, and organization, change, constancy and measurement; evolution and equilibrium.
- **Physical Science:** position and motion of objects; properties and changes of properties in matter, motions and forces, transfer of energy.
- **Earth and Space Science:** origin and evolution of the universe.
- **History and Nature of Science:** historical perspectives

## Student Workshops

All student workshops are **FREE** and will be conducted at the NASA IV & V Educator Resource Center.

- Workshop can be scheduled between 9:00AM – 5:00PM and may be 3-5 hours long depending on the workshop requested.
- Groups should have a minimum of 8 students and a maximum of 24 students from grades 4th-9th.
- Chaperones will be responsible for the transportation of the students and provide lunch before or during the workshop.

### Workshops Available

- Rocketry
- Robotics
- Living & Working in Space
- Planetary Geology
- Making the Invisible Detectible
- Aviation



Students look on while launching a model rocket as part of the rocketry student workshop

### Benefits of Student Workshops

- Meeting engineers from NASA's IV&V facility
- Hands on STEM (Science, Technology, Engineering, and Mathematics) activities
- Unique workshops your students, scouts, and club members will remember for a long time.

# Student Workshops

## Rocketry

Time: 4 hours

Students will learn about the early studies of rocketry up through the current use of rockets by NASA and will simulate a rocket's performance using RockSim software. Force, drag, lift, and Newton's Three Laws of Motion are some of the physics principles that students will be exploring during the process of building and launching a model rocket.



## Robotics

Time: 4 hours



Students will learn the definition of a robot and how they are used in our everyday lives by NASA. Students will learn basic programming skills using a LEGO NXT robot to utilize mathematical problems to solve a maze and capture a satellite using a robotic arm. At the conclusion of the workshop, the students will visit the JSTAR lab in the NASA IV&V Facility to see how NASA is using robotics.

## Science and Math Content Standards met by Rocketry and Robotics

- \*Science as Inquiry: abilities necessary to do scientific inquiry
- \*Unifying Concepts and Processes: evidence, models, and explanation; change, constancy, and measurement
- \*Physical Science: motions and forces
- \*Geometry: solve real-world and mathematical problems involving angle
- \*Measurement and Data: convert like measurement units within a given measure system
- \*Ratios and Proportional: employ unit rates and ratios to explain proportionalities in real-world situations

# Student Workshops

## Living and Working in Space

Time: 3 hours

From adequate nutrition to muscle loss, students will learn the importance of wearing a space suit, the inconvenience of completing everyday activities, and how to stay physically fit. We will even explore how to play basketball in space! During the workshop, the students will enjoy a virtual tour of the Neutral Buoyancy Lab at Johnson Space Flight Center in Houston, TX.



## Planetary Geology

Time: 3 hours



Students will study the surface of the planets in the solar system to get an idea about when and how the planets were formed. Students will engage in hands-on activities to study craters, volcanoes, and geologic features on Mars from data obtained by NASA space crafts.

## Science and Math Content Standards met by Living & Working in Space and Planetary Geology

- \*Science as Inquiry: abilities necessary to do scientific inquiry
- \*Unifying Concepts and Processes: evidence, models, and explanation; change, constancy, and measurement
- \*Life Science: Structure and function in living systems; diversity and adaptations of organisms
- \*History and Nature of Science: historical perspectives
- \*Earth and Space Science: objects in the sky; changes in earth and sky; Earth's history; Earth in the Solar System; origin and evolution of the Earth system
- \*Physical Science: position and motion of objects; properties and changes of properties in matter, motions and forces, transfer of energy

# Student Workshops

## Making the Invisible Detectable

Time: 4 hours

Students will make the invisible detectable in five stations of hands-on activities which include how to detect different sources of electromagnetic radiation, how life is affected by electromagnetic emissions, and the Electromagnetic Spectrum. Students will use spectrometers to aid them in observing the emission spectrum of several gases.



## Science Content Standards Met with Making the Invisible Detectable

- \*Science As Inquiry: abilities necessary to do scientific inquiry
- \*Unifying Concepts and Processes: systems, order, and organization
- \*Physical Science: light, heat, electricity and magnetism; properties of matter; transfer of energy
- \*Earth and Space Science: interactions of energy and matter.

## Aviation

Time: 4-5hours



Students will learn about the work of the IV&V Program and how it has helped the field of aviation from NASA software engineers. Education specialists from the MACC and the ERC will introduce the students to the basic principles of weight and balance, Newton's Laws of Motion, and Bernoulli's Principle through hands-on activities such as designing, producing, and testing Styrofoam airfoils in a wind tunnel at 40mph. Students will then examine the control surfaces of modern and model planes to learn how these are used to maneuver aircrafts. Students will have the opportunity to fly NASA's own E-flight Alpha 450 aircraft with the safe use of a buddy-box system at Meredith Field or near-by the NASA ERC on WVHTCF property.

## Science Content Standards met by Aviation

- \*Science as Inquiry: abilities necessary to do scientific inquiry
- \*Unifying Concepts and Processes: evidence, models, and explanation; change, constancy, and measurement
- \*Physical Science: motions and forces
- \*History and Nature of Science: Science as the human endeavor

# STEM Competitions

-**Jr. FIRST LEGO League** captures young children's curiosity and directs it toward discovering the wonders of science and technology. [www.usfirst.org](http://www.usfirst.org)



-**FIRST LEGO League** introduces younger students to real-world engineering challenges by building LEGO-based robots to complete tasks on a thematic playing surface. [www.usfirst.org](http://www.usfirst.org)

-**FIRST Tech Challenge** is designed for students in grades 7-12 to compete head to head, using a sports model. Teams are responsible for designing and building more complex robots with advanced programming techniques to compete in an alliance format against other teams. [www.usfirst.org](http://www.usfirst.org)



-**FIRST Robotics Competition** combines the excitement of sport with the rigors of science and technology. Under strict rules, limited resources, and a 6 week time limit, teams of high school students are challenged to raise funds, design a team brand, hone teamwork skills, and build and program robots to perform tasks against a field of competitors. [www.usfirst.org](http://www.usfirst.org)

For more information on these competitions contact:

WV Jr FLL Director, WV FLL Director:

Todd Ensign.....[Todd.Ensign@ivv.nasa.gov](mailto:Todd.Ensign@ivv.nasa.gov)

WV FLL Senior Mentor:

Jaime Ford.....[Jaime.Ford@ivv.nasa.gov](mailto:Jaime.Ford@ivv.nasa.gov)

FIRST AmeriCorps Vistas:

Michael Lyden.....[mlyden@usfirst.org](mailto:mlyden@usfirst.org)

Ryan Utzman.....[rutzman@usfirst.org](mailto:rutzman@usfirst.org)

Ryan Headlee.....[rheadlee@usfirst.org](mailto:rheadlee@usfirst.org)

Darek Czarnecki .....[dczarnecki@usfirst.org](mailto:dczarnecki@usfirst.org)



# STEM Competitions

-VEX students, with guidance from their teachers and mentors, build innovative robots and compete year-round in a variety of matches. In addition to learning valuable engineering skills, students gain life skills such as teamwork, perseverance, communication, collaboration, project management, and critical thinking.  
[www.vexrobotics.com](http://www.vexrobotics.com)



-VEX IQ teams solve exciting robot challenges by driving a robot using a controller and pre-programming it using computer software. Teams work together to score points in Teamwork Matches and also show off their skills in individual Skills Challenges. [www.vexrobotics.com](http://www.vexrobotics.com)

**Team America Rocketry Challenge** teams design, build and fly a model rocket that reaches a specific altitude and duration determined by a set of rules developed each year. The contest is designed to encourage students to study math and science and pursue careers in aerospace.  
[www.rocketcontest.org](http://www.rocketcontest.org) or [www.wvrocketry.org](http://www.wvrocketry.org)



**The Real World Design Challenge (RWDC)** is an annual competition that provides high school students, grades 9-12, the opportunity to work on real world engineering challenges in a team environment. Each year, student teams will be asked to address a challenge that confronts our nation's leading industries. Students will utilize professional engineering software to develop their solutions and will also generate presentations that convincingly demonstrate the value of their solutions.

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

For more information on these competitions contact:  
WV VEX Tournament Director,  
WV Rocketry Association President,  
& NASA IV&V Robotics Alliance Director.....[Todd.Ensign@ivv.nasa.gov](mailto:Todd.Ensign@ivv.nasa.gov)

## Invite us to your STEM Community Event



**Expanding Your Horizons**  
*Association of Women in Science*  
West Virginia University

**Science and Engineering Day**  
Fairmont State University



**Science and Engineering Day**  
*Girl Scouts of America*  
Charleston Clay Center



**National Jamboree**  
*Boy Scouts of America*  
Summit Betchel Reserve



**Astronomy Day**  
*Gaston Caperton Center*  
Clarksbug, WV



Go to [www.facebook.com](http://www.facebook.com) and search for the **NASA IV&V Educator Resource Center**. Join our group to get the latest updates on upcoming workshops, trainings, statewide conferences, and more!



Educator Workshops



Equipment Loan Program



Student Workshops



STEM Competitions



Community Outreach



Internships

For more information about Educational Opportunities at NASA IV&V, contact:  
**[erc@ivv.nasa.gov](mailto:erc@ivv.nasa.gov) or 304-367-8436**