

Featured Lesson Title/Description	Grade Levels	Subjects/Topics
<p>Algebraic Equations: Calculator Controlled Robots: Students create programs in calculator robots. Missions are built sequentially on the knowledge of previous missions.</p>	6-9	<ul style="list-style-type: none"> • Mathematics: Algebra, Geometry, Measurement • Science • Technology
<p>Algebraic Equations: Transit Tracks -- Finding Habitable Planets: In this activity, students will investigate light curve data gathered by Kepler from ten planets.</p>	9-12	<ul style="list-style-type: none"> • Mathematics: Algebra 2 • Physical Science: Kepler's Laws of Motion
<p>Analyzing Solar Energy Graphs: MY NASA DATA: Students explore data for sample locations to determine the solar radiation available for use with a solar cell.</p>	9-12	<ul style="list-style-type: none"> • Earth and Space Science: Atmospheric Circulation, Solar Electricity, Solar Energy, Solar Intensity and Latitude • Mathematics: Graphing and Interpreting Graphs
<p>Center of Mass and Center of Pressure: Engineering a Stable Rocket: Students construct paper rockets and test fly them, then evaluate their designs, modify and fly them again to determine if their changes have affected the rocket's performance.</p>	9-12	<ul style="list-style-type: none"> • Technology: Engineering Design • Physical Science: Forces, Friction, Center of Mass, Center of Pressure, Newton's Laws of Motion • Mathematics: Geometry, Trigonometry
<p>Chemical Elements: GENESIS -- What Are We Made Of?: Students study the chemical elements of the sun and learn about the essential building blocks for everything that exists, including planets and the human body.</p>	5-8	<ul style="list-style-type: none"> • Physical Science: Matter • Mathematics: Data Analysis and Probability
<p>Chemistry of Water: Mars Exploration -- Is there Water on Mars? Students create their own electrolysis-of-water apparatus to generate oxygen.</p>	10-12	<ul style="list-style-type: none"> • Chemistry: Electrolysis of water; Reactions; Stoichiometry
<p>Chemistry of Water: Math and Science @ Work -- Breath of Fresh Air: Students create their own electrolysis-of-water apparatus to generate oxygen.</p>	10-12	<ul style="list-style-type: none"> • Chemistry: Electrolysis of water; Reactions; Stoichiometry
<p>Derivatives: Math and Science @ Work -- Space Shuttle Auxiliary Power Units: This problem is an application of various calculus concepts including an application of related rates.</p>	10-12	<ul style="list-style-type: none"> • Mathematics: AP Calculus AB/BC; Application of differentiation -- related rates

<p>Distance/Rate/Time Problems: Smart Skies™: Students use a computer-based air traffic control simulator to enact solutions to problems in real-life applications of mathematics and science.</p>	5-9	<ul style="list-style-type: none"> • Mathematics: Algebra • Physical Science
<p>Electromagnetic Spectrum: Remote Sensing Ices on Mars: Students analyze data collected from visible light, infrared, and gamma rays to investigate the composition and distribution of ices on Mars.</p>	8-10	<ul style="list-style-type: none"> • Physical Science
<p>Engineering Design: Forces and Motion -- Balloon Aerodynamics Challenge: Students think and act like teams of scientists and engineers as they follow the eight steps of the engineering design process to create a helium balloon system that will float at a predetermined height in the classroom.</p>	6-12	<ul style="list-style-type: none"> • Engineering: Design Process • Science: Force and motion • Technology
<p>Engineering Design Challenge: Forces and Motion -- The Great Boomerang Challenge: Following the design process, students design, build and test a boomerang after conducting research on airfoils and aerodynamic forces. Then they compare their flight to how a boomerang reacts in the microgravity environment on the ISS.</p>	9-12	<ul style="list-style-type: none"> • Engineering: Design Process • Physics and Physical Science: Aerodynamic forces
<p>Engineering Design Challenge: Lunar Plant Growth Chamber: This activity combines engineering design with plant growth whereby middle school students learn about and apply the design process to develop a lunar plant growth chamber.</p>	4-8	<ul style="list-style-type: none"> • Technology: Engineering Design, Modeling • Life Science: Plant Growth
<p>Engineering Design Challenge: Spacecraft Structures: The challenge is to build a model thrust structure that is as light as possible, yet strong enough to withstand the load of a "launch to orbit" three times.</p>	5-9	<ul style="list-style-type: none"> • Physical Science: Engineering, Transfer of Energy, Force, Mass, Newton's Laws of Motion
<p>Engineering Design Challenge: Thermal Protection System: The challenge is to build a thermal protection system model that can withstand the heat of a propane torch.</p>	8-12	<ul style="list-style-type: none"> • Science, • Mathematics • Engineering
<p>Engineering Design Challenge: Water Filtration: Students propose and test filtration device designs, make observations, collect data, and analyze results to identify the best filter media to use.</p>	9-10	<ul style="list-style-type: none"> • Earth and Space Science: Waste Water Management, Chemistry of Water, Water Cycle • Physical Science: Conductivity, Alkalinity, Mixture, Solution, Evaporation, Condensation
<p>Engineering Design: Forces and Motion -- Balloon Aerodynamics Challenge: Students think and act like teams of scientists and engineers as they follow the eight</p>	6-12	<ul style="list-style-type: none"> • Engineering: Engineering Design Process • Science: Properties and changes of

steps of the engineering design process to create a helium balloon system that will float at a predetermined height in the classroom.		<ul style="list-style-type: none"> property in matter, Force and motion • Technology: Abilities of technological design, Understanding about science and technology
Engineering Design Process: On the Moon Educator Guide: Feel the Heat: Students follow the engineering design process to build a passive solar hot water heater, test the design, then use test results to improve their design.	7-8	<ul style="list-style-type: none"> • Physical Science: Heat Transfer, Energy Conservation, Electromagnetic Spectrum
Engineering Design Process: On the Moon Educator Guide: On Target: Students follow the engineering design process to modify an object on a zip line; testing their performance and the results to improve their system.	6-12	<ul style="list-style-type: none"> • Engineering: Design Process
Geometry: Space Math -- Solar Storms: Students analyze images of a solar tsunami and use geometry and measurement skills to find the speed of the wave.	5-12	<ul style="list-style-type: none"> • Mathematics: Geometry
Graph Analysis: GENESIS -- Exploring Data: Students observe and record data patterns from the Genesis mission, reviewing anomalies, or divergences from the predicted values and think about questions that might arise from this study.	10-12	<ul style="list-style-type: none"> • Earth and Space Science: Origin and Evolution of the Universe • Mathematics: Data Analysis and Probability
Graphing With MathTrax: This free computer program helps teach students how to graph equations and datasets, or to experiment with physics simulations.	6-12	<ul style="list-style-type: none"> • Mathematics: Equation Analysis, Graphing • Physical Science: Forces and Motion
Heat, Temperature and Energy: MESSENGER -- Cooling with Sunshades: Students construct a simple device based on the phase change of water from ice to liquid and investigate the effectiveness of different shading materials and designs.	9-12	<ul style="list-style-type: none"> • Physics: Temperature, Latent Heat, State of Matter, Transfer of Energy • Mathematics: Geometry
Heat Transfer: MESSENGER -- My Angle on Cooling: Students perform an experiment measuring the heat experienced by an object as the distance and viewing angle changes, and relate their results to the reason for the seasons on Earth.	5-8	<ul style="list-style-type: none"> • Physical Science: Light, Heat, Energy • Earth and Space Science: Seasons, Solar System
High-Power Microscopes: The Virtual Lab: This hands-on experience brings relevance to class material to inspire the next generation of explorers.	9-12	<ul style="list-style-type: none"> • Biology: Using microscopes; Using an energy-dispersive spectrometer

<p>Linear Equations: NASA Connect -- Breaking Barriers: Students learn about supersonic aircraft and the concept of average speed as a linear function.</p>	6-8	<ul style="list-style-type: none"> • Mathematics: Pre-algebra • Science: Newton's Third Law of Motion • Technology: Engineering Design Process
<p>Linear Regression: Exploring Space Through Math -- Space Shuttle Ascent: Space Shuttle Ascent gives students a unique opportunity to analyze authentic NASA data from a space shuttle launch.</p>	7-10	<ul style="list-style-type: none"> • Mathematics: Algebra
<p>Mathematical Models: Black Holes: Black Hole Math problems investigate black hole science and mathematics concepts, including parts of a simple black hole and calculating gravitational potential energy.</p>	9-12	<ul style="list-style-type: none"> • Mathematics: Algebra • Physical Science: Forces and Motion
<p>Meteorology: How Clouds Form: The purpose of this investigation is to facilitate understanding of the basics of cloud formation and the changing state of water.</p>	5-8	<ul style="list-style-type: none"> • Earth Science
<p>Newton's Laws of Motion: Lunar Nautics: Featured lessons are linked to exploring the moon, human presence on the moon and enabling future exploration. The lessons focus on real-world understanding of Newton's laws.</p>	5-8	<ul style="list-style-type: none"> • Physical Science: Newton's Laws of Motion, Gravity, Centripetal Force
<p>Percentage and Volume: Space Food and Nutrition -- How Much Is Waste?: Students compare the mass and volume of packaged food before and after its repackaged for spaceflight to determine usable and waste portions.</p>	5-8	<ul style="list-style-type: none"> • Mathematics: Computation, Measurement, Percentage, Volume • Physical Science: Mass, Volume
<p>Properties of Living Things: Fingerprints of Life: Students conduct an experiment to find a range of tolerance for temperature extremes in samples of baker's yeast.</p>	5-8	<ul style="list-style-type: none"> • Life Science: Astrobiology, Extremophiles, Metabolism
<p>Properties of Living Things: Searching for Life on Mars: Students research characteristics of living organisms and develop a chart to help define important features of a living organism.</p>	4-8	<ul style="list-style-type: none"> • Life Science: Properties of Life
<p>Pythagorean Theorem: Exploring Space Through Math -- Lunar Rover: This activity focuses on the concept of minimizing distance and time, using formulas to calculate the distance and the time for a task.</p>	8-12	<ul style="list-style-type: none"> • Mathematics: Algebra 1, Geometry

<p>Quadratic Functions: Exploring Space Through Math -- Weightless Wonder: Students use the parabolic flight path of an aircraft to interpret graphs of quadratic functions, determine the length of time of microgravity during one parabolic segment, and the maximum altitude of the C-9 and the time when it occurs.</p>	9-12	<ul style="list-style-type: none"> • Mathematics: Algebra I, Geometry, Algebra 2, Pre-calculus, Algebra 2, Pre-calculus
<p>Radiation Biology: Ultraviolet Radiation and Yeast: This lesson demonstrates the effects of radiation on living organisms.</p>	9-12	<ul style="list-style-type: none"> • Biology: Effects of radiation • Life science: DNA
<p>Temperature and Earth Climate: Modeling Hot and Cold Planets: The module uses science and mathematics concepts to help students explore factors affecting the habitability of planets by determining their climate.</p>	7-9	<ul style="list-style-type: none"> • Earth Science: Climate, Weather, Solar Radiation, Energy
<p>Vector Addition: Math and Science @ Work -- Lunar Surface Instrumentation: Students solve a problem involving an astronaut servicing three instruments on the flat lunar surface.</p>	11-12	<ul style="list-style-type: none"> • Physics: Vector Addition
<p>Weather and Climate: Satellite Meteorology: Students use authentic data from geostationary satellites to detect and monitor forest fires and biomass burning.</p>	7-12	<ul style="list-style-type: none"> • Earth Science: Sun-Earth System, Meteorology • Physics: Reading Graphs and Data Representations, Interpreting Data

Coming Soon to the NES Virtual Campus -- Additional Featured Lessons

Human Body: Space Adaptations	Middle School	Life science
Problem Solving: Transportation and Space -- Reuse and Recycle	High School	Technology
Skeletal System: Human Physiology in Space	High School	Life science