



Workshop Objectives and Standards

The following workshops are designed for grades 1st – 5th. Applicable **topics and standards for the full range of subject matter available** accompany each workshop description. Adjustments are made to suit the specific grade involved.

The **overarching objectives for all workshops** are listed below

- Communication, Teamwork, and Interactive skills
CCSD: S5CS5, S3CS4, S2CS3, S2CS4, S2CS5
- Tools, Materials, Measurement, Safety, and Hands-On skills
CCSD: S5CS1d, S5CS3, S5CS8c, S4CS3, S3CS3, S2CS3, S2CS7c
- Research, Analysis, Estimation, and Critical-Thinking skills
CCSD: S5CS4, S5CS8c, S3CS2, S3CS4, S2CS2
- Inspiration through observation and inquiry. Understanding through scientific methods and collaboration.
CCSD: S5CS1a, S5CS7a,b, S5CS8, S3CS8, S2CS1a, S2CS7

About Us

Kevin Howard: Workshop Creator and Presenter

- 5+ years in educational presentation and Hands-On program development
- 10 years as an aerospace engineer, analyst, and software designer
- Broad scientific content knowledge and extensive experience in its real-world application
- Global Perspective from unique national and international experience
- Fluency in Spanish

Elena Garcia, Ph.D: Research and Project Development Partner

- 10 years Aerospace research and instruction (Georgia Tech Faculty)
- Extensive international experience
- Fluency in Spanish

References available upon request

Contact

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Biology and Ecology

Living Machines

Learn how things smaller than you can see are changing the world, and you, all the time.

Topics Include: Cell, DNA, Genome, Bacteria, Biofilm, Metabolism, Strength and Scale, Individual vs Colony Behavior, Symbiotic and Parasitic Relationships

CCSD Standards: S5L2, S5L3, S5L4, S4L2, S2L1

Take a Breath

Bacteria might be gross, but you have a lot more in common with them than you might realize. Take a deep breath and get ready to get your hands on the cornerstones of life: cellular respiration and the amazing ATP molecule.

Topics Include: Cellular Respiration and the ATP Molecule, Combustion, Krebs Cycle, Glycogen Cycle, Anaerobic/Aerobic Respiration, Redox Reactions, Catalysts

CCSD Standards: S5L3, S5P2, S4L1, S2L1

The Birds, The Bees, Plants and You

Examine the fragile balance of biological systems from microorganisms to humans. And get your hands and mind on the important issues we face today.

Topics Include: Carbon Cycle, Energy Cycle, Photosynthesis, Bio Diversity, Ecological Balance, Population Strain, Potable Water, Flood Control, Oil Spills, Heat Island Effect, Climate Change

CCSD Standards: S5L4, S4L1, S3L1, S3L2, S2E3

Eat or Be Eaten

Be a part of the food chain, literally, in a game of ecological competition and balance. Learn first hand about biological relationships and environmental influences while trying to avoid extinction!

Topics Include: Food Chain, Carbon Cycle, Energy Cycle, Autotroph, Heterotroph, Producer, Primary Consumer, Secondary Consumer, Predator / Prey

CCSD Standards: S5CS4a, S5L4, S4L1, S3L1, S2L1



The workshops above may also be presented as a
Biology and Ecology Course



Can You Sense It?

Learn and experiment with the ins and outs of the senses that help us experience our world.

Topics Include: Nervous System, Olfactory System, Auditory System, Vision, Touch, Taste, Additive / Subtractive Color, Light Frequencies, Sound Frequencies, Diffusion, Volatile Fluids

CCSD Standards: S4P1, S4P2, S2P2

More than Meets the Eye

Strobe lights and optical illusions are more than just neat effects, they can be amazing tools, a window into your mind's function, and a hidden part of your everyday life.

Topics Include: Strobe Effect, Timing Devices, Circuits, Frame Rate, Retinal Impression, Physiology, Optical Illusions

CCSD Standards: S4P1, S4P3, S2CS3b



The workshops above may also be presented
as a Physiology Course





Chemistry and State Change

Now it's Here, Now it's Not

A change of physical state is more than chemistry, it can be an exciting experience. Through the implosion, explosion, and sublimation of common materials, explore the importance of state changes to life on earth and human endeavors, from entertainment to transportation.

Topics Include: State Change, Matter, Latent Heat, Energy, Water Cycle, Evaporation, Condensation, Sublimation, Plasma, Phase Diagrams, Desalination/Filtration, Stirling Cycle, Nucleation Sites

CCSD Standards: S5P2b, S4E3, S3CS4b, S3P1, S2P1, S2P2

Food for Thought

It takes a lot of energy to think. Where would you guess it comes from? Take another look at your food and open your eyes to the vast potential of chemical energy.

Topics Include: Atoms, Molecules, Mixtures, Compounds, Exothermic/Endothermic, Acid/Base Reactions, pH Scale, Energy Cycle, Cellular Metabolism, Fermentation, Piezoelectric Effect

CCSD Standards: S5P2a, S5P2c, S4L1, S2P2

Of Insects and Fuel Cells

All around us plants, insects, even cars are doing the same thing we are. Explore how oxidation reactions work for animals and can be used for the technologies of tomorrow.

Topics Include: Redox Reactions, Cellular Respiration, ATP Molecule, Voltaic Pile, Batteries, Catalysts, Fuel Cells

CCSD Standards: S5P2c, S5P3b, S4L1b, S2P2

Cooking with Chemistry

Do you ever think atoms get knotted, tied up, and generally confused? You do it to them every day. Find out how while tasting, feeling, and playing with the amazing potential of carbon and silicon structures.

Topics Include: Organic Chemistry, Cross linking, Protein, Hydrocarbon, Energy Cycle, Viscosity (Newtonian and Non-Newtonian Fluids)

CCSD Standards: S5P2a, S5P2c, S4L1, S3P1, S2P2

What's that Smell?

Dust, odors, and solutions can move through holes and against gravity as if they have a mind of their own. Discover the forces behind their behavior and how they affect you daily from your shower to the great outdoors.

Topics Include: Diffusion, Brownian Motion, Osmosis, Filtration, Statistics, Entropy, Capillary Attraction, Surface Tension

CCSD Standards: S5L3, S2CS4d



The workshops above may also be presented as a
Chemistry Course





Earth and Space

Earth Works

Get your hands on the workings of the earth from the formation of rocks to the influence of celestial bodies.

Topics Include: Planetary Composition, Magnetic Poles, Plate Tectonics, Earthquakes, Volcanoes, Deposition, Rocks, Fossils, Oil Formation, Erosion, Tides, Currents, Energy Sources, Sonar Imaging

CCSD Standards: S5E1, s3E1d, S3E1, S3E2b, S2P2

Weather or Not

Could Mars have once been like the Earth? Find out what makes our atmosphere special, see how it works, and feel what it can do.

Topics Include: Weather, Water Cycle, State Change, Atmosphere, Density, Air Pressure, Coriolis Effect, Jet Stream, Ionosphere, Aurora Borealis, Plasma, Solar Wind, Planetary Comparisons

CCSD Standards: S5E1, S4E2, S4E3, S4E4, S4L2, S3L1, S3L2, S2E2, S2E3

From Soil it was Made

At the root of all habitats is soil. Play with earth's forces to learn how soil is created, why life is dependent upon it, and how natural and human actions affect it. Then experiment with solutions of your own.

Topics Include: Soil Development, Ecosystems and Habitats, Nitrogen Fixing, Water Cycle, Evapotranspiration, Biofilms, Deforestation, Desertification, Erosion and Prevention, Hydroseeding

CCSD Standards: S5E1, S4L1, S4L2, S3E1, S3L1, S3L2, S2E3



The workshops above may also be presented as an
Earth Sciences Course



To Infinity and Beyond

How far can you throw a baseball? Could you throw it around the world? Put your mind in orbit while exploring space, gravity, interplanetary travel, and rocket design. Then see how high your own rocket building skills can take you!

Topics Include: Gravity, Orbital Mechanics, Escape Velocity, Aero Braking, Space Travel (Risks, Limitations, and Concepts), Artificial Gravity, Solar System, Time, Relativity, Rocket Design

CCSD Standards: S4P3, S4E2d, S4E1

It's Astronomical!

Seeing the future might be impossible, but watching events unfold billions of years ago is a snap, just look up! And time travel is just the beginning; the facts and theories about the universe we live in may just boggle your mind.

Topics Include: Celestial Bodies and Events, Astronomic Distances, Light Speed, Red Shift, Relativistic Effects, Gravity, Dark Matter, Black Holes, Worm Holes, Mobius Strip

CCSD Standards: S4E1, S4E2, S4P3d, S2E1



The 2 workshops above may also be presented as an Astro Course





Electricity to Robotics

Shocking Science

Is lightning electricity? Where does it come from? Let your hair tell you.

Topics Include: Subatomic Particles, Electric Field, Energy, Contact Electrification, Conductors, Insulators, Plasma, Triboelectric Series, Lightning, Versorium, Franklin Bells, Electroscope

CCSD Standards: S5P3a, S5P3c, S2P1, S2P2

Light it Up

From flying electrons to tangy vegetables, delve into the chemical and electrical fundamentals of everything from candy to light bulbs.

Topics Include: Voltage, Amperage, Current, DC, Resistance, Power, Multimeter, Ionic Conductivity, Triboluminescence, Piezoelectric Effect, Van de Graaff Generator, Superconductivity, Voltaic Piles and Batteries, Parallel and Series Circuits, Bulbs (Fluorescent, Incandescent, and Solid State)

CCSD Standards: S5P2a, S5P3b, S2P2, T.S6CS6.3

Opposites Attract

Batteries and refrigerator magnets probably have more in common than you realize. Discover how that unexpected relationship has transformed our world.

Topics Include: Permanent and Electromagnets, Solenoid, Speakers, Motors, Generators, AC / DC, Oscilloscope, Magnetic Induction, Transformers, Cathode Ray Tube, Rail Gun, Particle Accelerators

CCSD Standards: S5P3, S4P2, S3P1, S3P2, S2P2



The workshops above may also be presented as an
Electricity and Magnetism Course



Get Discrete

Complex things have simple beginnings. This is especially true for circuits. Learn the basics and start building your own electrical devices.

Topics Include: Resistor, Potentiometer, Capacitor, Transistor, Voltmeter, Ohmmeter, Ammeter, Soldering, Breadboard, Circuit Board, Voltage, Current, Resistance, Power Relationships

CCSD Standards: S5P3b, S5CS3, S4CS3, S3CS3, S2CS3

Picture Perfect Memory

How do you think cameras, DVDs, and computers are able to remember and show us all the things we put into them? Learn for yourself and create your own memory ... by hand.

Topics Include: Semiconductor, Diode, LED, Transistor, Analog/Digital, Memory Storage (Light, Magnetism, Solid State), Amplifier

CCSD Standards: S5P3b, S5CS3, S4CS3, S3CS3, S2CS3

Mind and Machine

Now that you understand the basics of electronics, memory and displays, enter the mind of the machine, and see if you can make it think for you.

Topics Include: Microchip, Software, Hardware, Firmware, Logic Circuits (AND, NAND, OR, NOR), Robotics, Artificial Intelligence, Neural Network, Agent Based Modeling, Internet

CCSD Standards: S5P3b, S5CS3, S4CS3, S3CS3, S2CS3



The workshops above may also be presented as a beginning
Robotics and Programming Course





Flight and Physics

Full of Hot Air

Raisins usually end up on the bottom of your cereal box. Why? And what does that have to do with balloons?

Topics Include: Atmospheric Composition, Brownian Motion, Density, Buoyancy, Archimedes Principle, Ballonet (and biologic equivalent), Periodic Table, Reactive and Inert Elements

CCSD Standards: S4L2, S3L1c, S2CS4d

Will it Fly?

It's a bird ... no, it's a plane ... no, it's a rocket. Experiment, discover the difference, and learn principles that will help you make any airplane fly.

Topics Include: Air Resistance, Drag, Center of Gravity, Moment, Surface Area, Planform (Conventional, Canard, Flying Wing) Weight and Balance, Stability and Control

CCSD Standards: S5P1a, S5CS7, S4P3c, S4L2, S3L1c, S2CS4d

Wings and Things

Have you ever ridden a flying vacuum before? Chances are you have. See how the principles jet liners use to fly can be applied to everything from boomerangs to paint sprayers. Then build and test your own airfoils.

Topics Include: Venturi Effect, Gyroscopic Effect, Vortex, Lift, Drag, Density, Static and Dynamic Pressure, Bernoulli's Principle, Hot Wire, Airfoil, Wind Tunnel, Computational Fluid Dynamics

CCSD Standards: S4P3, S4L2, S3L1c, S2CS4d

The Need for Speed

Explore the basics of propulsion from roller skates to rocket engines, and take a rocket ride of your own!

Topics Include: Newton's Laws, Force, Mass, Acceleration, Atmosphere, Density, Outer Space, Wings, Propellers, Jet Engines, Rocket Motors (solid, liquid, electric), Rocket Design

CCSD Standards: S4P3, S4L2, S3L1c, S2CS4d, S2P3

Spin It

From break dancing to satellites, get your hands (and feet) on the amazing effects and uses of spinning objects.

Topics Include: Centrifugal/Centripetal Force, Gyroscopic Effect, Precession, Artificial Gravity, Acceleration, Momentum, Conservation of Momentum, Density, Centrifuge, Flywheel, Coriolis Effect

CCSD Standards: S5P1a, S4P3, S2P3

Floating on Air

You've probably seen helicopters and hovercraft, but what about ducted fans and ground effect vehicles? Find out how they are all related and levitate for yourself!

Topics Include: Propellers, Torque, Counter Rotation, Auto Gyration, Ground Effect, Hover Craft, Helicopters, Ducted Fans, Newton's Laws

CCSD Standards: S5P1, S4P3, S2CS4d, S2P3



The workshops above may also be presented as an Aero Course





Light, Sound, and Energy

Feel the Force

Force fields are not just the material of science fiction movies, they are very real and very useful. Experiment with them for yourself, if you can figure out how to find them.

Topics Include: Magnetic, Electric, and Gravitational Fields, Field Visualization, Plotting and Exponential Relationships, Potential and Kinetic Energy, Momentum, Induction

CCSD Standards: S5P3, S4P1, S4P3, S3P1, S3P2, S2P1, S2P2, S2P3

Music Mysteries

Have you ever made a wine glass sing? Have you played the didgeridoo? Explore the fundamentals of musical instruments and the principles of sound.

Topics Include: Matter, Waves, Shocks, Interference, Resonant Frequency, Doppler Effect, Oscilloscopes, Wave Pools, Amplification, Musical Instruments

CCSD Standards: S5P3, S4P2, S3P2, S2P2

End of the Rainbow

What do a light bulb, your microwave, and a TV remote have in common? Find out and dig into the treasure trove of potential at the end of this electromagnetic spectrum.

Topics Include: Heat, Energy, Spectral Lines, Ultraviolet, Visible, Infrared, Radio, Microwaves, Lasers, Analog, Digital, Frequency Modulation, Electromagnetic Spectrum, Wireless Communications, Induction, Electroluminescence, Chemoluminescence, Bioluminescence

CCSD Standards: S5P2, S5P3, S4P1, S3P1, S2P2

Bionic Eyes and Ears

From the nanoscopic to the astronomic, discover ways we have learned to magnify, navigate, and produce images of the universe around us.

Topics Include: Speed of Light, Time, Refraction, Reflection, Amplification (Lenses and Parabolic Dish) Telescopes, Microscopes, Ultrasound, MRI, Radar, GPS (Triangulation), Laser

CCSD Standards: S5P3, S4E1d, S4P1, S4P2



The workshops above may also be presented as an Energy Course





Mechanics: Build it, Drop it, Shoot it!

Mighty Mechanisms

Through competition, experimentation, a little sweat, and a lot of laughter uncover the tricks and tools of ancient civilizations that are the basis of our technology today.

Topics Include: Force, Work, Friction, Conservation of Energy, Mechanical Advantage, Simple Machines, Archimedes Screw, History of Machines.

CCSD Standards: S5P1a, S5CS5b, S4P3, S2CS3b

Put It In Gears

Explore how simple mechanisms are combined to form the complex machines that are all around us today. Here is your chance to take things apart without having to put them back together. But don't leave before you finish building your own machine!

Topics Include: Work, Power, Entropy, Compound Machines, Gears, Cams, Pulley Systems, Hydraulics, Pneumatics

CCSD Standards: S5P1a, S5CS5b, S4P3, S2CS4a, S2CS3b

Shoot It

From the middle to the space ages, explore the numerous ways human kind has discovered to propel things. And take your own imagination to new heights - literally!

Topics Include: Mechanical Advantage, Lever, Fulcrum, Momentum, Sling, Trebuchet, Material Selection, Elasticity, Sling Shot, Gun Powder, Air Pressure, Rocket Propulsion

CCSD Standards: S5CS5b, S5P1, S4P3, S2P3, S2CS3b



The workshops above may also be presented as a Machines Course



Egg Drop Soup

Ever wondered how sky scrapers and space stations are designed, or been fascinated by automobile crash tests? Learn the secrets of ordinary and extraordinary structures, before building to the sky or creating the ultimate egg protection capsule.

Topics Include: Structural Geometry (Triangle, Circle, Sphere), Plates, Cables, Welds, Space Frames, Trusses, Monocoque Design, and Geodesic Domes

CCSD Standards: S5P1a, S5CS5b, S4P3, S2CS3b, S2CS4d

Don't Stress Out

Do you know all the I's, O's and U's about structures? Well, no need to stress out about it. Uncover how shapes of structural cross sections are part of your everyday life. Then put them to work to achieve the impossible or at least the unbeatable.

Topics Include: Stress, Strain, Tension, Compression, Shear, Strength, Fatigue, Structural Members (tube, I beam, channel), Frames, Material Selection Charts

CCSD Standards: S5P1a, S5CS5b, S4P3, S2CS3b



The 2 workshops above may also be presented as a Structures Course





Science Matters!

Why Scientists Mater

Uncover the composition, characteristics and uses of the world's newest material: "Toffle". And get a first hand opportunity to play the part of researcher, scientist, and engineer while investigating and exploiting Toffle for the good of human kind.

Topics Include: Scientific, Engineering, and Research Roles, Observation, Deduction, Implementation, Communication, Classification, Terminology

CCSD Standards: S5CS8, S5CS6, S2CS6, S2CS7

Outdoor Survival

If you were lost, could you purify water, find your way, tell the time, stay warm or find food? Explore simple ways to use science and every day materials to help you not only survive, but enjoy the outdoors.

Topics Include: Micro Organisms, Filtration, Orienteering, Weather Prediction, Simple Tools, Materials, Sources of Food, Health Risks, Shelter, Warmth, Physical Dangers, Physiological Control, Teamwork, Planning, Environmental Awareness, Conservation

CCSD Standards: S5L4, S4E2, S4E4, S4P1, S4L2, S3L2, S3L1c, S3L4, S3P1, S3P2, S2E2

What's Burning?

We take a lot for granted when we watch a candle burn. Now is your chance to take a closer look. Delve into the reactions, radiation, state change and aerodynamics at work, before competing to build the ultimate camp fire!

Topics Include: Combustion, Oxidation, Exothermic Reactions, Hydrocarbons, Energy Cycle, Electromagnetic Radiation, Spectral Lines, Fireworks, Capillary Attraction, Fire Safety

CCSD Standards: S5P2c, S4L1b, S4P1, S3P1, S2P2

Lights, Camera, Science!

Behind the glitz and awe of special effects, magic and theatrical productions is also a good bit of science. Learn the whys behind some of the tricks of the trade, and amaze someone else for a change.

Topics Include: Props, Lighting, Makeup, Smoke and Mirrors, Density, State Change, Reflection, Opacity, Circuits, Material Properties, Sound, Physiological Effects

CCSD Standards: S5P2, S5P3, S4E3, S4P2, S4P1, S2P2, S2P1

*Further presentations will be added to this list as time permits.
Some modification of this series may also be required*