In-School Curriculum Guide 2012-13

Investigation and Experimentation

- **ALL of our lessons are based on Investigation and Experimentation.**

Rock-it Science

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Life Sciences

Disease Spreading (Grades K - 5): Students discover how quickly a "disease" can spread through their unicorns and then they try to determine which unicorn had the disease first. This relates to pollution, bacterial infection prevention, acid/base indicators, epidemiology, and logic.

Stethoscope (Grades 1 - 5): Students discover how sounds can travel through solids, liquids, and air using a simple stethoscope that they make and can keep. This relates to the anatomy of the ear, vibrations, sound amplification, and anatomy of the heart.

Heart Chambers: (Grades K – 5) Students put valves onto bellows, and then connect the bellows together with tubing to make their own hearts with two or more chambers. This relates to circulatory systems, air pressure, one-way valves, and teamwork.

Earth Sciences

Compass (Grades 2 - 5): Students make their own compass to find the earth's magnetic poles and then they try to guide their partner to the goal using only compass directions. This is an outdoor activity. This relates to direction, distance, mapping, magnetic fields, animal migrations, and teamwork.

Dry Ice (Grades K - 5): Students discover how to make a hollow ice egg, how soap bubbles can float in mid air, how to make fog, and how to make eerie noises. This relates to solids, liquids, gases, sublimation, condensation, dew point, freezing point, vibrations, clouds, greenhouse effect, and respiration. Watch a video lesson on Dry Ice.

Earthquakes (Grades K - 5): Students discover how different types of shaking motions can affect their tower made from Lego bricks. They will see the shapes of earthquake waves and will be introduced to the numbers associated with earthquakes. This relates to plate tectonics, wave motion, and speed of wave propagation through solids, structures, and vibration.

Fog and Static Electricity: (Grades K – 5) Students make fog with dry ice and warm water. Then they try to find ways to make the fog disappear using static electricity. This relates to solids, liquids, gases, sublimation, condensation, dew point, freezing point, clouds, greenhouse effect, respiration, and static electricity.

Our Solar System (Grades 2 - 5): Students work in groups to draw a creature that could survive on their planet. Then, as a field activity, the class forms a scale model of the solar system 100 yards across. This is an outdoor activity. This relates to distance, speed of light, atmospheric pressure, temperature, extreme heat, extreme cold, radiation, poison gases, the human effects of space travel, and teamwork.

Smoke Rings (Grades K - 5): Students discover a way to make a puff of air travel across the classroom with amazing efficiency. We then use stage fog to create smoke rings of many sizes. This relates to weather, convection, and properties of matter.

Static Electricity (Grades K - 5): Students learn about thunder, lightning, and electrons. They discover how to separate a mixture of salt and pepper, lightning safety, and with one hair-raising experience, they discover the nature of static

electricity. This relates to weather, lightning safety, electrons, positive and negative charges, voltage, lightning bolts, and cloud formation.

Wind Chill Factor (Grades K - 5): Students discover how evaporation of water and rubbing alcohol can feel in the wind. They also make their own device to measure wind speed (a pinwheel). This relates to humidity, wet and dry bulb temperature, evaporation, evaporative cooling, and simple machines.

Physical Sciences

CHEMISTRY

Exploding Bubbles: (Grades 2 –5) Students collect soap bubbles filled with hydrogen in their hand, and then ignite the bubbles to see if it makes a pop sound. They also make hydrogen with magnesium and vinegar. This relates to chemistry, separating water into hydrogen and oxygen, combustion, and hydrogen as a future fuel.

Hot, Cold, Fizzy & Colorful (Grades K - 5): Students discover that common chemicals can create a wide variety of results when they are mixed in a certain way. This relates to dissolving, chemical reactions, mixtures, exothermic reactions, endothermic reactions, acids, bases, and acid/base indicators.

Bouncy Stretchy Goo (Grades K - 5): Students discover a weird goop that acts as a solid and a liquid made from cornstarch. They compare it to rubber made from white glue and Boraxo (GAK). This relates to mixtures, solutions, chemical reactions, non-Newtonian fluids, viscosity, and elasticity.

Liquid Heat Bags: (Grades K – 5) Students experiment with various liquids to see what happens when they quickly crystallize. This relates to chemistry, solutions, and heat of solution.

Making Ice Cream (Grades K through 5): Students discover how to lower the freezing point of water enough so that their sample of ice cream becomes a solid. This relates to freezing point depression, solutions, melting point, freezing point, and temperature scales.

Color Changers (Grades K - 5): Students discover that ordinary yellow paper can do extraordinary things. They draw on it with household ammonia, baking soda mix, and vinegar to develop a way to send secret messages. This relates to chemical changes, acids and bases, pH indicators, and evaporation.

Shrinking Plastic (Grades K - 5): Students discover that certain plastics will shrink dramatically upon heating. They then make an ornament on a container of clear plastic and shrink it to show how some areas shrink more than others.

ELECTRICITY

An Electrifying Experience (Grades 1 - 5): Students discover what happens when colored Xmas tree light bulbs are hooked up in series and in parallel. They also check a wide variety of materials to see if they are conductors. This relates to batteries, circuits, resistance, short circuits, and energy transformation.

Foam Cutters: (Grades K – 5) Students use a battery and a thin piece of wire and find ways to make the wire melt through thin foam. This relates to electricity, resistance, and melting point.

Fog and Static Electricity: (Grades K – 5) Students make fog with dry ice and warm water. Then they try to find ways to make the fog disappear using static electricity. This relates to solids, liquids, gases, sublimation, condensation, dew point, freezing point, clouds, greenhouse effect, respiration, and static electricity.

Hand-Crank Generators: (Grades K – 5) Students discover how hard it is to create the electricity needed to light up light bulbs, turn fan motors, and ring bells. This relates to electricity, magnetism, circuits, resistance, short circuits, energy transformation, and teamwork.

Static Electricity (Grades K - 5): Students learn about thunder, lightning, and electrons. They discover how to separate a mixture of salt and pepper, lightning safety, and with one hair-raising experience, they discover the nature of static electricity. This relates to weather, lightning safety, electrons, positive and negative charges, voltage, lightning bolts, and cloud formation.

LIGHT and HEAT

Colored Lights & Paints (Grades K - 5): Students discover the nature of additive and subtractive color through the use of filters and mirrors. We also experiment with ultraviolet light and fluorescent materials. This only works in a darkened room. This relates to light frequency, wavelength, fluorescence, and the difference between sunlight and incandescent light.

Glow Sticks: (Grades K – 5) Students light up their glow sticks and try to find ways to make them glow more brightly or dimly. Then they paint with glow stick chemicals on a black surface. This relates to chemistry, luminescence, chemical reactions, heat and light. Note: Requires a room that can be made very dark.

Heat Conduction Dry Ice (Grades 2 - 5): Students discover how well heat travels through materials (such as copper, zinc, iron, aluminum, magnesium, plastic, wood and foam) that are touching dry ice. This relates to conductivity, specific heat, and insulators.

Lasers and Mirrors (Grades K - 5): Students use their reflections in plastic mirrors to discover how to make a million eyes, a "tunnel" through the desk, periscopes, kaleidoscopes, and how the "fun house" mirrors work. A laser is used to show the light path. This lesson only works in rooms that can be darkened. This relates to reflection, refraction, interference, rainbows, lasers, light waves, and color.

Liquid Heat Bags: (Grades K – 5) Students experiment with various liquids to see what happens when they quickly crystallize. This relates to chemistry, solutions, and heat of solution.

Pinhole Masks: (Grades K – 5) Students make a mask and then poke pinholes in it and look through them to see how the number and position of pinholes changes their view. This relates to light, diffraction lenses, and focal point.

MAGNETISM

Compass (Grades 2 - 5): Students make their own compass to find the earth's magnetic poles and then they try to guide their partner to the goal using only compass directions. This is an outdoor activity. This relates to direction, distance, mapping, magnetic fields, animal migrations, and teamwork.

Magnetic Creatures (Grades K - 5): Students discover all the weird things that magnets can do. Students make their own weird creature that moves magnetically

through the habitat they create. This relates to magnetic fields, electrons, magnetic materials, attraction and repulsion, and north versus south poles.

Magnetic Pendulum: (Grades 2 – 5) Students build a tower with a magnet suspended on a thread. Then they use other magnets below it to make their pendulum oscillate in unpredictable patterns. This relates to magnetism, polarity, structures, and magnetic fields.

Objects the Same (Grades 1 - 5): Three groups of ten objects each are presented with one overriding characteristic in common. The students eventually discover that characteristic. This relates to the scientific method, density, magnetism, ultraviolet light, and electrical conductivity.

MOTION

Cartesian Divers: (Grades K – 5) Students make a tiny submersible and put it in a bottle of water. Then they try to find ways to make it go up and down. This relates to compressibility, density, and buoyancy.

Gigantic Bubbles (Grades K - 5): Students try making bubbles in their hands, on the tabletop, and outdoors. We also create a bubble tube large enough for a student to stand inside. This is related to buoyancy, air convection, reflection of light, evaporation, and light interference.

Hovercraft: (Grades K – 5) Students use balloons and DVDs to create a hovercraft that will slide effortlessly across the table. This relates to air pressure, surface area, friction, balance, and air bearings.

Pendulums: (Grades 2 – 5)) Students work in teams and create pendulums next to each other. Then they try to make the pendulums swing in unison. This relates to oscillating motion, mass, periodicity, gravity, and teamwork.

Slow Marbles: (Grades 2 – 5) Students receive magnetic barriers and position them on a sloping metal table any way they like to create a maze. Then they try to make the marble roll as slowly as possible through their maze. This relates to momentum, friction, potential and kinetic energy, and inclined planes.

Straw Rockets (Grades 2 - 5): Students discover ways to make their straw travel further by adding just the right parts. This is an outdoor activity. This relates to center of drag, center of gravity, air friction, pressure, and Newton's three laws of motion.

Water-Powered Cars (Grades 2 - 5): Students use bicycle pumps to pressurize their cars with either air or a mixture of air and water. Then they try to find out which mix makes their car go the furthest. This relates to pressure, friction, air drag, momentum, compression of air, energy storage, and Newton's three laws of motion.

Water Bottle Rockets (Grades K - 5): Students launch water bottles with bicycle pumps and discover how to make them go higher and farther by adding weight! This is an outdoor activity. This experiment demonstrates Newton's laws of motion in a way that they will not forget. This relates to pressure, friction, air drag, momentum, compression of air, energy storage, Newton's three laws of motion, and teamwork.

SIMPLE MACHINES

Gyroscopes (Grades K - 5): Students discover how the gyroscopic effect can help them steer a bicycle, then they make their own gyroscopic top and try to make it spin as long as possible. This relates to momentum, balance, center of mass, and guidance of missiles and aircraft.

Roller Coasters (Grades K - 5): Students work in groups to make a roller coaster with split foam tubes, marbles and tape. They discover amazing ways to get as many energy conversions as possible. This relates to potential and kinetic energy, friction, inertia, and teamwork. Watch a video of a fifth-grade class doing this lesson.

Weird Water (Grades K - 5): Students make water flow uphill with no power added, they make water stay in a jar that is upside down, and they discover how to make a musical instrument from a tube and some water. Students keep the instrument. This relates to siphons, suction, and air pressure.

SOUND

Stethoscope (Grades 1 - 5): Students discover how sounds can travel through solids, liquids, and air using a simple stethoscope that they make and can keep. This relates to the anatomy of the ear, vibrations, sound amplification, and anatomy of the heart.

STRUCTURES

Balance (Grades 1 - 5): Students discover that the center of gravity for an object can be way off to one end of the object or even off the object altogether! Students make their own gravity-defying dragon. This relates to balance, density, and center of mass.

Density: (Grades K – 5) Students experiment with eight cubes made of different materials and try to make them balance each other on teeter-totters. This relates to density, mass, volume, balance, materials, and perception.

Destructive Testing: (Grades K – 5) Students try to destroy all sorts of samples, such as paper, plastic sheeting, bullet vest thread, and garbage bags with just their hands, to see which materials are strongest. This relates to properties of matter, strength of materials, tensile testing, shear strength, and elasticity.

Earthquakes (Grades K - 5): Students discover how different types of shaking motions can affect their tower made from Lego bricks. They will see the shapes of earthquake waves and will be introduced to the numbers associated with earthquakes. This relates to plate tectonics, wave motion, and speed of wave propagation through solids, structures, and vibration.

Sampson's Columns (Grades 2 - 5): Students decide which structural shapes are the strongest by forming paper to see how many books they can support with one sheet of ordinary paper. The record is 152 pounds! This relates to properties of matter, structures, compression strength, and force.

Straw Tower: (Grades 2 – 5) Students receive a limited number of straws, tape, and a plastic teddy bear. Then they try to construct a tower to hold the teddy bear as high as possible. This relates to structures, elasticity, center of mass, friction, and teamwork.