About the Phenomenon Master List

Hi-

This list is aggregated as I work with teachers implementing the NGSS. Possible phenomenon are added in brainstorming sessions. Many of these phenomenon are then added to the website with short descriptions, resources, and possible uses.

My wife and I are using this as a working document as we populate the website so I am unable to grant access to this document. If you would like to help on this project please request access to the Community - Phenomenon Master List. It is a mirror of this document and I will move phenomenon between the two. The more information you can provide (e.g. standard addresses, video link, class use, etc.) the easier it will be for me to update the list.

Thanks! -Paul

KINDERGARTEN - Life and the Environment

Tag**: k-life-and-the-environment**

K-ESS2-2 - Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
K-ESS3-1 - Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.
K-ESS3-3 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
K-LS1-1- Use observations to describe patterns of what plants and animals (including humans) need to survive.

- Biological Weathering - K-ESS2-2
- Woodpecker Homes - K-ESS2-2
- Farming Fish with Vegetables - K-ESS2-2, K-LS1-1
- 12 Years in a Sealed Ecosphere - K-LS1-1, K-ESS2-2
- Exploring Microhabitats - K-ESS3-1, K-LS1-1
- Plant Your Socks - K-ESS3-1
- Google Maps Timelapse - K-ESS3-3
- Dolphins and Humans Fishing Together - K-ESS3-1
- Precious Plastic - K-ESS3-3
- Virtual Field Trips - K-ESS3-1
- Biosphere 2 - K-LS1-1, K-ESS2-2
- Crown Shyness - K-LS1-1
- Alligators Survive in Ice - K-LS1-1
- Corn Cob Sprouting in Water - K-LS1-1
- Why Do Sunflowers Follow the Sun? - K-ESS3-1, K-LS1-1
- Desert Beetle Harvests Water - K-LS1-1
- Vertical farms
- Hamster habitats
- Plants with too much, perfect, and too little water.
- Migrations (wildebeest, birds, etc.)
- Lichen helps break rocks (description 2, website name, standard)
- Ant hills, wormholes,
- Agriculture, mining, etc.
- Living or nonliving?
- Time lapse of growing plants
- Where do animals live?
- Animals and habitat
- Animal poop
- Worm composting

- Animal tracks
- Deforestation
- Reduce, reuse, recycle
- Terrarium
- Fish tank
- Plants in room
- Nature walk
- Biosphere
- The walking fish of Singapore
- Oil spill

KINDERGARTEN - Weather and Climate

Tag: **k-weather-and-climate**
K-ESS2-1 - Use and share observations of local weather conditions to describe patterns over time.
K-ESS3-2 - Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.
K-PS3-1 - Make observations to determine the effect of sunlight on earth's surface.
K-PS3-2 - Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on an area.

- How the Sun Sees You - K-PS3-1
- Timelapse of a Blizzard - K-ESS2-1, K-ESS3-2
- Windcatchers - K-PS3-2
- World Climographs - K-ESS2-1
- Why Does the Wind Blow? - K-ESS2-1
- Lightning Strikes Thrice - Empire State Building - K-ESS3-2
- Homemade Thermometer - K-ESS2-1, K-PS3-1
- Snowman Melt Timelapse - K-ESS2-1, K-PS3-1
- Weather Folklore - K-ESS2-1, K-ESS3-2
- Why Do Sunflowers Follow the Sun? - K-ESS2-1
- Black paper with sunscreen
- Weather forecasting
- Wind vane, weather vane
- Ancient weather forecasting
- Severe weather (heatwave, blizzard)
- Light affecting different materials through heating
- Sunscreen
- Sun umbrella design
- Black vs light colors and temperature
- Daylight savings time
- Sunshades
- UV beads
- People at beach (timelapse with umbrellas?)
- Sun exposure on a variety of items
- Temperature over time
- Why are there shadows?
- What causes shade?
- Snow shadows
- Where do puddles come from? Where do they go?
- Why does snow melt?
- Why is there less sunlight in the winter?

- Why do we have seasons?

- A storm is coming
- Melting ice cube in different areas
- Cloud in a jar
- Weather stations
- Hot pavement
- Solar ovens
- Weather station

KINDERGARTEN - Pushes and Pulls

Tag: **k-pushes-and-pulls**
K-PS2-1 - Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
K-PS2-2 - Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

- The Walking Table - K-PS2-1
- Perplexus Epic 1-125 Demonstration - K-PS2-1, K-PS2-2
- Giant Newton's Cradle - K-PS2-1
- Caine's Arcade - K-PS2-2
- The Ollie - Skateboarding Slow Motion - K-PS2-1
- Top Spinning for Over 50 Minutes - K-PS2-1, K-PS2-2
- Amazing Rube Goldberg Machines - K-PS2-1, K-PS2-2
- A Bed of Nails - K-PS2-1
- Amazing Slinky Tricks - K-PS2-1, K-PS2-2
- Slow Motion Golf Ball Collision - K-PS2-1
- GoldieBlox - Toys for Future Engineers (video)
- Stringless Yo Yo (video,
- Yo-yo
- Push-pull toy on trapeze (Lima Peru)
- Pull back toys
- Pushing on a swing
- Bowling
- Curling
- Collisions (roller skates, etc.)
- Newton's cradle
- Reducing friction
- Rubbing hands together generates heat
- Marble run
- Pinball machines
- Slinky on stairs
- Maze tipping game
- Woodpecker pecking
- Matchbox cars (loop)
- Dominoes
- Rube goldberg machine
- Zipper
- Racecars
- Photo showing motion of object
- Foosball
- Marble maze

- Setting a trap
- Olympic sports
- Simple machines
- Snake climbing a tree
- Tractor pull
- Egg drop
- Dogsled
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GRADE 1 - Life: Structures and Functions

Tag: **1-life-structures-and-functions**
1-LS1-1 - Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
1-LS1-2 - Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
1-LS3-1 - make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

- Biomimicry - 1-LS1-1
- Cute Baby Animals - 1-LS1-2, 1-LS3-1
- Gecko Feet - 1-LS1-1
- Polar Bears are Actually Black - 1-LS1-1
- Crown Shyness -1-LS1-1
- Shrew Caravan - 1-LS1-2
- Corn Cob Sprouting in Water - 1-LS3-1
- Hemingway's Polydactyl Cats - 1-LS3-1
- Male Water Bug with Eggs - 1-LS1-2
- Mouthbrooding Fish - 1-LS1-2
- Desert Beetle Harvests Water - 1-LS1-1
- Animal structures (birds, mammals, insects)
- Plant structures (roots, stems, leaves, flowers)
- Architecture based on life
- Variation in offspring
- Cactus needles
- Turtle hiding
- Scary thorns
- Poison ivy
- Porcupine quills
- Root growth
- Time-lapse of plant growing
- Shade seeking plants that climb trees
- Food coloring in celery or carnation
- Warning coloration
- Ducks following mother or imprinting on humans
- Polar bear fur
- Phototropism
- Parental care
- Family resemblances
- Spiders out of eggs
- Seahorse males
- Hermit crab

- Hummingbird and flower size
- Bee sting
- Cowbirds
- Emperor penguins taking care of young
- Variation in color of puppies
- Acorn shape
- Why do zebras have stripes?
- Phototropism (SAS)
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GRADE 1 - The Earth in Space

Tag: **1-the-earth-in-space**

1-ESS1-1 - Use observations of the sun, moon, and stars to describe patterns that can be predicted.
1-ESS1-2 - Make observations at different times of year to relate the amount of daylight to the time of year.

- Dubai 24 Hour Timelapse - 1-ESS1-1
- Total Solar Eclipse - 1-ESS1-1
- How Do Sundials Work? - 1-ESS1-1, 1-ESS1-2
- Pipehenge: Poor Man's Stonehenge - 1-ESS1-1, 1-ESS1-2
- Star Trails - 1-ESS1-1
- Seeing the Moon During the Day - 1-ESS1-1
- Lahaina Noon - (video, Lahaina Noon - Wikipedia, 1-ESS1-1, 1-ESS1-2)
- Daylight and night
- Seasons
- Phases of the moon
- Seasonal changes in the amount of light
- Stonehenge
- Sunset and sunrise
- Moon during the day
- Telescopes
- Stars in the day?
- The ecliptic
- Lunar eclipse
- Going to bed earlier in the springtime
- Blood moon
- Why is space black?
- Tracing movement of sun during the day
- Seasonal constellations
- Constellations from different angles
- Shadows time lapse

GRADE 1 - Light and Sound

1-PS4-1 - Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
1-PS4-2 - Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.
1-PS4-3 - Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.
1-PS4-4 - Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

- The Lion and the Mouse Shadow Puppet Show 1-PS4-2, 1-PS4-3, 1-PS4-4
- Tuning fork vibrates other tuning fork and ball 1-PS4-1, 1-PS4-4
- Vantablack - The Darkest Material on Earth - 1-PS4-2, 1-PS4-3
- Why is Space Black? - 1-PS4-2
- Tin Can Telephone - 1-PS4-1, 1-PS4-4
- There Is No Sound in Space - 1-PS4-1
- Shatter a Wine Glass with Your Voice - 1-PS4-1
- Daniel Kish Uses Echolocation to Navigate - 1-PS4-1
- The Visual Microphone: Passive Recovery of Sound from Video - 1-PS4-1
- Ruben's Tube - 1-PS4-1
- The Shadow Illusion - 1-PS4-2, 1-PS4-3
- Trichroic Prism - 1-PS4-3
- The Sound Carousel
- Shadows
- A black box
- Resonance (shattering a wine glass with sound)
- Fireflies Lightning bugs
- Feeling a speaker playing music
- Playing a rubber band with different tightnesses
- Playing cups filled with different amounts of water
- Echos
- Telephone cups
- Singing road
- Musical instruments
- Laser pointer
- Why can't we hear in space?
- Colors in darkness
- Glow lights
- Speaker and laser
- Dancing rice or paper on drum
- Tuning fork
- The wave moves through a medium. Bobbing cork or seabird.

- Prisms can change the path of light
- Mirrors
- Whales communicating over large distances
- Blind person navigates with clicks
- Lightning arrives before the thunder
- Rainbows and moonbows
- Triple rainbow all the way across the sky
- Hearing but not seeing around a corner
- Helium makes your voice go higher and ??? makes it go lower (Mythbusters)
- Boats in the fog. Foghorn.
- Nocturnal animals - cat eye reflection
- Lighthouses
- Pinhole camera box
- No stars during the day
- Shadow puppets
- Snare drum
- Rubber band makes different noises when stretched
- Musical instruments
- Morse code
- Mirrors backward but not upside down
- Funny mirrors
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GRADE 2 - Biodiversity and Ecosystems

2-LS2-1 - Plan and conduct an investigation to determine if plants need sunlight and water to grow.
2-LS2-2 - Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
2-LS4-1 - Make observations of plants and animals to compare the diversity of life in different habitats.

- Farming Fish with Vegetables - 2-LS2-1
- 12 Years in a Sealed Ecosphere - 2-LS2-1
- Exploring Microhabitats - 2-LS4-1
- Plant Your Socks - 2-LS2-1, 2-LS2-2, 2-LS4-1
- Air Plants - No Soil Needed - 2-LS2-1, 2-LS4-1
- The Mystery of the Missing Bees - 2-LS2-2
- Virtual Field Trips - 2-LS4-1
- Crown Shyness - 2-LS2-1
- Why Do Sunflowers Follow the Sun? - 2-LS2-1, 2-LS2-2
- Corn Cob Sprouting in Water - 2-LS2-1
- What do plants need? (SAS)
- Plant time-lapse
- Hitchhiking seeds
- Helicopter seeds
- Hydroponics
- Oh deer
- Walking palm tree
- Bat pollination
- Coconut floats
- Pollen everywhere (allergies)
- Velcro
- Exploding seeds (ngssphenomenon)
- Squirting cucumbers (ngssphenomenon)
- Worst smelling plant in the world
- No plants on ice
- Plants with no water, little water
- Different types of teeth depending on what animals eat
- Monoculture
- What is in pollen?
- Why do plants have flowers?
- Does grass have flowers?
- Fruits and Fruit ripening
- Green and red apples
- Seedless watermelon
- The bees are dying

- Vibrating bumblebee
- Habitats
- Biomimicry
- Beesticks - self pollination
- Mendel and his pea pollination
- Quadrants
- Biodiversity loss
- Terrarium
- Biosphere II
- Biosphere
- Mesospheres
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GRADE 2 - A Changing Earth

2-ESS1-1 - Use information from several sources to provide evidence that earth events can occur quickly or slowly.
2-ESS2-1 - Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
2-ESS2-2 - Develop a model to represent the shapes and kinds of land and bodies of water in an area.
2-ESS2-3 - Obtain information to identify where water is found on earth and that it can be solid or liquid.

- How Was the Grand Canyon Formed? - 2-ESS1-1, 2-ESS2-1
- Augmented Reality Sandbox - 2-ESS1-1, 2-ESS2-2
- Why Do Rivers Curve? - 2-ESS1-1, 2-ESS2-1
- Epic Mudslide Caught on Camera - 2-ESS1-1, 2-ESS2-1
- Towing an Iceberg to the UAE - 2-ESS2-3
- Glacier National Park is Melting Away - 2-ESS2-3
- Virtual Field Trips - 2-ESS2-2
- Flash floods
- Sandstorm in Saudi Arabia
- Switchbacks on trails
- Prevention of landslides
- Erosion prevention
- Canyons always have rivers in the bottom
- Windbreaks
- Volcanoes
- Earthquakes - fast
- Erosion of rock time-lapse
- Stream tables
- Arches National Park
- Floods
- Early maps of the World
- 3D mapping projection
- Glaciers - time lapse or over large time
- Deltas
- Sinkholes
- Glacier National Park
- Weathering of statues
- Landslides
- Where does sand come from?
- Sand dunes and Sand dune migration
- Oxbow lakes
- Flooding of large rivers - levees

- Severe storms
- The ice creeping off the lake into houses (YouTube)
- Ice in a bottle in the freezer
- Revegetation
- Dust Bowl
- Changing coastlines
- Mt St. Helens explosion

GRADE 2 - Matter and Materials

2-PS1-1 - Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
2-PS1-2 - Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
2-PS1-3 - Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
2-PS1-4 - Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

- Elephant Toothpaste - 2-PS1-4
- Slime - 2-PS1-4
- Melting and Freezing Time Lapse - 2-PS1-4
- Brinicles - 2-PS1-4
- Will it Conduct? - 2-PS1-1, 2-PS1-2
- The Wonderful Tower of Watts - 2-PS1-3
- Precious Plastic - 2-PS1-1, 2-PS1-2, 2-PS1-3
- Ice Cube Spikes - 2-PS1-4
- The Ten Most Useful Lego Bricks - 2-PS1-2, 2-PS1-3
- Reusable Heat Packs - 2-PS1-4
- Indestructible Coating - Polyurea - 2-PS1-2
- Supercooled Water - 2-PS1-4
- Milk and Soap Experiment - 2-PS1-1, 2-PS1-2, 2-PS1-4
- Reaction in a Bag - 2-PS1-1, 2-PS1-4
- Dry ice
- Freezing Hot Water - mpemba effect
- Snowflakes
- Reversible and non-reversible reactions
- Lego building and rebuilding
- Volume of liquids is conserved
- Float or sink?
- Melting and freezing phenomenon
- Combustion
- Baking a cake chemistry
- A match
- Prince rupert’s drop
- Sodium bicarbonate and vinegar
- Melting with heat
- Oobleck
- Heat insulation
- Simple water cycle
- Ice floats
- Watt’s Tower

- Jenga
- Sorting rocks/minerals
- Popcorn
- Classifying different materials (e.g. minerals, metals, etc.)
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GRADE 3 - Ecosystem Change

3-LS2-1 - Construct an argument that some animals form groups that help members survive.
3-LS4-1 - Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
3-LS4-3 - Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
3-LS4-4 - Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

- Termite Olympics - 3-LS2-1
- Exploring Microhabitats - 3-LS4-3
- Dolphins and Humans Fishing Together - 3-LS2-1
- The Asteroid That Killed the Dinosaurs - 3-LS4-1, 3-LS4-3
- Ant Cooperation - 3-LS2-1
- Megafauna Extinction: Humans or Climate? - 3-LS4-1, 3-LS4-3
- Can Prairie Dogs Talk? - 3-LS2-1
- The Salmon Cannon - 3-LS4-4
- Desert Beetle Harvests Water - 3-LS4-3
- Colonial animals (meerkats, wolves, ants, termites, etc.)
- Migration of coyotes across north and central america - link
- Dinosaur fossils
- Fireants mimic viscous fluid - (video, link,
- Camels swimming in the sea (video,
- Feathered dinosaurs
- Fossils in amber
- Tyrannosaurus rex diet
- Triceratops babies vs. different species
- Bubble net fishing
- Dolphins fishing along the shore
- Damming up the river
- The Wooly Mammoth
- Bringing back the mammoth
- Tuatara
- Battle at Kruger
- Ant colonies
- Termite mound
- Muskox behavior
- Fossil footprints
- Quiet crickets of Hawaii
- Whale fossils over time
- Deer or horse fossils changing over time

- Whales in the desert. Rainforests in cold areas today
- Mass extinctions
- Polar bear starving
- Bees (worker and queen bees)
- Wildebeest migration
- Wolves hunting in Yellowstone
- Slime mold group behavior
- Human social grouping
- Closed glass ecosystem with plants (or shrimp)
- Nature walk in socks
- Animal poop
- Clownfish and anemone
- Plants growing on rocks, trees, in baggies
- Wolves in Yellowstone park
- Cactus in desert
- Earthworm habitat or ant farm
- Sea creature fossils on hilltops
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GRADE 3 - Life Cycles and Traits

3-LS1-1 - Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
3-LS3-1 - Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
3-LS3-2 - Use evidence to support the explanation that traits can be influenced by the environment.
3-LS4-2 - Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

- Cute Baby Animals - 3-LS3-1
- A Peacock's Tail - 3-LS1-1, 3-LS4-2
- Ice Turns Himalayan Rabbits Black - 3-LS3-2
- Attack of the Killer Fungi - 3-LS1-1
- Galapagos Finch Evolution - 3-LS3-1, 3-LS4-2
- Why Do Humans Different Colored Skin? - 3-LS3-1, 3-LS3-2, 3-LS4-2
- Male Water Bug with Eggs - 3-LS1-1, 3-LS4-2
- Mouthbrooding Fish - 3-LS1-1, 3-LS4-2
- Inflation of Moth Coremata - 3-LS4-2
- Alligators Survive in Ice - 3-LS3-2
- Corn Cob Sprouting in Water - 3-LS1-1, 3-LS3-1, 3-LS3-2
- Hemingway's Polydactyl Cats - 3-LS1-1, 3-LS3-1
- Different proportions in children
- Corn or pea seeds variation
- Stunted plant growth
- Mayflies can't eat
- Which came first the chicken or the egg?
- Butterfly metamorphosis
- Large number of offspring and parental care vs. small number of offspring
- Salmon reproduction. Eggs and then death.
- Deer with large antlers have more offspring
- Tadpole metamorphosis
- Crazy life cycles - Slime mold
- Change in color of butterflies due to light
- Squirting cucumbers
- Charlotte's Web children
- Spider nest
- Trees at high elevation (clines)
- Angled trees with wind
- Tree grows to light
- Phototropism in plants

- Flowers turning during the day
- Miniature mammoths and humans on islands
- Different breeds of domesticated animals (dogs, cats, cows, chickens, etc.)
- Color changing chameleon
- Color changing octopus and cuttlefish
- Different seedlings
- Acorn to an oak tree
- Dandelions (white and puffy seeds)
- Long haired cats
- Flower color changes with soil
- Rock pocket mouse
- Beaks of finches
- Dragonfly larvae hunting
- Caterpillar lives in leaf

GRADE 3 - Weather and Climate

3-ESS2-1 - Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
3-ESS2-2 - Obtain and combine information to describe climates in different regions of the world.
3-ESS3-1 - Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

- UAE Building a Mountain to Increase Rainfall - 3-ESS2-2, 3-ESS3-1
- The Driest Place on Earth -3-ESS2-2
- Why Does the Wind Blow? - 3-ESS2-2
- Stilt Houses - 3-ESS2-1, 3-ESS3-1
- World Climographs - 3-ESS2-1, 3-ESS2-2
- Lightning Strikes Thrice - Empire State Building - 3-ESS2-1, 3-ESS3-1
- Weather station
- Time lapse of a forest over a year
- Homemade weather vane
- Weather comes from the west
- Cloud formation
- Extreme temperatures, snow, rain, etc.
- Windchill
- Rolling clouds (ngss phenomenon)
- Irma waterspout
- Temperature, precipitation, wind direction averages
- Lightning
- Ball lightning
- Lightning rods
- Wind turning house
- Wind resistant roof
- Sahara Desert
- Hurricane shutters
- Hurricane season
- Storm-chasers
- Cloud in a bottle
- Cloud formation
- Tornadoes
- Dew point
- Tacoma Narrows bridge
- Thatch roof
- Ocean vs inland cities temperature
- Rainshadow

GRADE 3 - Forces and Interactions

3-PS2-1 - Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
3-PS2-2 - Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
3-PS2-3 - Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
3-PS2-4 - Define a simple design problem that can be solved by applying scientific ideas about magnets.

- The Walking Table - 3-PS2-1
- Coupled pendulum - 3-PS2-1, 3-PS2-2
- Magnetic Canon - 3-PS2-1, 3-PS2-3
- Magnetic Slime - 3-PS2-3
- Programmable Magnets - 3-PS2-1, 3-PS2-3, 3-PS2-4
- Amazing Slinky Tricks - 3-PS2-1, 3-PS2-2
- Airpod Case Design - 3-PS2-4
- Raw or Boiled Egg Experiment - 3-PS2-1, 3-PS2-2
- Programmable Droplets from MIT - 3-PS2-3
- Flymo Hover Lawnmower - 3-PS2-1
- Amazing Rube Goldberg Machines - 3-PS2-1, 3-PS2-2
- A Bed of Nails - 3-PS2-1
- Magnetic drill and invisible screws - video
- Magnetic rotation
- Graphical analysis (e.g. bottle flip)
- Galileo's experiment (all objects fall at same rate)
- Pinewood derby cars
- Objects in space (eg. water)
- Electroscope
- Pith balls dancing
- Socks on the carpet
- Friction experiments
- Magnets interact with each other (#projectphenomenon)
- How do magnets work?
- Magnet through copper pipe
- Bending water or Magnet Magic (videos)
- Tug of war
- Marbles in a bowl
- Hot wheels on track
- Static electricity balloon
- Marshmallow guns
- Catapult
- Magnetic toys

- Electromagnet picking up cars.
- Etch a sketch
- Face with irons filings and magnetic pencil
- Newton’s cradle
- Playground forces
- Lodestone
- Bending water with static electricity
- A number of magnets with one added in the middle
- Maglev train
- Rocket
- Trapeze motion
- Bouncing ball graph
- Magnetic sculpture
- Magnetic fields
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GRADE 4 - Life: Structures and Senses

4-LS1-1 - Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
4-LS1-2 - Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
4-PS4-2 - Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

- Polar Bears are Actually Black - 4-LS1-1
- Air Plants - No Soil Needed - 4-LS1-1
- Can Prairie Dogs Talk? - 4-LS1-1, 4-LS1-2
- Vantablack - The Darkest Material on Earth - 4-PS4-2
- Why is Space Black? - 4-PS4-2
- Desert Beetle Harvests Water - 4-LS1-1
- Male Water Bug with Eggs (video, Water Bug Breeding - Wikipedia, 4-LS1-1)
- Mouthbrooding Fish - 4-LS1-1
- Synesthesia - 4-LS1-2
- The Shadow Illusion - 4-PS4-2
- Mysterious Glowing Ball - 4-LS1-2, 4-PS4-2
- What Does a Soccer (Football) Player See? - 4-LS1-2, 4-PS4-2
- xLabs Eye Gaze Tracking Software - 4-LS1-2, 4-PS4-2
- Inflation of Moth Coremata - 4-LS1-1, 4-LS1-2
- Crown Shyness - 4-LS1-1
- Alligators Survive in Ice - 4-LS1-1
- Shrew Caravan - 4-LS1-1, 4-LS1-2, 4-PS4-2
- Why Do Sunflowers Follow the Sun? - 4-LS1-1
- Shamrocks at night - 4-LS1-1
- Ground squirrel language
- Growing roots time-lapse
- Leaves growing time-lapse
- Sensitive mimosa
- Venus flytrap
- Panda's thumb
- Plant that looks like a rock
- Plant or Animal (ngss phenomenon)
- Flower colors
- Multitude of eye shapes
- Insect eyes
- Large ears on deer, rabbit, bat, etc.
- Eyes on side of head vs front of head
- Dung beetles use snapshot of stars to find their way
- How do you read a skull (SAS)

- Brain control
- Fruit
- Hawk in NY city
- Memory phenomenon (eg. phantom memories)
- Instincts
- Long vs. short term memory
- Reflex arc
- Why is space black?
- Optical illusions
- Octopus vs. human eye
- Snakes see heat
- Insects see in UV
- Magnification through lens
- Electron microscopy
- Color blindness
- Color blind corrective lenses
- Laser eye surgery
- Blind man can see with clicks
- Thigmotropism
- High pitch vs. low pitch
- Elephants can hear sounds that we can’t hear
- Chameleons tongue
- Archer fish
- European wasp vs. bull ant
- Designer ears
- SmarterEveryDay hearing above phenomenon
- Pinhole cameras
- Foldscope
- McGurk Effect
- Yanny or Laurel
- Blue dress / gold dress
-

GRADE 4 - Earth: Features and Processes

4-ESS1-1 - Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time.
4-ESS2-1 - Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
4-ESS2-2 - Analyze and interpret data from maps to describe patterns of earth's features.
4-ESS3-2 - Generate and compare multiple solutions to reduce the impacts of natural earth processes on humans.

- Biological Weathering - 4-ESS2-1
- How Was the Grand Canyon Formed? - 4-ESS1-1, 4-ESS2-1
- Why Do Rivers Curve? - 4-ESS2-1
- Stilt Houses - 4-ESS3-2
- Virtual Field Trips - 4-ESS2-2
- The Marianas Trench - Deepest Ocean - 4-ESS2-2
- Yellowstone Supervolcano - 4-ESS2-2, 4-ESS3-2
- Elephants Warn Tourists of Tsunami - 4-ESS3-2
- Fossil seashells in mountains
- Grand Canyon
- Time-lapse weathering, erosion, and deposition
- Ages of rocks
- Tree rings
- Ice cores
- The rock cycle
- Cloud in a bottle
- Cloud formation
- Landslide
- Ice wedging
- Human impacts on erosion rates
- Pistol butted trees
- The Ring of Fire
- Earthquakes
- Tsunamis
- Floods
- Coastal erosion - moving beeches
- Natural hazards
- Vegetation - erosion prevention
- Sinkholes
- Karst topography
- Between two continents (ngssphenomenon)
- Meandering rivers

- Oxbow lakes
- Different volcanic explosions
- Old vs. young mountains
- Meandering river time lapse
- Emriver simulator
- Plate tectonics
- Statue weathering
- Fossils in Antarctica
- New Island formation - Iceland
- Seismographs
- Ancient seismographs
- Earthquake prevention
- Sailing rocks
- Death Valley's sailing rocks
- Earthquake proof construction
- Soil formation
- Road cuts
- Bottle of water in the freezer
- Potholes
- Rock tumbler
- Sand dunes
- Sand dune migration
- 100-year, 1000-year flood
- Induced seismicity and fracking

GRADE 4 - Energy

4-ESS3-1 - Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
4-PS3-1 - Use evidence to construct an explanation relating the speed of an object to the energy of that object.
4-PS3-2 - make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
4-PS3-3 - Ask questions and predict outcomes about the changes in energy that occur when objects collide.
4-PS3-4 - Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

- Drinking bird - 4-PS3-2
- Giant Newton's Cradle - 4-PS3-1, 4-PS3-2, 4-PS3-3
- Coupled pendulum - 4-PS3-1
- Shatter a Wine Glass with Your Voice - 4-PS3-2
- Algae Fuel and Food - 4-ESS3-1
- Vegetable Oil as Fuel - 4-ESS3-1
- Slow Motion Golf Ball Collision - 4-PS3-1, 4-PS3-3
- Earthships - 4-PS3-4
- Solar Cars - 4-PS3-1, 4-PS3-2, 4-PS3-4
- Candle-Powered Car - 4-PS3-1, 4-PS3-2, 4-PS3-4
- The Gravity Light - 4-PS3-2, 4-PS3-4
- The Visual Microphone: Passive Recovery of Sound from Video - 4-PS3-2
- Amazing Rube Goldberg Machines - 4-PS3-1, 4-PS3-2, 4-PS3-3, 4-PS3-4
- Biofuels
- Tuning fork vibrates other tuning fork and ball 4-PS3-2
- Renewable vs. non-renewable fuels
- Dams (Chinese massive dam)
- Environmental impacts of natural resources
- The Boy who captured the wind
- Electricity phenomenon
- Wind generators
- Tidal generators
- Solar panels
- Football collisions
- Car crashes in slow motion
- Windmills
- Kinetic sculpture
- Hand cranked radio
- Roller coaster rollback
- Sweet spot in baseball or tennis
- Explosions

- Launching rubber bands
- Rubbing hands together
- Building a circuit to light a bulb
- Slinky
- Pull back toys
- Mexican jumping beans
- Hand cranked flashlight
- Glow sticks
- Hand warmers
- Echolocation in animals
- Solar lighting
- Chain reaction machine
- Rube Goldberg device
- Radiometer
- Solar bobble heads
- Pinwheels
- Lightning
- Musical instruments
- Happy ball / sad ball
- Squishy circuits
- Andersen TENS machine
- Tennis ball sound at different speeds
- Curling
- Radio using electricity to create sound
- Cymbal
- Chopping wood gets hot
- Speaker generates sound
- Slow motion guitar strings
- Newton’s cradle
- Rubber band powered airplane
-

GRADE 4 - Waves and Information

4-PS4-1 - Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
4-PS4-3 - Generate and compare multiple solutions that use patterns to transfer information.

- Arecibo Message - 4-PS4-3
- There Is No Sound in Space - 4-PS4-1
- Shatter a Wine Glass with Your Voice - 4-PS4-1
- Amazing Slinky Tricks - 4-PS4-1
- Daniel Kish Uses Echolocation to Navigate - 4-PS4-1, 4-PS4-3
- Analog vs. Digital Television - 4-PS4-3
- The Visual Microphone: Passive Recovery of Sound from Video - 4-PS4-1, 4-PS4-3
- Ruben's Tube - 4-PS4-1
- Self-Leveling Pool Table on Cruise Ship - 4-PS4-1
- Blinking Eyes Send a Morse Code Message - 4-PS4-3
- The Dock Helps Surfers Catch Waves - link
- Morse code
- Breaking the sound barrier
- Tsunami
- Slinky waves
- Earthquake P and S waves
- Sounds don't interfere
- Echo
- Sound phenomenon (phantom sounds)
- Helium changes our voice higher and ??? makes it lower.
- Floating objects dropped in water bounce up and down (#projectphenomenon)
- Magnification of image using microscopes and telescope
- Foldscope
- Pixels
- Digital information vs. analog
- No sounds in space
- Space is black
- Ultrasound and elephants
- Dog whistle
- Whale communication
- Sperm whales sounds are dangerous
- Hear around a corner but you can't see
- Resonance
- Break a wine glass with sound
- Singing in the shower
- Tacoma Narrows Bridge
- Homemade telephone

- Pop bottle waves (with cork) better lesson
- Wave kinetic sculptures
- Freezing sound with camera frame rate
- Wave tank
- Washboards on a dirt road
- Road ridges play music
- Hair dryer blowing on water
- California earthquakes - San Andreas fault
- Using earthquakes to map the Earth
- Ripples when a rock is thrown into water
- The Mexican wave
- Dominoes falling
- Ship signals using flags
- Polybius Square
- Smoke signals
- Binary information
- Slow motion guitar strings
-

GRADE 5 - Matter and Energy in Life

5-LS1-1 - Support an argument that plants get the materials they need for growth chiefly from air and water.
5-LS2-1 - Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
5-PS3-1 - Use models to describe that that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

- 50 Year old sealed ecosphere - 5-LS2-1
- 12 Years in a Sealed Ecosphere - 5-LS1-1, 5-LS2-1, 5-PS3-1
- Farming Fish with Vegetables - 5-LS1-1, 5-LS2-1, 5-PS3-1
- Air Plants - No Soil Needed - 5-LS1-1
- Attack of the Killer Fungi - 5-LS2-1
- Algae Fuel and Food - 5-LS1-1
- Vegetable Oil as Fuel - 5-LS1-1
- Biosphere 2 - 5-LS1-1, 5-LS2-1, 5-PS3-1
- Why Do Sunflowers Follow the Sun? - 5-LS1-1, 5-PS3-1
- Time lapse of plants growing and animal development
- Why do dead things disappear?
- Body healing itself
- Phototropism
- Time-lapse of roots growing
- Time-lapse decomposition
- Biosphere II
- Biosphere
- Mass of a tree (Veritasium)
- Mass loss in humans (Veritasium)
- Wolves in Yellowstone Park
- Trees couldn't be broken down for millions of years (enzyme)
- Gut bacteria (cows)
- Mutualistic fungi
- Numbers pyramid in ecosystems
- The year without summer
- Seasonal carbon dioxide levels
- Ferry rings
- Fungi that eat nematodes
- Invasive species (eg. Zebra mussels, kudzu, etc.)
- Hydroponics
- Fertilizers
- Bacteria in aquariums
- Burning food
- Calorimetry
- Human hair contains different amounts of corn

- Regeneration of body parts (tails, starfish legs, spider legs, etc.)
- Leaves fall off trees in the winter
- Leaves fall off during times of low water
- What do plants eat?
- Where do leaves that fall go?
- Kelp deforestation
- You are what you eat
- Pop bottle terrarium
- Solar panels
- Plants in a closet
- Where does our food come from?
- Compost pile
- Colonizing the moon
- Poinsettias in the closet
- Air pollution
- Hydroponics
- The seed bank
- Plants with different conditions
- Soil biosolarization
- Water moves through plants
- Owl pellets
- Keystone species (wolf, jaguar, seastar, killer whale)
- Venus flytrap
- Animal eating plants
- Plants without water, light, or minerals

GRADE 5 - Earth: Systems and Interactions

5-ESS2-1 - Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
5-ESS2-2 - Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on earth.
5-ESS3-1 - Obtain and combine information about ways individual communities use science ideas to protect the earth's resources and environment.

- How Was the Grand Canyon Formed? - 5-ESS2-1
- Augmented Reality Sandbox - 5-ESS2-1
- Why Do Rivers Curve? - 5-ESS2-1
- Epic Mudslide Caught on Camera - 5-ESS2-1
- Towing an Iceberg to the UAE - 5-ESS2-2, 5-ESS3-1
- Glacier National Park is Melting Away - 5-ESS2-2
- How to Make a Cloud in Your Mouth - 5-ESS2-1
- The Mystery of the Missing Bees - 5-ESS3-1
- Formation of soil
- Desertification
- Cloud forests
- Coral reefs
- Rainforest vs. deserts
- Finite amount of water
- Hurricanes
- Singapore's water crisis
- Ocean currents and life
- Weathering, erosion, and deposition
- Aquifers
- Melting glaciers
- Ice melting in Greenland
- Artesian wells
- Salt lake, dead sea, ocean is salty
- Mangrove desalination
- Iguanas spitting out salt
- Animals living in saltwater and freshwater
- Arches, Grand Canyon, etc.
- Water treatment
- Sewage treatment
- Reduce, reuse, and recycle
- Water reclamation (Singapore)
- Air and water pollution
- Low flow toilets and showers
- Rain shadow
- Lake effect snow

- Deltas
- Saharan Air Layer
- The Gulf Stream
- Cloud in a bottle
- Statue weathering
- Cloud Seeding in Dubai and California
- Droughts
- Cloud seeding
- Building a mountain in Dubai
- Levees and dikes
- Water filtration
- Solar desalination
- Desalination costs
- The moving shower curtain
- Mt. St. Helens
- The year without summer
- Shrinking lake in Russia
- Deforestation
- Macroinvertebrates to determine water quality
- Sustainable farming
- The Dust Bowl
-

GRADE 5 - Earth, Space, and Stars

5-ESS1-1 - Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the earth.
5-ESS1-2 - Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
5-PS2-1 - Support an argument that the gravitational force exerted by earth on objects is directed down.

- Total Solar Eclipse - 5-ESS1-2
- How Do Sundials Work? - 5-ESS1-2
- Forced Perspective - 5-ESS1-1
- 3D Tour of Constellations - 5-ESS1-1
- Felix Baumgartner Space Jump World Record - 5-PS2-1
- Protecting the Earth from Killer Asteroids - 5-PS2-1
- Woman Hit by Meteorite - 5-PS2-1
- Pipehenge: Poor Man's Stonehenge - 5-ESS1-2
- Star Trails - 5-ESS1-1, 5-ESS1-2
- Seeing the Moon During the Day - 5-ESS1-2
- Sun is a star
- Gravity at the Center of the Earth
- Stellar size and brightness
- Voyager spacecraft
- Time it takes light to get to the Earth
- Star paths (time-lapse)
- Seasonal constellations
- Stars in northern and southern hemisphere
- Seasons
- Sun dial
- Stonehenge
- The dark side of the moon
- Shadow length over time
- Phases of the moon
- The ecliptic
- Sunrise and sunset
- The North Star stays in the same place
- Seasonal differences in northern and southern hemispheres
- Dung beetles use the stars to navigate (#projectphenomenon)
- Wayfinding (Moana)
- Sextant
- Total solar eclipse
- Lunar eclipse
- The Powers of Ten

- Mercury transit across the Sun (#projectphenomenon)
- Wandering stars
- The Morning star
- Sun tracks
- Photoperiod
- Weight on different planets
- Road that looks like you are rolling uphill
- Atmosphere on different planets and the Moon
- Comets
- Rivers flowing north
- Mystery House!!
-

GRADE 5 - Matter: Structure and Properties

5-PS1-1 - Develop a model to describe that matter is made of particles too small to be seen.
5-PS1-2 - Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
5-PS1-3 - Make observations and measurements to identify materials based on their properties.
5-PS1-4 - Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

- Magnetic Slime - 5-PS1-3
- Brinicles - 5-PS1-1
- Elephant Toothpaste - 5-PS1-3, 5-PS1-4
- Slime - 5-PS1-3, 5-PS1-4
- Will it Conduct? - 5-PS1-3, 5-PS1-4
- The Collapsing Train Car - 5-PS1-1
- Ice Cube Spikes - 5-PS1-1, 5-PS1-2
- Desert Beetle Harvests Water - 5-PS1-1
- How to Make a Cloud in Your Mouth - 5-PS1-1
- Why Does Cutting an Onion Make You Cry? - 5-PS1-1, 5-PS1-4
- Burning Steel Wool - 5-PS1-1, 5-PS1-2, 5-PS1-3, 5-PS1-4
- Reusable Heat Packs - 5-PS1-1, 5-PS1-2, 5-PS1-3, 5-PS1-4
- Indestructible Coating - Polyurea - 5-PS1-1, 5-PS1-3, 5-PS1-4
- Supercooled Water - 5-PS1-1, 5-PS1-2
- Fire Piston - 5-PS1-1
- Milk and Soap Experiment - 5-PS1-1, 5-PS1-3, 5-PS1-4
- Reaction in a Bag - 5-PS1-2, 5-PS1-3, 5-PS1-4
- DIY Solar Distiller 5-PS1-1, 5-PS1-2
- Crystals
- Phase change phenomenon
- Photo of Single Atom - article
- Freezing Hot Water - mpemba effect
- Conductors, insulators, and semiconductors
- Burning steel wheel and adding mass
- The darkest material
- Brownian motion
- Sublimation of dry ice
- Vinegar and baking soda (conservation of mass)
- Rust adds mass
- Jet contrails
- Smells (food, perfume, etc.)
- Burning a match

- Disappearing candle wax
- Trick candles
- Fireworks colors
- Electroplating
- Rising bread
- Yeast and H_2O_2
- Dissolving sugar and salt
- Growing crystals
- Various chemical reactions (eg. Na + Cl)
- Milk, food coloring, and soap
- Hindenburg
- Burning wood
- Covered syringe
- Floating cans of diet soda
- Mass of a saltwater vs. freshwater fish tank
- Float or not
- Magnetic and nonmagnetic material
- Moh’s hardness scale
- Boiling water (what are the bubbles)
- Invisible ink
- Gallium melts in your hand
- The disappearing spoon
-

MS LIFE SCIENCE - Cells to Organisms

MS-LS1-1 - Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
MS-LS1-2 - Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
MS-LS1-3 - Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
MS-LS1-8 - Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

- Can Prairie Dogs Talk? - MS-LS1-8
- The Immortal Cells of Henrietta Lacks - MS-LS1-1, MS-LS1-3
- The Inner Life of the Cell - MS-LS1-2, MS-LS1-3
- White Blood Cell Chases Bacteria - MS-LS1-1, MS-LS1-2
- Synesthesia - MS-LS1-1, MS-LS1-2, MS-LS1-3, MS-LS1-8
- Darius Goes West - (video, Darius Goes West - Watch the Movie and Join the Movement,Duchenne Muscular Dystrophy, Darius Goes West - Wikipedia, MS-LS1-1, MS-LS1-2, MS-LS1-3)
- Runner's High - MS-LS1-3, MS-LS1-8
- Mysterious Glowing Ball - MS-LS1-8
- What Does a Soccer (Football) Player See? - MS-LS1-8
- xLabs Eye Gaze Tracking Software - MS-LS1
- Killer T Cell - The Cancer Assassin - MS-LS1-1, MS-LS1-2, MS-LS1-3
- Inflation of Moth Coremata - MS-LS1-8
- Shrew Caravan - MS-LS1-8
- Cancerous vs. normal cells
- Osmosis and diffusion in onion cells
- Alien Faces Illusions
- Optogenetics trigger killer mice instinct - link
- Rubber Hand Illusion - link
- Cheek cells
- Cell shrinking and bursting in different concentrations
- Photosynthetic sea slug
- Water intoxication
- Single cell vs. multicellular life
- Plant vs. animals in different salinity
- Snake venom and blood cells
- Blood lysis
- Mitochondrial diseases
- Reaction time
- Reacting plants
- Overstimulation

- Distracted driving
- Color blindness
- Phototropism
- Muscle contracts out of frog
- Short term vs. long term memory
- Optical illusions
- Blue or Gold dress
- Yanny and Laurel (sound)
- Pulse rates
- Check / onion cells with salt
- Egg shrinking
- Hydra defense
- Amoeba phagocytosis
- Disease - sickle cell, diabetes, cystic fibrosis
- Pulse rate with exercise
- Yawning (is yawning contagious)
- Reflex arc
- Bat echolocation
- Moths that can hear bats
- Clogged artery
- Antibiotics and bacterial lysis
- Normal flora
- DNA extraction
- Water bucket challenge
- Fight or flight
- Archaea
- Spinning ballerina and rotation direction

MS LIFE SCIENCE - Matter and Energy in Life

MS-LS1-6 - Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
MS-LS1-7 - Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
MS-LS2-1 - Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-3 - Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS-LS2-4 - Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

- 50 Year old sealed ecosphere - MS-LS1-6, MS-LS2-3
- 12 Years in a Sealed Ecosphere - MS-LS1-6, MS-LS1-7, MS-LS2-3
- Farming Fish with Vegetables - MS-LS1-6, MS-LS1-7, MS-LS2-3
- Air Plants - No Soil Needed - MS-LS1-6
- Attack of the Killer Fungi - MS-LS2-3, MS-LS2-4
- Algae Fuel and Food - MS-LS1-6, MS-LS1-7, MS-LS2-3
- Vegetable Oil as Fuel - MS-LS1-6, MS-LS1-7, MS-LS2-3
- Biosphere 2 - MS-LS1-6, MS-LS2-1, MS-LS2-3, MS-LS2-4
- The Great Oxygenation Event - MS-LS1-6, MS-LS2-1, MS-LS2-3, MS-LS2-4
- Reconstructing Ancient Diets with Isotopes - MS-LS1-7, MS-LS2-3
- If We Are What We Eat, Americans Are Corn and Soy - MS-LS1-7, MS-LS2-3
- Corn Cob Sprouting in Water - MS-LS1-6
- Why Do Sunflowers Follow the Sun? - MS-LS1-6
- Tiger stalking prey
- Leaf in test tube with water
- Cracker and saliva
- Year without a summer
- Benedict's reagent
- Paper clips on leaf
- Gummy bear with potassium permanganate
- Carbon cycles
- Wolves in Yellowstone
- Lactic acid and muscles
- Elodea and light
- How do plants grow? CO2
- Carbon cycle and global warming
- Energy in food
- Why are plants green?
- Exercise - weight gain and weight loss
- Energy drinks

- Paleo diet
- Producers vs consumers (numbers pyramid)
- Photosynthetic bacteria
- Why is life made of carbon?
- You are what you eat?
- Decomposition
- How do you grow?
- Calorimetry (burning gummy bear or Cheetoh)
- Happy Meal separation
- Carbo loading
- Biosphere II
- Biosphere in a bottle
- Hydroponics
- Air plants Hibernation
- Ectotherms vs. endotherms
-

MS LIFE SCIENCE - Ecosystems

MS-LS2-2 - Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-5 - Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

- The Salmon Cannon - MS-LS2-5
- Attack of the Killer Fungi - MS-LS2-2
- Terrarium
- Composting
- Aquaponics or hydroponics
- Manure and growing crops
- Food chains and food webs
- Deforestation
- Pollution
- Citizen science
- Overfishing
- National parks
- The Endangered Species Act
- The Wolves of Yellowstone changing the rivers
- Predator-prey relationship (e.g. lynx-hare , wolves and moose on Isle Royale)
- HIPPO
- Ecosystem services valuation
- Trophic levels
- Holocene - 6th mass extinction
- Killer whales eating sea otters
- Keystone species (e.g. jaguar, wolf, Ochre sea stars, sea otter, Acorn banksia, etc.)
- Introduced or invasive species
- Genetic pollution
- Food security
- Polar bears
- Biodiversity banking
- Seed bank
- Ecosystem services
    - Portfolio effect
    - Ecological redundancy
- Hydrothermal vent ecosystems
- Ecotourism
-

MS LIFE SCIENCE - Natural Selection

MS-LS4-1 - Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on earth under the assumption that natural laws operate today as in the past.
MS-LS4-2 - Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
MS-LS4-3 - Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
MS-LS4-4 - Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
MS-LS4-6 - Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

- Natural Fish Lure | Lampsilis Mussel and Bass - MS-LS4-6
- Megafauna Extinction: Humans or Climate? - MS-LS4-1, MS-LS4-2
- Why Do Humans Have Different Colored Skin? - MS-LS4-4, MS-LS4-6
- Galapagos Finch Evolution - MS-LS4-4, MS-LS4-6
- A Peacock's Tail - MS-LS4-4
- Hox Genes - MS-LS4-2, MS-LS4-3
- Hind limb loss in dolphins (sonic gene) - link
- Galapagos
- Beaks of Finches
- Necks of the tortoises
- Lesbian whiptail lizards
- Peppered Moths
- Rapidly evolving whiptail lizards
- Darwin and Natural Selection
- Dinosaur extinction and the KT Boundary
- Antibiotic resistance
- HIV evolution
- Newts and the garter snakes
- Human evolution
    - Hobbits, Neanderthals
- Skin color evolution
- Eye color - blue
- Lactose tolerance / persistence
- Mammal explosion
- Island biology (E.O. Wilson)
- No snakes and no rabies in England
- Pigeon breeding

- Dog breeding
- 23andMe - genetic testing
- Jack Horner - turning a chicken into a dinosaur
- The giraffe's long neck
- Dinosaur extinction
- Fossils
- Tiktaalik
- Vestigial Structures (i.e. wisdom teeth, appendix, etc.)
- Bacterial megaplate evolution
- HIV evolution
- Eye, brain, wing evolution (analogy)
- Whale evolution
- Burgess shale
- Tetrapod evolution
- Flowering plants and invertebrate evolution
- Evolutionary arms race (newt and garter snake)
- Archaeopteryx
- Lactose persistence
- Dog breeding
- Allergies (e.g. peanut, egg, etc.)
- Cancer (leukemia?) linked to lack of exposure to germs early in life.
- Superbugs
- Antibiotic resistance
-

MS LIFE SCIENCE - Heredity, Growth, and Development

MS-LS1-4 - Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5 - Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS3-1 - Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
MS-LS3-2 - Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
MS-LS4-5 - Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

- Termite Olympics - MS-LS1-4
- Ice Turns Himalayan Rabbits Black - MS-LS1-5
- Male Water Bug with Eggs - MS-LS1-4, MS-LS3-2
- Mouthbrooding Fish - MS-LS1-4
- Hemingway's Polydactyl Cats - MS-LS1-5, MS-LS3-1, MS-LS3-2
- Corn Cob Sprouting in Water - MS-LS1-5, MS-LS3-2
- Malaria and Sickle Cell Anemia - MS-LS3-1, MS-LS3-2
- The Potential and Ethics of CRISPR - MS-LS1-5, MS-LS3-1, MS-LS3-2, MS-LS4-5
- Darius Goes West - (video, Darius Goes West - Watch the Movie and Join the Movement,Duchenne Muscular Dystrophy, Darius Goes West - Wikipedia, MS-LS1-5, MS-LS3-1)
- Inflation of Moth Coremata - MS-LS1-4
- Shrew Caravan - MS-LS1-4
- Parthenogenesis
- Glowing puppies
- Whiptail lizards
- Disappearing bees
- Cotton candy grapes
- Dolly
- Golden rices
- BT corn
- Dog breeding
- Silk in goat milk
- Mutations
- Dominant vs recessive genes
- 1950's thalidomide babies
- Miracle of Life

- Variation in traits
- Tadpole development
- Varied skin color in twins
- Colorblind
- Sickle-cell anemia
- Himalayan rabbit and temperature dependent skin coloration
- Fixing broken bone or healing cut
- PTC paper
-

MS EARTH SPACE SCIENCE - Space Systems

MS-ESS1-1 - Develop and use a model of the earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
MS-ESS1-2 - Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
MS-ESS1-3 - Analyze and interpret data to determine scale properties of objects in the solar system.

- How Do Sundials Work? - MS-ESS1-1
- Total Solar Eclipse - MS-ESS1-1, MS-ESS1-3
- Pipehenge: Poor Man's Stonehenge - MS-ESS1-1
- Star Trails - MS-ESS1-1
- Seeing the Moon During the Day - MS-ESS1-1
- Forced Perspective - MS-ESS1-3
- 3D Tour of Constellations - MS-ESS1-3
- Felix Baumgartner Space Jump World Record - 5-ESS1-2
- Gravitational Waves and LIGO - MS-ESS1-2, MS-ESS1-3
- Cavendish Experiment - MS-ESS1-2
- Weighing the World - MS-ESS1-2
- Protecting the Earth from Killer Asteroids - MS-ESS1-2, MS-ESS1-3
- Woman Hit by Meteorite - MS-ESS1-2, MS-ESS1-3
- Bulging ball on rotation of paper sphere on pencil
- Tracing shadows during the day
- Phases of the moon
- Total solar eclipse
- Extrasolar planets
- Space exploration - moon, mars and beyond
- Apollo 13
- Volcanism on other planets
- Are we alone?
- Pluto isn't a planet?
- Ancient humans understanding of space (eg. Stonehenge)
- Way finders
- Space, time and gravity
- How big is the Universe?
- Asteroid harvesting
- International Space Station (ISS)
- Blue Marble and Pale Blue Dot photos
- Tides (video)
- Meteor impact in Russia
- Temperature during different seasons
- Pictures/videos of eclipses
- Comet tails

- Black holes
- Cosmic Background Radiation
- What’s outside the Universe?
- Dark Matter / Dark Energy
- Supernova
- Astrobiology
- SpaceX
- Voyager missions (outside the Solar System)
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-

MS EARTH SPACE SCIENCE - History of Earth

MS-ESS1-4 - Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize earth's 4.6-billion-year-old history.
MS-ESS2-2 - Construct an explanation based on evidence for how geoscience processes have changed earth's surface at varying time and spatial scales.
MS-ESS2-3 - Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

- How Was the Grand Canyon Formed? - MS-ESS1-4, MS-ESS2-2
- Augmented Reality Sandbox - MS-ESS2-2
- The Marianas Trench - Deepest Ocean - MS-ESS2-3
- Yellowstone Supervolcano - MS-ESS2-2
- Convection
- Coral reef fossils
- Marie Tharp
- Pangaea
- Iridium in the KT boundary
- Snowball earth
- Natural hazards (e.g. earthquake, volcanoes, tsunami, etc.)
- Induced seismicity and fracking
- Age of the Earth, sun, moon, solar system
- Moon formation
- Rock cycle
- Glomar Challenger
- Sand Dunes
- Sedimentary Rock on Everest
- Shell Fossils on top of Mountain
- Supervolcanoes
- Karst Topography
- Sand Mafia
- Mid-Atlantic Ridge
- Fracking and Earthquakes
- Deep Sea Trenches

MS EARTH SPACE SCIENCE - Earth's Systems

MS-ESS2-1 - Develop a model to describe the cycling of earth's materials and the flow of energy that drives this process.
MS-ESS2-4 - Develop a model to describe the cycling of water through earth's systems driven by energy from the sun and the force of gravity**.**
MS-ESS3-1 - Construct a scientific explanation based on evidence for how the uneven distributions of earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

- Augmented Reality Sandbox - MS-ESS2-4
- Towing an Iceberg to the UAE - MS-ESS2-4
- The Marianas Trench - Deepest Ocean - MS-ESS2-1
- UAE Building a Mountain to Increase Rainfall - MS-ESS2-4, MS-ESS3-1
- Yellowstone Supervolcano - MS-ESS2-1
- Volcanoes, earthquakes, plate tectonics
- Mineral distribution maps (e.g. here)
- Rare earth metals
- Minerals in your mobile devices
- Lava lamp
- Artesian wells
- Aquifer - Ogallala Aquifer depletion - Groundwater resources
- Amazing minerals - link
- Rock cycle (e.g., melting, sedimentation, weathering)
- Rock in hydraulic press
- Acid rain
- Cape Town water shortage (link)
- Dew point (water forming on the outside of a glass of ice water)
- Cloud formation - Why do the bottoms of all the clouds line up?
- Desalination costs
- Cloud seeding
- Electronic waste - e-waste
- The Dust Bowl
- Lake Effect Snow
- Sand Dunes
- Super Volcanoes
- Sedimentary Rock on Everest
- Shells on Top of Mountain
- Karst Topography
- Sand Mafia
- Coal
- Deep Sea Trenches
- Ring of Fire
- Fossil Fuel Consumption

- Fracking & Earthquakes

MS EARTH SPACE SCIENCE - Weather and Climate

MS-ESS2-5 - Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ESS2-6 - Develop and use a model to describe how unequal heating and rotation of the earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
MS-ESS3-5 - Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

- Glacier National Park is Melting Away - MS-ESS3-5
- How to Make a Cloud in Your Mouth - MS-ESS2-5
- UAE Building a Mountain to Increase Rainfall - MS-ESS2-6
- The Driest Place on Earth - MS-ESS2-5, MS-ESS2-6
- Why Does the Wind Blow? - MS-ESS2-5, MS-ESS2-6
- World Climographs - MS-ESS2-5, MS-ESS2-6
- The Dark Snow Project - MS-ESS3-5
- Coriolis effect
- CO2 levels
- Methane
- Global warming
- Severe weather (e.g. tornadoes, thunderstorms, etc.)
- Urban heat islands
- DIY Barometer with balloon and jar
- Prevailing winds (trade winds, horse latitudes, etc.)
- Jupiter's great red spot
- Weather-related migraines - link
- Groundhog Day
- Severe weather - tornadoes, thunderstorms
- Heat waves
- Jet stream
- Water shortages in Cape Town
- Desertification of Spain
- Dew point and dew point calculation
- DIY thermometer
- Weather stations
- Jet stream
- Changes in the gulf stream due to climate change
- Melting of the polar ice caps
- Fossil fuels
- Alternative energy
- The Boy Who Captured the Wind
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MS EARTH SPACE SCIENCE - Human Impacts

MS-ESS3-2 - Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
MS-ESS3-3 - Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
MS-ESS3-4 - Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact earth's systems.

- Google Maps Timelapse MS-ESS3-3
- Easter Island Deforestation - MS-ESS3-3, MS-ESS3-4
- Towing an Iceberg to the UAE - MS-ESS3-3
- The Mystery of the Missing Bees - MS-ESS3-3
- The Salmon Cannon - MS-ESS3-3
- Precious Plastic - MS-ESS3-4
- Algae Fuel and Food - MS-ESS3-4
- Vegetable Oil as Fuel - MS-ESS3-4
- Earthships - MS-ESS3-4
- Yellowstone Supervolcano - MS-ESS3-2
- Elephants Warn Tourists of Tsunami - MS-ESS3-2
- Mount St. Helens
- Large earthquakes
- Tsunami warning system
- Oil spill
- Polar bear on ice / starving polar bear
- Plastic in the stomach of birds
- Hurricanes
- Coal mining
- Fish kill
- Python/gator death
- Bamboo
-

MS PHYSICAL SCIENCE - Matter: Structure and Properties

Tag: **ms-matter-structure-and-properties**

MS-PS1-1 - Develop models to describe the atomic composition of simple molecules and extended structures.
MS-PS1-3 - Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
MS-PS1-4 - Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

- Drinking bird - MS-PS1-4
- Brinicles - MS-PS1-4
- Slime - MS-PS1-3, MS-PS1-1
- The Collapsing Train Car - MS-PS1-1, MS-PS1-4
- Precious Plastic - MS-PS1-1, MS-PS1-3
- Ice Cube Spikes - MS-PS1-1, MS-PS1-4
- Reusable Heat Packs - MS-PS1-1, MS-PS1-4
- Indestructible Coating - Polyurea - MS-PS1-1, MS-PS1-3
- Supercooled Water - MS-PS1-1, MS-PS1-4
- Fire Piston - MS-PS1-1, MS-PS1-4)
- Milk and Soap Experiment - MS-PS1-1
- Why Does Cutting an Onion Make You Cry? - MS-PS1-1
- Aerogels - World's Lightest Solids - MS-PS1-3, MS-PS1-4
- Oobleck
- Freezing Hot Water - mpemba effect
- M&M in water
- Large cryogenic gas tank - link
- Whiteboard marker liftoff
- Food coloring with water
- Hand boiler
- Ball and ring heated
- Electrolysis
- Tea bag rockets
- Typhoons, hurricanes, etc.
- Density column
- Soap and pepper on water
- Water on a penny
- Greenhouse gases
- Lava lamp
- Coca-cola instant slushy
- Periodic table of foods
- Growing crystals
- Massive crystals in mine

- Separation of mixtures
- Lava lamp
- Density column
- Ice in alcohol vs water
- Oil and vinegar separation
- Egg sucked into bottle
- Salt and Pepper

MS PHYSICAL SCIENCE - Chemical Reactions

MS-PS1-2 - Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
MS-PS1-5 - Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
MS-PS1-6 - Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

- Elephant Toothpaste - MS-PS1-2
- Slime -MS-PS1-2
- Will it Conduct? - MS-PS1-2
- Burning Steel Wool - MS-PS1-2, MS-PS1-5
- Reusable Heat Packs - MS-PS1-5, MS-PS1-6
- Indestructible Coating - Polyurea - MS-PS1-2, MS-PS1-6
- Reaction in a Bag - MS-PS1-2, MS-PS1-5, MS-PS1-6
- Why Does Cutting an Onion Make You Cry? - MS-PS1-2
- Aerogels - World's Lightest Solids - MS-PS1-2
- Warm and cold packs
- Baking soda and vinegar
- Exploding gummy bear
- Rusting nail
- Glow sticks
- KI and PbSO4
- Making ice cream
- Food as fuel
- Ammonium chloride (fast freeze)
- Dinoflagellate bioluminescence
- Burning marshmallows
-

MS PHYSICAL SCIENCE - Forces and Interactions

MS-PS2-1 - Apply newton's third law to design a solution to a problem involving the motion of two colliding objects.
MS-PS2-2 - Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
MS-PS2-3 - Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
MS-PS2-4 - Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
MS-PS2-5 - Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

- Magnetic Slime - MS-PS2-3
- Magnetic Canon - MS-PS2-1, MS-PS2-2, MS-PS2-3
- Programmable Magnets - MS-PS2-3, MS-PS2-5
- Slow Motion Golf Ball Collision - MS-PS2-1, MS-PS2-2
- Amazing Slinky Tricks - MS-PS2-2
- A Bed of Nails - MS-PS2-1, MS-PS2-2
- Amazing Rube Goldberg Machines - MS-PS2-1, MS-PS2-2
- Candle-Powered Car - MS-PS2-3
- Felix Baumgartner Space Jump World Record - MS-PS2-4, MS-PS2-5
- Cavendish Experiment - MS-PS2-2, MS-PS2-4, MS-PS2-5
- Weighing the World - MS-PS2-2, MS-PS2-4, MS-PS2-5
- The Gravity Light - MS-PS2-4
- Raw or Boiled Egg Experiment - MS-PS2-2
- Programmable Droplets from MIT - MS-PS2-3, MS-PS2-5
- Flymo Hover Lawnmower - MS-PS2-2
- Amazing Electromagnet - MS-PS2-3
- Newton's cradle
- Gyroscope
- Pendulum
- Ball and ramp
- Floating magnets
- Homemade motor
- Rocket from a balloon
- Galileo's experiment (feather and hammer on the moon)
- Aurora borealis
- Van de Graaff generator
- Metal hand completes a circuit
- Pop can electroscopes
- Motors
- Electromagnets

- Homemade compass
- Newton’s laws in sports
- Tug of war
- Spring scale
- Red bull space jump
- Simple machines
- Atwood machine
- COllision carts
- Magnetic fields with iron filings
- Alternative energy
-

MS PHYSICAL SCIENCE - Energy

MS-PS3-1 - Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
MS-PS3-2 - Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
MS-PS3-3 - Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
MS-PS3-4 - Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
MS-PS3-5 - Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

- Drinking bird **-** MS-PS3-1, MS-PS3-3, MS-PS3-4, MS-PS3-5
- Coupled pendulum -MS-PS3-1, MS-PS3-5
- Giant Newton's Cradle - MS-PS3-5
- Brinicles - MS-PS3-4
- Magnetic cannon - MS-PS3-2
- Amazing Slinky Tricks - MS-PS3-1, MS-PS3-5
- Amazing Rube Goldberg Machines - MS-PS3-1, MS-PS3-2, MS-PS3-5
- Earthships - MS-PS3-3, MS-PS3-4
- Candle-Powered Car - MS-PS3-1, MS-PS3-4
- The Gravity Light - MS-PS3-1, MS-PS3-2, MS-PS3-5
- Ice-cutting Experiment - MS-PS3-4
- Aerogels - World's Lightest Solids - MS-PS3-3
- Cuckoo clock
- Happy ball / sad ball
- Thermocline lab
- Calorimetry lab
- Ball and ring demonstration
- Bimetallic strip
- Rubber band
- Spark balls
- Pendulum - Coupled pendulum
- Hand boilers
- Burning a water balloon
- Caron on paper
- 2 Liter convection
- Lava lamps
- Kinetic theory demonstration
- Building a thermometer

- Building a cooler
- Radiometers
- Wind turbines
- Generators
- Solar cells

MS PHYSICAL SCIENCE - Waves and Information

MS-PS4-1 - Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
MS-PS4-2 - Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
MS-PS4-3 - Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

- Arecibo Message - MS-PS4-3
- Daniel Kish Uses Echolocation to Navigate - MS-PS4-1, MS-PS4-2
- Analog vs. Digital Television - MS-PS4-1, MS-PS4-2, MS-PS4-3
- The Visual Microphone: Passive Recovery of Sound from Video - MS-PS4-1, MS-PS4-2
- Ruben's Tube - MS-PS4-1, MS-PS4-2
- The Shadow Illusion - MS-PS4-2
- Self-Leveling Pool Table on Cruise Ship - MS-PS4-1
- Blinking Eyes Send a Morse Code Message - MS-PS4-3
- Trichroic Prism - MS-PS4-2
- Amazing Slinky Tricks - MS-PS4-1
- Acoustic Levitation - MSPS4-1
- Soundproofing a room
- Noise-canceling headphones
- Daredevil sensing the world
- Theremin
- WiFi or Cellular signal strength
- Paper cup phone
- McGurk Effect
- Sonar kids
- Slinky and rope waves
- Northern lights
- Morse code
- Record player out of paper and needle
- Radar
- Code-breaking enigma machine
- 3G vs 4G vs 5G
- Cell coverage and dead zones
- New digital signal based on 4-base code
- UV index
- Strength of Sun in summer and winter
- Album vs. CD vs. MP3 (fidelity)

HS Life Science - Molecules to Organisms

HS-LS1-1 - Construct an explanation based on evidence for how the structure of dna determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-2 - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3 - Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

- The Immortal Cells of Henrietta Lacks - HS-LS1-2
- Hemingway's Polydactyl Cats - HS-LS1-1
- White Blood Cell Chases Bacteria - HS-LS1-1, HS-LS1-3
- Synesthesia - HS-LS1-2
- Malaria and Sickle Cell Anemia - HS-LS1-1, HS-LS1-2
- Hox Genes - HS-LS1-1
- The Potential and Ethics of CRISPR - HS-LS1-1
- Darius Goes West - (video, Darius Goes West - Watch the Movie and Join the Movement,Duchenne Muscular Dystrophy, Darius Goes West - Wikipedia, HS-LS1-1, HS-LS1-2)
- Runner's High - HS-LS1-2, HS-LS1-3
- Killer T Cell - The Cancer Assassin - HS-LS1-1, HS-LS1-2, HS-LS1-3
- Alligators Survive in Ice - HS-LS1-3
- Why Do Sunflowers Follow the Sun? - HS-LS1-3
- Shamrocks at night - HS-LS1-3
- Microscopic images of different cells
- Disorder images
- Heart vs activity
- Runners high
- Blood oxygen vs. activity
- Goldfish in ice
- Crickets with different concentration of CO2
- Alka seltzer (whole vs broken)
- Reptile morphs
- Clot formation
- Lactation
- Immune system
- Diabetes
- Sickle-cell disease
- Broken bone
- Malnutrition
- Outbreak - Ebola, bird flu, pandemic
- Lactose intolerance, lactase persistence

- Growth and development
- Paralysis
- COPD
- Cell specialization and differentiation
- Mitochondrial disease
- Stem cells
- Fitness - getting in shape
- Low sodium levels
- Cancer
- Alcohol detoxification
- Thermoregulation
- Infection and immune response
- Snake venom
- Albinism
- Circadian rhythms
- Emergent properties
- Autoimmune response
- PKU
- You are what you eat
- Blood typing
- 3 Parent baby
- Triple Crown Winner Doping
- Sex Change
- 23 & Me
- Ancestry.com
- GenoPalate
- Dengue
- Free Diving
- Genetic CRSPR
- Runner’s High
- Olympic Runners
- Sterile Mosquitos
- Skin Color
- Mt Everest - Nepalese
- Chickungunya Virus
- Snake Toxins
- Drugs / Opioids
- Deep Sea Mammals

HS Life Science - Inheritance and Variation

HS-LS1-4 - Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS3-1 - Ask questions to clarify relationships about the role of dna and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-2 - Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS-LS3-3 - Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

- The Twins that Everyone Can Tell Apart - HS-LS1-4
- Why Do Humans Have Different Colored Skin? - HS-LS3-1, HS-LS3-2
- Galapagos Finch Evolution - HS-LS3-3
- Hemingway's Polydactyl Cats - HS-LS3-1, HS-LS3-2
- Corn Cob Sprouting in Water - HS-LS1-4, HS-LS3-2, HS-LS3-3
- The Immortal Cells of Henrietta Lacks - HS-LS1-4
- The Inner Life of the Cell - HS-LS1-4, HS-LS3-1
- Malaria and Sickle Cell Anemia - HS-LS3-1, HS-LS3-2, HS-LS3-3
- Hox Genes - HS-LS3-1
- The Potential and Ethics of CRISPR - HS-LS3-1, HS-LS3-2
- Darius Goes West - (video, Darius Goes West - Watch the Movie and Join the Movement,Duchenne Muscular Dystrophy, Darius Goes West - Wikipedia, HS-LS3-1, HS-LS3-2)
- Shrew Caravan - HS-LS3-1
- Cloning
- Dolly the sheep
- Kentucky blue people
- Twins with different skin tone
- Myostatin bulls (super cows)
- Gene drives
- RNAi
- Identical twins
- Zebrafish development
- PTC paper
- Asparagus pee
- Banana extinction
- Beets pee
- 23 and me
- Color blindness
- Baldness patterns

- Nuclear radiation and the effect on humans affected
- Down Syndrome
- Smoking and Lung cancer
- Alcohol and cancer rates
- Lesbian lizards (Whiptail lizards)
- Clownfish and sex determination
- Aphids and telescoping generations
- Allp and teens
- Aging and progeria
- HPV and male vaccine
- Cystic fibrosis
- Vestigial males (angler fish)
- Genetic testing in children
-

HS Life Science - Matter and Energy in Life

HS-LS1-5 - Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS-LS1-6 - Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
HS-LS1-7 - Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
HS-LS2-3 - Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS-LS2-4 - Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

- 50 Year old sealed ecosphere - HS-LS2-3, HS-LS2-4
- 12 Years in a Sealed Ecosphere - HS-LS1-5, HS-LS1-7, HS-LS2-3, HS-LS2-4
- Farming Fish with Vegetables - HS-LS1-5, HS-LS1-7, HS-LS2-3, HS-LS2-4
- Air Plants - No Soil Needed - HS-LS1-5, HS-LS2-5
- Attack of the Killer Fungi - HS-LS2-3, HS-LS2-4
- Algae Fuel and Food - HS-LS1-5, HS-LS1-7, HS-LS2-5
- Vegetable Oil as Fuel - HS-LS1-5, HS-LS1-7, HS-LS2-5
- Biosphere 2 - HS-LS1-5, HS-LS1-7, HS-LS2-3, HS-LS2-4, HS-LS2-5
- Reconstructing Ancient Diets with Isotopes - HS-LS1-6, HS-LS1-7, HS-LS2-3, HS-LS2-4, HS-LS2-5
- If We Are What We Eat, Americans Are Corn and Soy - HS-LS1-6, HS-LS1-7, HS-LS2-3, HS-LS2-4, HS-LS2-5
- Crown Shyness - HS-LS1-5
- Sugar plant explosion in Georgia
- Losing weight while you sleep
- Bubbles in water weeds
- Bacterial mats in hot springs
- Mitochondrial diseases
- Running a marathon
- CAM and C4 plants
- Biosphere II
- Endosymbiotic theory
- Lactic acid fermentation
- Alcoholic fermentation
- CO2 levels and plant growth
- Electron transport chain

- Recycling ATP
- Rigor mortis
- Biofuels
- Euglena
- Photosynthetic sea slug
- Aphids
- Lichen
- Burning sugar
- Calorimetry
- Screaming gummy bear
- Van Helmont experiment
- Man who lived on a scale
- Living in a space station
- Measuring basal metabolic rate
- Increasing CO2 levels and plant growth
- Russia loves global warming
- Lactic acid and muscles
- Making alcohol - fermentation
- Calories - burning energy
- Carbon sequestration
- Eutrophication
- Mangroves as natural desalination
- Bioremediation
- Tetanus
- Long-term terrariums
- Biosphere II
- Carbon footprint
- Isotopes and ancient diet
- C3 / C4 and CAM plants
- Sulfur eating bacteria
- Hydrothermal vents and life

HS Life Science - Ecosystems

HS-LS2-1 - Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2 - Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-6 - Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7 - Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS2-8 - Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS4-6 - Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

- Termite Olympics - HS-LS2-8
- Easter Island Deforestation - HS-LS2-7, HS-LS4-6
- Dolphins and Humans Fishing Together - HS-LS2-8
- Google Maps Timelapse - HS-LS2-7, HS-LS4-6
- Galapagos Finch Evolution - HS-LS2-6
- The Salmon Cannon - HS-LS2-7
- Can Prairie Dogs Talk? - HS-LS2-8
- Attack of the Killer Fungi - HS-LS2-2
- Ant Cooperation - HS-LS2-8
- Megafauna Extinction: Humans or Climate? - HS-LS2-2
- Algae Fuel and Food - HS-LS2-7
- Vegetable Oil as Fuel - HS-LS2-7
- Shrew Caravan - HS-LS2-8
- Shopping cart with zebra mussels
- Hydroponics system
- Polar bears
- Biodiversity loss
- HIPPO
- Bradford pear trees
- Kudzu
- Japanese beetles
- Oh Deer
- Rabbit and Lynx case study
- Carbon capture
- Climate change
- Fuel to food

- Carbon footprint
- Planetary boundaries
- Fruit solar panels
- Ecosystem services
- Air pollution
- Coral bleaching
- Plastic islands in the ocean
- Microplastics
- Sustainability
- N2 cycles
- El Nino
- La Nina
- Energy pyramid
- DDT and bioaccumulation
- Before and after landscaping photos
- Potato bug tank lab
- Wolves changing the rivers in Yellowstone park
- DDT bioaccumulation
- Asian carp (videos)
- Anemone and clownfish
- Hunting debate
- Lichen
- Succession after the fires of 88
- Barnacles and the whale
-

HS Life Science - Natural Selection and Evolution

HS-LS4-1 - Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-LS4-2 - Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-3 - Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
HS-LS4-4 - Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-5 - Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

- Natural Fish Lure | Lampsilis Mussel and Bass - HS-LS4-3, HS-LS4-4
- A Peacock's Tail - HS-LS4-3
- Why Do Humans Have Different Colored Skin? - HS-LS4-2, HS-LS4-3, HS-LS4-4
- The Asteroid That Killed the Dinosaurs - HS-LS4-5
- Galapagos Finch Evolution - HS-LS4-1, HS-LS4-2, HS-LS4-3, HS-LS4-4, HS-LS4-5
- The Great Oxygenation Event - HS-LS4-5
- Malaria and Sickle Cell Anemia - HS-LS4-2, HS-LS4-3, HS-LS4-4
- Hox Genes - HS-LS4-1
- Inflation of Moth Coremata - HS-LS4-3
- Rock pocket mouse
- Stickleback fish
- Beaks of the finches
- Peppered moth
- Cute Baby Animals - HS-LS4-3
- Chromosomes in primates
- Dinosaurs
- Bacterial megaplate evolution
- Birds and dinosaurs
- Peppered moth
- Jack Horner making a dinosaur from a chicken
- The 6th extinction
- The 6th genesis
- Evolutionary arms race (newt and garter snake)Antibiotic resistance (MRSA)
- Neanderthal and

- DNA and all living things related on a tree
- Odd chromosome #
- The giraffes neck
- Embryos
- Human evolution
- Vestigial traits
- Artificial selection
- Skin color variation - vitamin D and folate
- Lactose intolerance
- Eugenics
- Sickle cell and malaria
- Warm-blooded vs. cold-blooded organisms
- Skull comparisons
- Amino acid comparisons
- Biointeractive Human Sickle cells
- Bacterial resistance to antibiotics
- Biodiversity lab
-

HS Earth Space Science - Space Systems

HS-ESS1-1 - Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy in the form of radiation.
HS-ESS1-2 - Construct an explanation of the big bang theory based on astronomical evidence of light spectra, motion of distant galaxies,and composition of matter in the universe.
HS-ESS1-3 - Communicate scientific ideas about the way stars, over their life cycle, produce elements.
HS-ESS1-4 - Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

- How Do Sundials Work? - HS-ESS1-4
- Why is Space Black? - HS-ESS1-2
- Pipehenge: Poor Man's Stonehenge - HS-ESS1-4
- Gravitational Waves and LIGO - HS-ESS1-2
- Solar Flares, Sunspots, and the Solar Cycle - HS-ESS1-1
- The Big Bang Theory - HS-ESS1-2, HS-ESS1-3
- Protecting the Earth from Killer Asteroids - HS-ESS1-4
- Woman Hit by Meteorite - HS-ESS1-4
- Redshift and blueshift
- Retrograde motion of planets
- Cold (con?) fusion - link
- HR diagrams
- Sunspot cycles
- Hunting for Earth 2.0
- Doppler shift
- Spectroscopy lab - elements
- Aurora borealis
- Exoplanets
-

HS Earth Space Science - History of Earth

HS-ESS1-5 - Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
HS-ESS1-6 - Apply scientific reasoning and evidence from ancient earth materials, meteorites, and other planetary surfaces to construct an account of earth's formation and early history.
HS-ESS2-1 - Develop a model to illustrate how earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

- The Marianas Trench - Deepest Ocean - HS-ESS1-5, HS-ESS2-1
- Woman Hit by Meteorite - HS-ESS1-6
- Oreo continental plates
- Plate tectonics puzzle
- Marbles into sand
- Radioactive dating with M&Ms
- Seafloor spreading demo
- Volcanic eruptions
- Hawaiian Islands
- Glaciers
- Fossils
- Rock formation
- KT Boundary
- Mid-Ocean Ridge
- Earthquakes
- Induced seismicity and fracking

HS Earth Space Science - Earth's Systems

HS-ESS2-2 - Analyze geoscience data to make the claim that one change to earth's surface can create feedbacks that cause changes to other earth systems.
HS-ESS2-3 - Develop a model based on evidence of earth's interior to describe the cycling of matter by thermal convection.
HS-ESS2-5 - Plan and conduct an investigation of the properties of water and its effects on earth materials and surface processes.
HS-ESS2-6 - Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
HS-ESS2-7 - Construct an argument based on evidence about the simultaneous coevolution of earth's systems and life on earth.

- How Was the Grand Canyon Formed? - HS-ESS2-5
- Epic Mudslide Caught on Camera - HS-ESS2-5
- Augmented Reality Sandbox - HS-ESS2-5
- The Marianas Trench - Deepest Ocean - HS-ESS2-3
- The Dark Snow Project - HS-ESS2-2
- The Great Oxygenation Event - HS-ESS2-7
- Terraforming Mars - HS-ESS2-2, HS-ESS2-6, HS-ESS2-7
- Snowball Earth - (video,
- Sediment tube
- Graded bed
- Stream table
- Landslide video
- Dust Bowl
- Niagara Falls changing over time
- Potholes
- Lake freezing from the top down
- Lake Effect rain and snow
- Fossils
-

HS Earth Space Science - Weather and Climate

HS-ESS2-4 - Use a model to describe how variations in the flow of energy into and out of earth's systems result in changes in climate.
HS-ESS3-5 - Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to earth systems.

- Glacier National Park is Melting Away - HS-ESS3-5
- The Dark Snow Project - HS-ESS2-4
- Rise in sea level
- Ice ages
- Year Without a Summer
- Glaciers disappearing
- Keeling Curve
- Shutdown of the gulf stream - link
-

HS Earth Space Science - Human Sustainability

HS-ESS3-1 - Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
HS-ESS3-2 - Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
HS-ESS3-3 - Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
HS-ESS3-4 - Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
HS-ESS3-6 - Use a computational representation to illustrate the relationships among earth systems and how those relationships are being modified due to human activity.

- Ocean Acidification - HS-ESS3-6
- Google Maps Timelapse - HS-ESS3-4
- Towing an Iceberg to the UAE - HS-ESS3-2, HS-ESS3-3
- Glacier National Park is Melting Away - HS-ESS3-6
- The Mystery of the Missing Bees - HS-ESS3-3, HS-ESS3-4
- The Salmon Cannon - HS-ESS3-4
- Precious Plastic - HS-ESS3-4
- UAE Building a Mountain to Increase Rainfall - HS-ESS3-1
- Algae Fuel and Food - HS-ESS3-2, HS-ESS3-4
- Vegetable Oil as Fuel - HS-ESS3-1
- Earthships - HS-ESS3-1, HS-ESS3-2, HS-ESS3-4
- The Gravity Light - HS-ESS3-4
- Terraforming Mars - HS-ESS3-3, HS-ESS3-6
- Industrial composters
- SteelWinds
- Mt. Trashmore
- Cleveland river fire
- PowerVista
- Climate change and the Syrian civil war
- Human evolution out of Africa - climate change
- Bering land bridge theory
- Austronesian seafarers
- Refugee crisis
- State of Fear by Michael Crichton
- Hydraulic fracturing
- Sustainability city - eco-city
- Costa Rica sustainability
- Corporate social responsibility
- Collapse of Atlantic cod stock
- Green Revolution

- Norman Borlaug
- Sustainability and Biodiversity - article

HS Physical Science - Matter: Structure and Properties

HS-PS1-1 - Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
HS-PS1-3 - Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
HS-PS1-8 - Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
HS-PS2-6 - Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

- Gecko Feet - HS-PS1-3
- Floating Whiteboard Ink - HS-PS1-3
- Slime - HS-PS2-6
- Ice Cube Spikes - HS-PS1-3
- Burning Steel Wool - HS-PS1-1
- Reusable Heat Packs - HS-PS2-6
- Indestructible Coating - Polyurea - HS-PS2-6
- The Manhattan Project - HS-PS1-8
- Milk and Soap Experiment - HS-PS1-3
- Aerogels - World's Lightest Solids - HS-PS2-6
- Radium Girls - HS-PS1-8
- Marie Curie's hands - HS-PS1-8
- Chromatography
- Density column
- Polyglu flocculant - link
- Glow Ink and Glass Pen Painting - link
- Superhydrophobic coating - link
- Geiger counter
- Alkali metals
- C-14 dating
- Nuclear weapons
- Fireworks
- Walking on water
- Walking on walls (gecko)
- Melting point and rocket materials
- Conduction of water vs. ionized water
- Evaporation rates
- Solid hydrogen metal
- Sublimation
- Carbon, graphite and diamond
- Neon signs

- Argon and windows insulation
- Sodium reactivity
- $Na + Cl \rightarrow NaCl$
- Why does alcohol feel cold?
- Smoke Detector
- Bridges
- Concrete
- Tattoos
- Hair dye and straightening
- Detergents
- Milk and food coloring
- Tongue on flagpole
- Rock salt on frozen sidewalks
- Hindenburg
- Nuclear submarine
- Batteries on cells phones explode
- Halogen lights
- Conductivity
- Rising water (candle in water glass)
- Sun / Supernova
- Dry Erase markers with water
-

HS Physical Science - Chemical Reactions

HS-PS1-2 - Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PS1-4 - Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS-PS1-5 - Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS1-6 - Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
HS-PS1-7 - Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

- Elephant Toothpaste - HS-PS1-2, HS-PS1-4, HS-PS1-5
- Slime - HS-PS1-2, HS-PS1-6
- Burning Steel Wool - HS-PS1-2, HS-PS1-7
- Reusable Heat Packs - HS-PS1-4, HS-PS1-6, HS-PS1-7
- Indestructible Coating - Polyurea - HS-PS1-4, HS-PS1-5, HS-PS1-6
- Reaction in a Bag - HS-PS1-5, HS-PS1-7
- Metals in water
- Hydrogen (Hindenburg) explosion
- Cu(s) + AgNO3(aq)
- Dry ice
- Na and K in water
- Water to wine (indicator)
- Invisible Ink
- Metals in HCl
- Oscillating clocks
- Glow sticks in different temperatures of water
- Surface area and combustion
- Burning food (calorimetry)
- Colorless to Blue - Shaking the blues
- Heating magnesium metal
- Ba(OH)2 in water with wood
- N2O4 + NO2 temperature
- Heating and cooling Lauric acid
- MgO
- H2 balloon
- Baking soda and vinegar with gas capture
- Climate and weathering
- Iodine and vitamin C
- Flour putting out a fire and creating a fireball

- Pressure color and color change NO_2
- Contact explosives
- Gun powder
- TNT and DNT
- Nitroglycerin
- Soaked rags catching on fire
- Magnesium fire
- H explosion
- Rust adding weight
- Buffers
- Carbon snake
- Color changing straws
- Precipitation reaction
- Decomposition of $(NHS)_2Cr_2O_8$
- Iodine clocks
- Genie in the bottle
- Le Chatelier's experiment
- $2NO_2 <> N_2O_4$
- Graphite electrolysis
- PbI_2 (Cobalt chloride catalyst)
- Bromothymol blue
- Thermite
- Alkali reactivity
- Silver nitrate / copper
- Walking in the footsteps of Dalton
- Combustion
- Whoosh bottle
- Grain elevator explosion
- Fireworks
- Burning different salts color - flame tests
- Acetylene explosion
- MRE (meals ready to eat)
- Electrolysis
- Hoffman's Apparatus
- Distillation
- Oil refining
- Cooling balloons (one is helium)
- Lead iodide
- Electroplating
- Solubility trends in Group 1
- NaCl formation
- Dry Erase marker with Water

HS Physical Science - Forces and Interactions

HS-PS2-1 - Analyze data to support the claim that newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
HS-PS2-2 - Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
HS-PS2-3 - Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
HS-PS2-4 - Use mathematical representations of newton's law of gravitation and coulomb's law to describe and predict the gravitational and electrostatic forces between objects.
HS-PS2-5 - Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

- The Walking Table - HS-PS2-1
- Why Don't Woodpeckers Get Concussions? - HS-PS2-3
- Magnetic Canon - HS-PS2-1, HS-PS2-2, HS-PS2-4
- Giant Newton's Cradle - HS-PS2-2, HS-PS2-3
- Programmable Magnets - HS-PS2-5
- Slow Motion Golf Ball Collision - HS-PS2-3
- Amazing Slinky Tricks - HS-PS2-1
- A Bed of Nails - HS-PS2-1
- Amazing Rube Goldberg Machines - HS-PS2-2, HS-PS2-3
- Candle-Powered Car - HS-PS2-4, HS-PS2-5
- Felix Baumgartner Space Jump World Record - HS-PS2-4
- Cavendish Experiment - HS-PS2-4
- Weighing the World - MS-PS2-4
- The Gravity Light - HS-PS2-4
- Protecting the Earth from Killer Asteroids - HS-PS2-4
- Raw or Boiled Egg Experiment - HS-PS2-1, HS-PS2-2
- Programmable Droplets from MIT - HS-PS2-4, HS-PS2-5
- Flymo Hover Lawnmower - HS-PS2-1
- Newton's cradle
- Designing effective crash barriers - link
- Car crash
- Football helmets
- Magswitch Keychain - link
- Lenz's Law - link
- Mouth guard lights up
- Center of gravity
- Van de Graaff generator

- Table cloth demonstration
- Space probes
- Black holes
- Dark matter
- Terminal velocity
- Curling
- Planetary orbits
- Comets
- Meteor impacts
- Dancing pith balls
- Sticky tapes
- Motor / generator (EM induction)
- Amusement park rides with empty and full seats
- Newton’s cradle
- Lenz’s law
- Modified atwood machine
- Basketball and tennis ball drop
- Pendulum period vs mass, height, etc.
- Bathroom scale in an elevator
- Falling object with varying masses
- Car crashes with airbags
- Car videos - c.u.
- Olympic diving
- Air tracks
-

HS Physical Science - Energy

Tag: **hs-energy**

HS-PS3-1 - Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
HS-PS3-2 - Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).
HS-PS3-3 - Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
HS-PS3-4 - Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system second law of thermodynamics).
HS-PS3-5 - Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

- Drinking bird - HS-PS3-4, HS-PS3-3
- Magnetic Slime - HS-PS3-5
- Coupled pendulum - HS-PS3-1, HS-PS3-2
- Magnetic cannon - HS-PS3-1, HS-PS3-2, HS-PS3-3, HS-PS3-5
- Brinicles - HS-PS3-4, HS-PS3-2
- The Collapsing Train Car - HS-PS3-2
- Ice Cube Spikes - HS-PS3-2
- Programmable Magnets - HS-PS3-5
- Amazing Slinky Tricks - HS-PS3-3
- Amazing Rube Goldberg Machines - HS-PS3-1, HS-PS3-3
- Earthships - HS-PS3-3, HS-PS3-4
- Solar Cars - HS-PS3-3, HS-PS3-5
- Candle-Powered Car - HS-PS3-1, HS-PS3-3, HS-PS3-4, HS-PS3-5
- The Gravity Light - HS-PS3-1, HS-PS3-3, HS-PS3-5
- Supercooled Water - HS-PS3-2
- Fire Piston - HS-PS3-2
- Ice-cutting Experiment - HS-PS3-2, HS-PS3-4
- Aerogels - World's Lightest Solids - HS-PS3-2
- Revolving ice disc
- Absolute zero
- Rail gun
- Nuclear bomb
- Stretched spring
- Dead ball / bouncy ball (happy vs. sad ball)

- Newton’s cradle
- Skateboarding
- Heat packs
- Refrigeration
- Pole vaulting
- Food to motion
- Newton’s cradle
- Combustion engines
- Hydraulic dams
- Solar panels - solar device
- Geothermal energy
- Lava lamp
- Ring and ball
- Roller coasters
- Brownian motion
- Planets
- Dry ice
- Wind up toys
- Hand powered radio
- Tennis ball on basketball
- Room temp feelings
- Rocket launch
- Brass ball and ring
- Solar panels
- Geothermal energy
- Wind turbines
- Nuclear fusion
- Van de Graaff generator
- Firing a cannon on a ship
- Trebuchet
- Hydroelectric power
- Wireless charging
- Energy storage in train cars?
- Cycling
- Hurricanes
- Big Bang
- Stirling Engine
- Pelton Turbine
- Magnetic trains (Maglev)
- Capacitor
- Solenoid
- Magnetic door lock
- Radioactivity
- Battery

- Combustion engine
- Shot put
- Electric motor / generator
- Hand cranked generator
- “Magic” soda can
- Electric wire and a compass
- Perpetual motion machines
- Shake flashlight
- Radiometer
- Sticky tape electrostatics
- Rice Krispies floating
- Eddy currents
- Metal vs. plastic - which is colder?
-

HS Physical Science - Waves and Information

HS-PS4-1 - Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-2 - Evaluate questions about the advantages of using a digital transmission and storage of information.
HS-PS4-3 - Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
HS-PS4-4 - Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
HS-PS4-5 - Communicate technical information about about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

- How the Sun Sees You - HS-PS4-4
- Amazing Slinky Tricks - HS-PS4-1
- Daniel Kish Uses Echolocation to Navigate - HS-PS4-1
- Analog vs. Digital Television - HS-PS4-1, HS-PS4-2
- Photoelectric Effect - HS-PS4-3, HS-PS4-5
- Solar Cars - HS-PS4-5
- Levitating Moon Dust (video, Space Dust in a Vacuum - APS Physics, HS-PS4-3)
- The Visual Microphone: Passive Recovery of Sound from Video - HS-PS4-1
- Ruben's Tube - HS-PS4-1
- Self-Leveling Pool Table on Cruise Ship - HS-PS4-1
- Blinking Eyes Send a Morse Code Message - 4-PS4-2
- Trichroic Prism - HS-PS4-1
- Digital storage advantages
- Music fidelity - album vs. cassette vs. CD vs. MP3
- Interference (destructive vs. constructive)
- Acoustic beats in sound waves
- Tuning fork vibrates other tuning fork and ball HS-PS4-1
- The angler fish
- AM and FM waves
- 3G vs 4G vs 5G cellular
- Cellular or WiFi dead zones
- Quantum computers
- Polarizing lenses
- Doppler Effect
- Redshift and blueshift
- Long distance whale sounds
- Schrödinger's cat
- Electron microscope

- Many-worlds interpretation
- X-ray machine
- Environmental mutations of DNA
- Radiation treatment for cancer
- Gas discharge tubes
- Greenhouse gases
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