Dear Educator,

Excitement is at an all-time high at LSC this school year. We are celebrating a big anniversary: 25 years of bringing the power, promise, and pure fun of science and technology to our visitors. One way we will mark this milestone is by opening the Jennifer Chalsty Planetarium and LSC Giant Dome Theater, the biggest and most technologically advanced planetarium in the Western Hemisphere. Yes, the Hayden Planetarium in New York City would fit neatly inside our iconic dome. That’s no idle boast—in the planetarium world, size matters. Our 88.6-foot full-dome view of the night sky and distant galaxies will be more expansive, immersive, and accurate than any other planetarium’s on our side of the planet. Take a tour of the solar system, experience a year of seasons in a few minutes, step off Earth to view Moon phases from multiple angles, explore the life cycle of stars, observe cyclic patterns of solar and lunar eclipses, journey from the surface of Earth to the edge of the galaxy, travel forward and backward in time, and more. Many of the NJSLS:S Space Systems Performance Expectations cover concepts that are difficult or even impossible to teach in a traditional classroom—so you will just have to come experience our new planetarium for yourself!

We are also expanding our footprint and programming array with the addition of the SURE House on our lawn. This storm-resistant, energy-efficient little beach house, designed by Stevens Institute of Technology students, won the 2015 Solar Decathlon sponsored by the US Department of Energy. It uses 90% less energy than a traditional home, and becomes a hub for emergency power to other buildings in the aftermath of a storm. Groups that come to LSC to study renewable energy, tropical storm systems, erosion, and other related topics in our labs and classrooms can cap off their visit with a tour of the SURE House to see resilient construction and clean energy systems in action.

We have expanded daily educational programming in our labs and classrooms with new courses for students as well as teachers, all tightly aligned to the NJSLS:S. If you don’t find a program in this guide that meets your specific curriculum needs, please contact us. Our STEM education staff can adapt or develop a program to meet your needs. As LSC expands its vision, our core commitment to educating future scientists and technology leaders remains at the heart of our mission. We are here for you.

Onward and upward,

Paul Hoffman
CEO & President

Liberty Science Center acknowledges the generous support of Josh Weston and Jennifer Chalsty. LSC is also grateful to the following donors for their support.
LIBERTY SCIENCE CENTER STEM PROGRAM PHILOSOPHY

In *A Framework for K-12 Science Education*, the National Research Council of the National Academy of Sciences provides a sound, evidence-based foundation for science standards. This foundation highlights the use of informal learning techniques for their ability to engage students in the actual processes of scientific phenomena. The goal of building student knowledge in science is to develop general ideas that can explain and predict natural phenomena based on evidence, are observable and repeatable, and can be explained or predicted.

The *Framework* provided the basis on which the Next Generation Science Standards are based. The New Jersey State Learning Standards: Science are based on the Next Generation Science Standards. A foundation of these standards is the belief that Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts should be integrated into what is known as “3-Dimensional Learning.” It is currently believed that integrating these three dimensions is an effective method for students to gain a deeper understanding of science and engineering concepts and to apply them to daily life.

Liberty Science Center has been a leader in providing high quality, evidence based educational programming for the past twenty-five years. In a Liberty Science Center program, students do not watch science, they actively engage in science.

As students explore scientific phenomena in a Liberty Science Center education program, they are building proficiency towards the science and engineering practices. Planning and carrying out investigations, analyzing and interpreting data, and constructing explanations and designing solutions are woven throughout our programs.

Investigations are driven by students utilizing crosscutting concepts to develop models for the scientific phenomena being explored. As students gain proficiency with patterns; cause and effect; and scale, proportion and quantity, they begin to understand how these crosscutting concepts apply to phenomena across multiple scientific disciplines.

Each program focuses on one grade specific disciplinary core idea so that your students can focus on gaining proficiency with a single scientific concept.

Exploring a science phenomenon related to a disciplinary core idea, while engaging in engineering practices using crosscutting concepts in a hands-on inquiry investigation is the best way to instill in your students the power, promise, and pure fun of science and technology.

Sincerely,

Patrick McQuillan
Vice President, STEM Education
LSC’s programming has been revised to align with NJSLSS. Look for specific standards alignment below each program offering.
NEW

JENNIFER CHALSTY PLANETARIUM

The Jennifer Chalsty Planetarium is the biggest and most technologically advanced planetarium in the Western Hemisphere. The 27-meter (88.6-foot) dome, coupled with the all-dome video and astronomical object database, provides an immersive environment in which to explore the Earth and Space Systems Performance Expectations of the NJSLS:S. View astronomical objects and celestial phenomena from the surface of Earth, and then travel into space to truly understand these difficult concepts by flying up to, around, and through the objects. Time can also be sped up in the planetarium, allowing you to make an entire year of space systems observations during one program—seasons, Moon phases, seasonal constellations, and more. Tour the universe without ever leaving your seat!
NEW The Sky Tonight (K - 12)
Using the unique immersive environment of the planetarium, students will explore earth and space science concepts using the current night sky above New Jersey. Topics covered are correlated with objects visible in the night sky on your visit date. Topics can include: Day and Night, Phases of the Moon, Reasons for the Seasons, Seasonal Constellations, Planets, Eclipses, Meteor Showers and more.

NJSLS:S: All topics discussed during the program will be correlated to the corresponding Earth and Space Systems Performance Expectations for the grade level of the students attending the program.

NEW Wonderful Sky (Grade 1)
Explore observations of the Sun, Moon, and stars to discover patterns that can be predicted. These patterns include sunrise and sunset locations, moon phases, and how constellation visibility varies with Earth’s position from season to season.

NJSLS:S: Space Systems: Patterns and Cycles 1-ESS1-1

NEW Are We There Yet? (Grade 5)
Explore observations of the Sun, planets, and stars to discover that objects in the universe are located at large distances from Earth and exhibit predictable cyclic patterns. Large objects can appear very small when they are located far from Earth. The length of day and night repeats on a yearly cycle. Constellation visibility varies with Earth’s position from season to season.


NEW Phases and Eclipses and Seasons, Oh My! (Middle School)
Develop a conceptual model of the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and the reason for the seasons. These astronomical phenomena will be explored from both the surface of Earth and outer space as we virtually leave the planet to give students a unique perspective that is only possible in the immersive environment of the planetarium.

NJSLS:S: Space Systems: MS-ESS1-1

NEW Life Cycles of the Stars (High School)
Develop a conceptual model of the formation of the universe and the life cycle of a star. Construction of this model will use evidence from stellar light spectra, the motion of distant galaxies, the composition of matter in the universe, nuclear fusion, and the production of elements in stars. The immersive environment of the planetarium allows students to travel back in time to the formation of the universe to explore these space science phenomena.

NJSLS:S: Space Systems: HS-ESS1-1, HS-ESS1-2, HS-ESS1-3
Live From Surgery is LSC’s flagship educational program, inspiring participants to explore exciting careers in medicine and biotechnology. Each session brings your group into a real operating room during a surgical procedure through videoconference interactions with surgeons and the whole medical team. In our state-of-the-art HD theater, LSC educators pass around the tools and anatomical models involved in the procedure for a hands-on connection to the surgery. Addressing questions and observations to the medical team is encouraged. It is one of our most powerful learning experiences!

The award-winning Live From Surgery program features three Meet the Surgeon sessions: Heart Transplant*, Pediatric Orthopedic*, and Neonatal Surgery*. These sessions create an intimate environment where surgeons can focus their attention on the students, narrate the surgical procedures, and discuss patient outcomes face-to-face. Groups may also arrange to pair the Live From Surgery session with a hands-on demonstration of LSC’s da Vinci Robotic Surgery system.

Exploration of our exhibitions after your session is included with the program.

**CHOOSE FROM:**
- Cardiac/Valve Surgery | 2.5 hours
  (not available via videoconferencing)
- Heart Transplant/VAD | 2.5 hours *
- Kidney Transplant | 2.5 hours
- Pediatric Orthopedic Surgery | 2.5 hours*
- Neonatal Surgery | 2.5 hours*
- Neurosurgery | 3 hours
- Robotic Surgery | 2.5 hours

*Note to elementary teachers: Interested in a surgical program? Try our Pediatric Orthopedic Surgery, appropriate for grades 3 - 12.

NJSSL5:  3-LS3-2, 3-S-ETS1-2, MS-LS1-3, HS-LS1-2
NYCCLS: 1, 2, 3a, 3b, 5, 6 & 7
National Science Education Standards: M.C.1, M.C.1.f & M.F.1.a.
National Health Education Standards: 1.12.4 & 7.12.1
MEET MARGARITA CAMACHO, MD

The first woman to receive the American Heart Association’s Distinguished Service Award is LSC’s partner in the Live From Surgery Heart Transplant program.

Dr. Camacho is the surgical director at Newark Beth Israel Medical Center, home to the largest heart transplant program on the East Coast. She has performed more than 550 heart transplants—that’s more than any other surgeon in New Jersey, and more than 98 percent of heart transplant surgeons in the nation. In addition to heart transplants, Dr. Camacho implants Ventricular Assist Devices (VADs), the tiny, life-saving pumps that mechanically regulate patients’ heartbeat. She also performs heart valve replacements and repairs.

She received the 2014 Healthcare Professional of the Year Award from the New Jersey Hospital Association and is President of the New Jersey Chapter of the American Medical Women’s Association. Needless to say, Live From Surgery participants are in the hands of a true heart transplant virtuoso!

OUR PARTNER HOSPITALS

Some of the best medical centers in the region help us bring the Live From Surgery experience to LSC.

- Morristown Medical Center: Cardiac Classroom
- Overlook Hospital: Neurosurgery
- RWJBarnabas Health: Kidney Transplant
- Hackensack Meridian UMC: Robotic Surgery
- Newark Beth Israel Medical Center: Heart Transplant/VAD
- Advocare the Orthopedic Center in Affiliation with Morristown Medical Center, Overlook Hospital: Pediatric Orthopedic
- The Bristol-Myers Squibb Children’s Hospital at Robert Wood Johnson University Hospital: Neonatal

Can’t bring your group to LSC? Most programs can be transmitted into your classroom using distance learning technology. See page 33 for technology requirements.

Must be booked in advance. Call 201.253.1310.
In LSC’s two newest education spaces, exciting programs help you meet curriculum goals and reinforce new concepts with invaluable, hands-on experiences. Come for a few hours, a full day, or a themed series of workshops over the course of several weeks.

**THE INNOVATION LAB**
offers computer and technology programs for middle and high school students over the 2017-2018 school calendar. These programs are aligned to the NJSLS (Science), ISTE standards, and/or Math Common Core Standards.

**THE MAKERLAB**
offers various maker programs for middle and high school students over the 2017-2018 school calendar. There is a 1:1 student to 3D printer ratio, so every student works with a designated printer in our programs. Programs are aligned to the NJSLS (Science), ISTE standards, and/or Math Common Core Standards.

**GRADES**
6–12

**LENGTH**
90 Minutes

Must be booked in advance.

Call 201.253.1310.

**MAKERLAB AND INNOVATION LAB PROGRAMS**
In LSC’s two newest education labs, guests program and build unique games, apps, projects, and gadgets using the latest tech tools. You can meet curriculum goals and reinforce new concepts through compelling, hands-on courses and projects. Come for a few hours, a full day, or a themed series of workshops over the course of several weeks.

THE INNOVATION LAB offers computer and technology programs for middle and high school students over the 2017-2018 school calendar. These programs are aligned to the NJSLSS:S, ISTE standards, and/or Math Common Core Standards.

THE MAKERLAB offers various maker programs for middle and high school students over the 2017-2018 school calendar. There is a 1:1 student to 3D printer ratio, so every student works with a designated printer in our programs. Programs are aligned to the NJSLSS:S, ISTE standards, and/or Math Common Core Standards.
HALF-DAY LABORATORY WORKSHOPS

NEW Intro to Stencyl (Grades 6 - 12)
Take your coding to the next level and learn how to make a web-based platforming video game using drag-and-drop programming in Stencyl. Leave with a URL that allows access to your game from home.
*Students must have familiarity with block coding, such as Scratch.
NJSLS:S: Engineering Design: MS-ETS1-1, MS-ETS1-2, HS-ETS1-1, HS-ETS1-2, HS-ETS1-4

Scratch (Grades 6 - 8)
Learn basic computer programming techniques with Scratch, a drag-and-drop coding program developed by MIT. Creatively use algorithmic thinking, systematic reasoning, and troubleshooting to develop your interactive program. Additional workshop time allows for greater complexity in designs. Completed projects can be downloaded and modified at home.
NJSLS:S: Engineering Design: MS-ETS1-1, MS-ETS1-4
ISTE: 1.b

App Development (Grades 6 - 12)
Learn basic computer programming techniques while building a simple Android-based mobile phone or tablet game using MIT App Inventor. Download the app to a personal Android phone to keep, or download to a flash drive or cloud storage to access at home.
NJSLS:S: Engineering Design: MS-ETS1-1, MS-ETS1-4, HS-ETS1-2
ISTE: 1.a, 1.b, 4.b

Intro to GIS (Grades 6 - 12)
Use ESRI GIS (Geographic Information Systems) mapping software to investigate how data-driven information can make a difference in your life. Learn how to analyze different sets of data and how human activity changes or is changed by it. Variable topics can include: earthquakes, pollen, and bacterial outbreaks (one topic per booking).
NJSLS:S: Earth and Human Activity: MS-ESS3-1, MS-ESS3-2, MS-ESS3-4, HS-ESS3-6, HS-ESS3-1

Intro to 3D Printing (Grades 6 - 12)
Engage in online digital creation of 3D models and learn how to create intricate pieces designed for 3D printing using Autodesk TinkerCad. Using our Monoprice Mini Select printers, print a personal design that’s yours to keep.
NJSLS:S: Engineering Design: MS-ETS1-1, MS-ETS1-2, HS-ETS1-2
ISTE: 1.b, 4.b

GRADES 6 - 12
Must be booked in advance. Call 201.253.1310
FULL-DAY LABORATORY WORKSHOPS

**NEW Hands-on Game Design (Grades 6 - 12)**
In this exciting class, take video game design into your own hands. Using Bloxels, a new hands-on platform for video game creation, create your own video game levels, characters, and challenges! Learn how to place blocks on a physical grid to lay out game levels and then use the Bloxels app to change those physical blocks into a virtual game world with your very own hero! Take home a URL to play the game on your own computer, or install the Bloxels app on a phone and play on mobile!

NJSLS: Engineering Design: MS-ETS1-1, MS-ETS1-3, MS-ETS1-4

**NEW Game Art & Design* (Grades 6 - 12)**
Ever want to make your own platformer game—like the ones starring a certain Italian plumber? Using Stencyl (drag-and-drop programming) create and animate your own customized player character and run your character through your own personal level design. Take home an Android mobile application version of the game.

*Students must have familiarity with block coding such as Scratch

NJSLS:S: MS-ETS1-1, MS-ETS1-2, MS-ETS3-1

**NEW Flight of the Drones (Grades 6 - 12)**
It’s drone training 101. Learn how to fly a drone and the basic concepts of flight using micro pocket drones. Then compete with your classmates to find out who is the best drone pilot.

NJSLS:S: Motion and Stability: HS-PS2-1, HS-PS2-2
Engineering Design: MS-ETS1-1

**NEW Becoming an Aviator (Grades 6 - 12)**
Learn the principles of flight, then jump behind the controls of XPlane, a computer based simulator with cockpit flight controls. Test your skills on several different aircraft ranging from the Sikorsky S-76 and Cessna 172 to the Space Shuttle and the B-52 Bomber.

NJSLS:S: Motion and Stability: MS-PS2-2, HS-ETS1-2
Engineering Design: MS-ETS1-2

**GIS Zombie Apocalypse (Grades 9 - 12)**
Use ESRI digital mapping software for Geographic Information Systems (GIS) to uncover relationships between sets of data points and locations. GIS is widely used in public health, transportation, science, and other fields. Learn to map and analyze spatial data—data with a location component. Identify local problems (perhaps a zombie uprising?) then use GPS coordinates from mobile devices to collect, map, and analyze related data. Discuss solutions to the problems based on data.

NJSLS:S: Engineering Design: HS-ETS1-1, HS-ETS1-3
ISTE: 3.d, 4.c, 4.d

**Program, Aim, Fire! (Grades 6 - 12)**
Construct medieval catapults and identify possible operational constraints. Then, through the use of the engineering design process and modern marvels such as Arduino microcontrollers, improve the catapult’s accuracy and distance.

NJSLS:S: Motion and Stability: Forces and Interactions:MS-PS2-1, MS-PS2-2,
Engineering Design: MS-ETS1-1, MS-ETS1-2, MS-ETS1-3

3D Printing: Engineering Design Challenge (Grades 6 - 12)
Learn to use 3D printers to solve complex problems in a collaborative work group. Your group will be engaged in advanced 3D design with Autodesk TinkerCad. Choose from: Bridge Engineering (2 hours), Fish Evolution (2 hours), Boat Design (4 hours), Egg-Drop Run (4 hours), Printed Pinewood Derby Car Race (4 hours), Siege Engines (4 hours)—one topic per booking.

NJSLS:S: Engineering Design: MS-ETS1-1, HS-ETS1-2, HS-ETS1-3

SERIES WORKSHOPS (FROM 7 - 14 WEEKS)

**Scratch**
Learn basic computer programming techniques using Scratch, a graphic user interface for drag-and-drop coding developed by MIT. Using these skills and techniques, develop a series of simple programs over a sequence of two-hour workshops offered for 7 to 14 weeks. Topics may include: loops, conditional statements, variables, and control elements. This will allow students to develop ever more complicated programs.

**Innovate, Inspire, and Engineer**
What does it take to become a successful inventor? Find out in this series of two-hour workshops offered for 7 or 14 weeks. Learn the engineering design process and collaborate on solving challenges. Hands-on activities include circuitry, soldering, and programming Arduino microcontrollers. Projects will be tailored to student interests.

Curriculum alignment details will vary with grade level, project, and duration of the series workshop.
LABORATORY WORKSHOPS

Our lab workshops really set LSC apart from other field trip destinations. Where else can your whole class explore science topics in a fully equipped, working lab with the latest technology tools? Our hands-on sessions often spark a lifelong interest in STEM fields.

GRADES 3–8
LENGTH 45 Minutes
RECOMMENDED TIMES 9:30 am, 11:00 am, 12:00 pm, or 1:00 pm
MAXIMUM 30 students per workshop

Must be booked in advance. Call 201.253.1310.
**GRADES 3-5**

**NEW A Look Inside**
What structures do our bodies have to help us survive? Find out how our bones connect by examining your own joints, add muscles to a skeleton to see how different systems work together, and use our anatomical mirror to get an X-ray look at the human body.

NJSLS:S: From Molecules to Organisms: Structures and Processes 4-LS1-1

**NEW Filter the Future**
How does tap water become so clean and clear? Conduct a variety of tests to determine if a water sample is safe for human consumption. Then generate a solution to make the water sample as clean and clear as the water from your home faucets.

NJSLS:S: Earth and Human Activity: 4-ESS3-2

**NEW It’s a Slimy Time**
Investigate chemical and physical changes as you create a variety of non-Newtonian fluids. Have a slimy time learning how mixing substances can create something new then test the fluids’ ability to support a structure.

NJSLS:S: Matter and Its Interactions: 5-PS1-4 and Engineering Design 3-5-ETS1-3

**Bee-Bot Robot Challenge**
Bee-Bots are programmable robots that follow a few basic rules, called algorithms. Discover how algorithms can be used in conjunction with mathematics skills to develop a solution to a given problem.

NJSLS:S: Engineering Design: 3-5-ETS1-1

**Magnetic Madness**
Using sets of permanent magnets of varying shapes and unknown intensities, explore the formation of magnetic fields between them. Model magnetic fields by varying the distances and orientations of the permanent magnets.

NJSLS:S: Motion and Stability: Forces and Interactions 3-PS2-3

**Adaptation Examination**
Examine the physical and behavioral adaptations of live animals in an up-close encounter to evaluate how their anatomical structures help ensure their survival.

NJSLS:S: Biological Evolution: 3-LS4-3

**Conductors and Insulators**
Explore the origin of electricity and investigate the conductive capability of various materials.

NJSLS:S: Motion and Stability: Forces and Interactions 3-PS2-3

**GRADES 6-8**

**NEW The Plankton Puzzle**
There’s a problem in the ecosystem! Explore water samples to identify plankton, discover the resources necessary for them to grow and thrive, and solve the mysterious puzzle of sudden plankton growth while you identify how disruptions to an ecosystem can lead to shifts in population.

NJSLS:S: Ecosystems: Interactions, Energy, and Dynamics: MS-LS2-1

**NEW Walking into the Present**
What did early humans look like? How closely are humans related to gorillas? How do we determine how old a fossil is? Discover the answers to these questions and more as students measure, compare, and organize hominid skulls into a family tree.

NJSLS:S: Biological Evolution: Unity and Diversity: MS-LS4-2

**Conserving the Masses**
Does the mass of elements really stay the same throughout chemical reactions? Explore chemical reactions and construct support for conservation of mass based on your observations.

NJSLS:S: Matter and Its Interactions: MS-PS1-5

**Green Energy**
How can we power the future? Explore new ways of generating electricity using different renewable methods, and learn where we can best apply them. Solar, wind, and more renewable sources come to the rescue!

NJSLS:S: Energy: MS-PS-3-2, MS-PS-3-5; Engineering Design: MS-ETS1-2

**Magnetic Motions**
Electromagnetism is one of the essential forces in our universe. Explore an electromagnetic motor to observe how various factors affect the magnitude of electrical and magnetic forces.

NJSLS:S: Motion and Stability: Forces and Interactions: MS-PS2-3

**Living or Not?**
Using state-of-the-art microscopes, discover the characteristics of living things, investigate different types of single-celled and multicellular organisms, and make arguments—supported by evidence—to determine whether something is living or nonliving.

NJSLS:S: From Molecules to Organisms: Structures and Processes: MS-LS1-1

**It’s All about Reactions**
Conduct an inquiry-based set of experiments using chemical reactions to analyze and interpret data on the properties of unknown substances.

NJSLS:S: Matter and Its Interactions: MS-PS1-2

**Scaling the Solar System**
Create a model of our solar system to gain an understanding of its spatial scale. Work with fractions and ratios to generate an accurate physical model of the solar system.

NJSLS:S: Earth’s Place in the Universe: MS-ESS1-3
Explore a subject in greater depth during a Half-Day Laboratory Workshop. Programs support curriculum standards and multiple learning styles, and can be configured to fit your needs. General admission is included, and your group is welcome to explore the Science Center before or after your session.

**GRADES 3–12**
**LENGTH** 90 Minutes

Must be booked in advance. Call 201.253.1310.

**HALF-DAY LABORATORY WORKSHOPS**

**GRADES 3-5**

**NEW Swinging into the Past**
Jurassic times call for Jurassic measures! Put your paleo party shoes on for a trek into the past with a variety of hands-on fossil activities, including making your own fossil. Compare live animals to their past relatives to determine environments from long ago.

NJSLS:S: Biological Evolution: Unity and Diversity: 3-LS4-1, 3-LS4-3

**NEW Brainstorming around the World**
Using a Geographic Information System, embark on a global meteorological journey! Climatological data collection is a breeze for student meteorologists using global data display units. Collect weather data and create graphical representations of climates around the world.

NJSLS:S: Earth Systems: 3-ESS2-1, 3-ESS2-2

**NEW Ocular Observations**
Follow light on its journey through the eye. In this very hands-on workshop, perform cow eye dissections and gain a deeper understanding of how light gets from an object to the human eye, and explore how the shape of the lens bends light.

NJSLS:S: Energy: 4-PS4-2

**NEW Bright Ideas**
Light up the room as you learn about the power of electricity! Create a model to explore how the movement of electrons generates electricity.

NJSLS:S: Energy: 4-PS3-4; Engineering Design: 3-5-ETS1-2
**Diversity of Life**
Explore the energy pyramid and learn about the relationships among producers, consumers, and decomposers. Interact with live plants and animals to see how their external structures help them grow and survive. Then explore the role fungi play in breaking down organisms and returning them to the soil.

NJSLS:S: From Molecules to Organisms: Structure and Processes: 4-LS1-1, 5-LS1-1
Ecosystems: Interactions, Energy, and Dynamics: 5-LS2-1

**Food, Glorious Food**
What does a food web represent? Discover the connection between producers and consumers of an ecosystem and how matter cycles through them. Assemble a 3D food web using local aquatic animals.

NJSLS:S: Ecosystems: Interactions, Energy, and Dynamics: 5-LS2-1

**Matter Matters**
Explore the basis of chemical changes by engaging in hands-on experiments to identify unknown substances by their properties. Investigate such concepts as hardness, chemical change, solubility, and others.

NJSLS:S: Matter and Its Interactions: 5-PS1-3

**Oh No, Oil Spill!**
Identify how oil spills can adversely affect our environment and ways that human beings can build solutions to this problem.

NJSLS:S: Engineering Design: 3-5-ETS1-2
Earth and Human Activity: 5-ESS3-1

**GRADES 6-8**

**NEW There’s Trouble on the Waterfront**
A small town just opened Kanye Western Automotive factory by an old water reservoir. Test a water sample to determine if the water is safe for use, and budget limited resources to decide which treatments must be purchased to purify the water.


**NEW Under Pressure**
Atmospheric pressure governs almost all weather. Discover how different converging and diverging air masses bring along different forms of precipitation, temperatures, and more. Analyze various atmospheric data sets, understand how to map isobars, and comprehend how weather is always under pressure.

NJSLS:S: Earth’s Systems: MS-ESS2-5

**NEW It’s an Acidic World**
Is it an acid or a base? Analyze, experiment, and interpret data on the properties of substances before and after they interact to determine whether an acidic or basic reaction has occurred.

NJSLS:S: Structure and Properties of Matter: MS-PS1-1
Chemical Reactions: MS-PS1-2

**Understanding Gravity**
Gravity is one of the fundamental forces in the universe. Explore the combination of interactions that generate gravitational forces. Using an online simulation, explore and experiment with variables that govern the behavior of a body’s gravitational field.

NJSLS:S: Earth’s Place in the Universe: MS-ESS1-2

**GRADES 9-12**

**NEW The Science of Sight**
How do we see? Understand how your eyes and brain interact to collect and interpret images as you dissect a cow eye, and learn what goes wrong along this pathway as you trick your brain with optical illusions.


**NEW No Place Like Home**
Learn about homeostasis and feedback mechanisms as you use Vernier sensors to observe and analyze your own heart rate, lung capacity, blood pressure, and more. Note: The results of these experiments can be taken back to school for analysis. Bring a USB drive for transport.


**NEW Level Up**
Gather evidence through analysis of model hominid and primate skulls, as well as simulated DNA. These investigations promote understanding that common ancestry is supported by multiple lines of evidence.

NJSLS:S: Biological Evolution: Unity and Diversity: HS-LS4-1

**Unlocking Your DNA**
Discover the world of genetics as you explore the human genome. Use hands-on lab techniques and lab equipment, such as micro-pipettes, centrifuges, and gel electrophoresis chambers as you solve a genetic mystery. Note: The results of these experiments can be taken back to school for analysis. Bring a USB drive for transport.

NJSLS:S: Heredity: Inheritance and Variation of Traits: HS-LS3-1
Biological Evolution: Unity and Diversity: HS-LS4-3

**Chemical Investigations**
Why is the periodic table that strange shape? Melt, dissolve, and electrify chemicals as you learn how to predict an element’s properties by noting its place on the periodic table.

NJSLS:S: Matter and Its Interactions: HS-PS1-1
FULL-DAY LABORATORY WORKSHOPS

Some topics are just too complex to explore meaningfully in under two hours. Full-Day Laboratory Workshops offer a deep dive into vital curriculum areas, and include General Admission to the Science Center for exploration before or after your workshop.

GRADES 3–12
LENGTH 2 - 4 hours per day

Must be booked in advance. Call 201.253.1310.
GRADES 3-5

NEW It’s All Connected
Explore how our one planet is actually composed of several major spheres. In this program we will be learning about the biosphere, lithosphere, atmosphere, and hydrosphere. See how these spheres impact each other to shape our world.
NJSLS:S: Earth’s Systems: 5-ESS2-1

Weathering Away
Discover how tiny particles of minerals and rocks, called sediments, form. Investigate how rocks and minerals break down through chemical and physical changes, and are redistributed around the planet.
NJSLS:S: Earth’s Systems: 4-ESS2-1

GRADES 6-8

NEW Earth Below Us
Discover and analyze the ground below our feet. Classify and justify the classification of minerals and rocks found on Earth. Learn to distinguish the natural processes of mechanical and physical forces that shape our planet.
NJSLS:S: Earth’s System: MS-ESS2-1, MS-ESS2-2, and MS-ESS2-3
NOTE: This program can be customized for your preference. Please call for more information.

Elemental Attraction
Experiment with non-contact forces and their resulting fields. Learn how elementary particles govern the behavior of matter and how electrons determine the behavior of electricity and magnetism.
NJSLS:S: Motion and Stability: Forces and Interactions: MS-PS2-5

Fiery Hazards
Classify and model the different types of volcanoes. Through study of a series of eruptions, discover how the lava flow changes Earth’s surface.
NJSLS:S: Earth’s Systems: MS-ESS2-2

The World of Chemistry
Explore the basis of chemical change. Analyze and interpret data using Vernier sensors and explore such concepts as reactions, acids and bases, electrolysis, mixtures and compounds, and many more.
NJSLS:S: Structure and Properties of Matter: MS-PS1-1
Chemical Reactions: MS-PS1-2

Forensics Science
Master forensics skills including how to properly collect evidence, take latent prints, conduct blood analysis, identify poisons and toxins, and more. To conclude, investigate a mock crime scene and solve the case!
NJSLS:S: MS-ETS1-1

Urban Ecology
What is the role of an ecologist? Learn about urban ecology through interaction with local wildlife, investigation of human impacts on ecosystems, and working to solve an ecological mystery.
NJSLS:S: Ecosystems: Interactions, Energy, and Dynamics: MS-LS2-2

GRADES 9-12

NEW Technology on Demand
Are you missing equipment essential to teaching a unit or program? Contact us for more information about our library of available equipment. Items include, but are not limited to: PCR machines, gel electrophoresis chambers, titration burets, Pasco probes, Vernier sensors, 3D printers, and more!

NEW A Catalytic Breakdown
What do proteins do? Uncover the world of proteins as you experiment with the role of an enzyme. Design your own investigation to discover the optimal conditions of a peroxidase and monitor your experiment using a spectrometer.
NOTE: The results of these experiments can be taken back to school for analysis. Please bring a USB for transport.

NEW Applied Forensics
Apply classroom techniques to real-life forensics scenarios. Explore how to properly collect evidence and analyze data in applications that can include anthropology, environmental science, biology, and chemistry.
Inheritance and Variation of Traits: HS-LS3-1
Matter and its Interactions: HS-PS1-2
Engineering Design: HS-ETS1-1, HS-ETS1-2

Program, Aim, Fire!
Construct medieval trebuchets to identify possible operational constraints. Then, through the use of the engineering design process and modern marvels such as Arduino microcontrollers, improve the trebuchets’ accuracy and distance.
NJSLS:S: Engineering Design MS-PS2-1, MS-PS2-2, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, HS-ETS1-2
ISTE:1.b

Thermal Motions
Investigate an exchange of thermal energies within a closed system. Analyze collected data to determine the amount of energy released within the closed system.
NJSLS:S: Energy: HS-PS3-4

Right Back at You
Through the construction of a reflectometer, explore the infrared radiation part of the electromagnetic spectrum by measuring the amount of energy an object radiates. Then use this information to model and interpret an infrared spectrum map.
NJSLS:S: Earth’s Systems: HS-ESS2-2
YOUNG SCIENTIST LAB WORKSHOPS

Put discovery in the hands of young scientists with activities that introduce and promote scientific thinking and reasoning.

GRADES Pre-K to 2
LENGTH 45 Minutes
TIMES 9:30 am and 11:00 am

Must be booked in advance.
These Young Scientist Lab Workshops can travel to your school. To book on site or off site, please call our reservation line at 201.253.1310.

YOUNG LEARNERS

NEW Cracking the Code
Discover the job of a computer programmer and the basics behind coding. Ask questions, make observations, and gather information to tell a story using the app Scratch Jr. in this hands-on introduction to coding.
NJSLS:S: Engineering Design K-2-ETS1-3

NEW Shooting Hoops with Uncle Isaac
Want to shoot baskets like a pro? Engineer a catapult designed to push and pull your way toward this goal. Then analyze, compare, and test a friend’s design. There is always more than one possible solution to a problem!

Mr. Golden Sun
Explore the job of a meteorologist. Learn what happens to water as Mr. Golden Sun warms up Earth’s surface.
NJSLS:S: Energy: K-PS3-1

Natural World around Me
Discover what animals need to grow and survive in this up-close animal encounter. Observe a variety of live animals, use your observations to describe patterns, and identify evidence that led to these discoveries. This workshop can be individualized to focus on, but is not limited to, the following topics: reptiles and amphibians, insects and arachnids, aquatic animals, pollinators, small mammals, and invertebrates vs. vertebrates.
NJSLS:S: From Molecules to Organisms: Structures and Processes: K-LS1-1

Light It Up!
Plan and conduct investigations using flashlights and light boxes to focus on what it means for objects to be transparent, opaque, translucent, or reflective.
NJSLS:S: Waves and Their Applications in Technologies for Information Transfer: 1-PS4-3

Ready, Set, Robotics!
Aspiring computer scientists, get ready for a hands-on introduction to the world of robotics. Solve a series of challenges using mobile, responsive robots called Cubelets.
NJSLS:S: Matter and Its Interactions 2-PS1-3

What’s the Matter?
Explore the colorful world of chemistry with investigations that show how to describe and classify materials by their observable properties.
NJSLS:S: Matter and Its Interactions: 2-PS1-1, 2-PS1-4

Ch-Ch-Ch-Changes!
Our planet is constantly being shaped by events that can happen very slowly over time, or quite suddenly. Using a model to represent land and bodies of water, students will simulate how glaciers and avalanches can change the shape of the land around us.
NJSLS:S: Earth’s Place in the Universe: 2-ESS1-1
A fun, informative day out at Liberty Science Center can spark a lifelong interest in science and technology, and might even set a young visitor on the path to a STEM career. Our expert STEM educators present scientific concepts in level-appropriate, hands-on explorations—and they make it totally fun.

School group admission includes access to general admission exhibition galleries and free, daily Live Science presentations. Meet our animals, explore new exhibits, and revisit your LSC favorites. You can also add laboratory workshops, films, or a Live From Surgery program to enhance your visit. Who knows? You may have a future surgeon, research scientist, or tech mogul in your midst!

FIELD TRIPS

SIGN UP FOR OUR FREE EDUCATOR NEWSLETTER
Receive an e-newsletter of program updates, professional development news, and special event previews. Email sales@lsc.org to join.
NEW Jennifer Chalsty Planetarium
Experience the biggest and most technologically advanced planetarium in the Western Hemisphere! Learn more about these all-new programs on page 7.

NEW LSC Giant Dome Theater
Students can explore distant lands, travel deep into the cosmos, or investigate the animal kingdom in the immersive LSC Giant Dome Theater.

JOSEPH D. WILLIAMS
3D SCIENCE THEATER
Catch spectacular science adventures in our 300-seat theater.

Center Stage Science Shows
Our live group shows bring science concepts to life and include audience participation. Each show aligns with core concepts from required science curricula.

• Flame, Foam, and Foom! Meet the Elements
  Elements dance in flames, ignite, and react dramatically in this energetic and explosive chemical play.

• The Weather Show
  Thunder roars, clouds form, and tornadoes appear in this fast-paced interactive program.

• NEW That Physics Show: A Sampler
  Pencils fly through wood, bowling balls float, and you can see the invisible in this exploration of different principles of physics, based on the award-winning, Off-Broadway That Physics Show.

• Nikola Tesla Lightning Show
  Twin solid-state, one-million-volt Tesla coils produce bursts of musical lightning right in front of you in our most spectacular live show.

LIVE SCIENCE
These interactive 20-25 minute presentations take place throughout the building, led by a STEM Educator with plenty of audience volunteers. Offerings vary each day, but can include:

• Subzero: The States of Matter
• Blast Off!
• Be a Surgeon
• Cow Eye Dissection
• Heart and Soul
• Your Puzzling Brain
• It’s Electrifying!
• Down to the Wire: How Electricity is Made
• The Power of Air
• Nanotechnology

GENERAL INFORMATION

Contact Us
201.253.1310 or sales@LSC.org
Weekdays 9:00 am – 5:00 pm
Weekends 9:00 am – 2:00 pm

Group Admission
Special rates are available for groups of 15 or more with advance reservations.

Transportation and Directions
Easily accessible by bus, car, light rail, and ferry. See LSC.org/visit.

Parking
Convenient, on-site parking is available. Cars are $7, buses $10.

Health and Safety
We care about your safety and comfort. We have an allergy-aware dining room (reserve in advance), and offer free admission for school nurses. We have an experienced safety and security staff, a building-wide Code Adam protocol for lost children, and a basic first-aid room. LSC is ADA compliant, and located just one mile from a top-ranked hospital.

Lunch Plans
To reserve brown-bag space or order box lunches, call 201.253.1310. You may also purchase lunches individually at Café Skylines, no reservations required.

Accessibility
Liberty Science Center is accessible to all guests. You may request wheelchairs at the Welcome Desk. Assistive listening devices for hearing-impaired guests are available for the theaters and several other public areas.

Special Needs Days
Liberty Science Center tailors days for students with special needs on December 5, 2017, and April 10, 2018. Call 201.253.1310 for details and reservations.
THE EXHIBITION GALLERIES

Your students will have a blast on our four exhibition floors, with hands-on experiences for all ages and stages of learning. Our galleries bring a wide range of STEM topics to life, from the environment and Earth science to health and green energy choices. Access to our general admission exhibitions is included in your ticket. Education staff and volunteers are happy to answer questions, assist with interactive features, and tell you more about what you’re seeing.
**NEW Bees to Bots**
Watch a live colony of honey bees as they go about their daily work, then check out an all-new exhibition about the surprisingly high-tech world of bee science. See real radar gear that scientists stick onto bees, watch video clips of bug-inspired drones and robots, and more.

**Skyscraper! Achievement and Impact**
Enter a cityscape of towers and discover what it takes to design and build the world’s tallest skyscrapers. Walk on an 18-foot-high I-beam just like a construction worker, see what it’s like to test a building in a wind tunnel, operate an electromagnetic crane, learn about careers in construction and architecture, and see artifacts from the World Trade Center.

**Eat and Be Eaten**
Learn how creatures evolved to catch prey and avoid being captured in our live animal exhibit. Study beautiful examples of camouflage. See mammals, insects, reptiles, amphibians, birds, and fish in natural settings, and marvel at nature’s complexity. Don’t miss the incredibly adorable family of critically endangered cotton-top tamarins, the colony of industrious leaf-cutter ants, or the new community of naked mole rats!

**The Touch Tunnel**
Take an 80-foot crawl through a pitch-black tunnel using only your sense of touch. It’s one of our most popular experiences, so visit early or late in the day to avoid a wait.

**Our Hudson Home**
Get acquainted with the creatures that live in the Hudson River at our Touch Tank and in our enormous aquariums, including 80-pound drum fish, terrapins, sea stars, and sea urchins. Then unload a virtual cargo ship, dredge a river channel, and try a real hands-on lab experiment.

**Wonder Why**
Experiment with air in motion, make a six-foot-wide soap bubble, scramble up our fossil-studded rock climbing wall, and more.

**Infinity Climber**
Explore this two-story climbing structure suspended 35 feet above the Center’s atrium. Can you make it to the top?

**Nano Mini-Exhibition**
Learn about nanoscience—the science of the super small—in this collection of hands-on exhibits.

**Infection Connection**
Diagnose a patient, dodge a wet sneeze from the Big Blue Nose, and step into the lab to conduct a guided, hands-on experiment.

**Energy Quest**
Drill for oil, locate uranium, discover the power in ocean waves and dams, and explore renewable energy: solar, geothermal, and wind.

**PixelPalooza from Bell Labs**
Play an active, multi-user game and learn about computer vision.

**Communication**
Discover how humans have exchanged ideas, from neolithic hand prints to sign language. Try a new way of speaking at Language Karaoke, see your electronic voice waves, and leave your mark on the digital Graffiti Wall.

**I Explore**
Exhibits, free weekday classes, and story times exclusively for learners ages 2–5.

**TRAVELING EXHIBITIONS**
We host several exciting exhibitions each year that relate to topics in science and technology, and incorporate pop culture and entertainment. This school year, exhibitions will include *Star Trek: The Starfleet Academy Experience* and *Thomas & Friends: Explore the Rails*. 
TRAVELING SCIENCE PROGRAMS

Can’t come to us? We’ll come to you! Our specially trained educators deliver dynamic and memorable science programs at your school. We offer shows for large audiences (assemblies) and individual classes (classroom workshops) on a wide range of STEM topics and can travel within a 140-mile radius of Jersey City.
Little Dragon’s Digestive System  
(Grades K - 1) 
Meet Sam, a dragon with really bad eating habits, and take a journey through the digestive system. A few lucky volunteers climb into a giant mouth, slide down an esophagus, and end up in a churning stomach before squeezing through the intestines. Using several models, both small and large, everyone learns all about the basic parts of the digestive system and how they work together. 
NJSLS:S: From Molecules to Organisms: Structures & Process: K-LS1-1

Flash! Bang! All about Natural Gas and Electricity  
(Grades 1 - 4) 
Arcing electricity. Balls of fiery gas. Join us for an interactive look at the two most common forms of home energy. Students generate electricity, explore insulators and conductors, and participate in our very own game show, all while learning how to avoid the hazards inherent in using natural gas and electricity. 
NJSLS:S: Energy: 4-PS3-2

Science Circus  
(Grades 1 - 8) 
It’s our most popular show! Explore the positives and negatives of static electricity, the subzero temperatures of liquid nitrogen, the states of matter, and the immense pressure of air. Includes more than a dozen thrilling experiments and, as always, we use lots of volunteers. It’s a great way to showcase the concepts of energy and matter. 
NJSLS:S: Matter and Its Interactions: 2-PS1-4, 5-PS1-1, MS-PS1-4

A Dose of Gross  
(Grades 4 - 6) 
Your body carries out many “gross” functions, like burping and sweating, but it does so for very important reasons. Take a journey through the human body to discover how your brain makes decisions, without your knowing it, to keep you healthy and strong by controlling the various organ systems of the body. 
NJSLS:S: From Molecules to Organisms: Structure & Processes: 4-LS1-1, 4-LS1-2, MS-LS1-8

Science Sportacular (Newton’s Laws)  
(Grades 4 - 8) 
Sports all have one thing in common—science. We demonstrate Newton’s Laws and cause and effect using sports equipment. Students learn how a pitcher makes a baseball curve and volunteers join in a momentum race. We even demonstrate concepts related to helmet safety by lying on a bed of sharp nails. No tricks or illusions here, just pure science. 
NJSLS:S: Energy: 4-PS3-3
Motion & Stability: Forces & Interactions: MS-PS2-2

Science of Flight  
(Grades 4 - 8) 
Most of us have probably wondered how aircraft fly. While it might seem impossible or magical, it’s really just science. Take a closer look at the four forces of flight and aviation in an educational and entertaining way! 
NJSLS:S: Motion and Stability: Forces and Interactions; 3-PS2-1, 3-PS2-2, 5-PS2-1, MS-PS2-2
Pumpkin Circle Grades (Pre-K to K)
Have you ever wondered what’s inside a pumpkin? Have you ever wondered how a pumpkin seed grows into a pumpkin?
After reading *Pumpkin Circle, The Story of a Garden* by George Levenson, children are encouraged to develop their senses and questioning skills as they explore real pumpkins, learn about seeds and appreciate the life cycle of all plants.
(Offered September through November)
NJSLS:S: From Molecules to Organisms: Structures & Processes: K-LS1-1

The Skeleton Inside You
(Grades Pre-K to K)
Why do we have bones? What are they made of? How is their structure related to their function? What happens when they break? Discover these answers and many more as we learn all about bones in the story *The Skeleton Inside You* by Philip Balestrino. After reading our story, craft your own ‘broken bone’ and mend it with a cast.
NJSLS:S: Engineering Design: K-2-ETS1-2

Flow Motion (Grades K - 2)
Learn the basics of the water cycle in this highly interactive program. Through active listening, investigation, and kinesthetic role-play, students will understand the main processes of the water cycle, from the Sun warming the Earth to the various forms water can take. Follow the leader as we become water droplets to model the water cycle, and complete our journey.
NJSLS:S: Energy: K-PS3-1
Matter and Its Interactions: 2-PS1-4
Earth’s Systems: 2-ESS2-3

Creepy Crawlies (Grades Pre-K - 1)
Giant Madagascar hissing cockroaches, tarantulas, and other wonderfully wiggly creatures visit your classroom in this hands-on workshop. Learn the important ecological roles these strange and wonderful animals play. Note: Snakes are not available in the winter.
NJSLS:S: From Molecules to Organisms: Structures & Processes: K-LS1-1
Earth and Human Activity: K-ESS3-1

The Power of Air (Grades K - 4)
Experience first-hand how surprisingly strong air can be! Conduct air pressure experiments in this interactive, station-based workshop. Discover the underlying principles of what makes wind, how suction cups work, and why airplanes fly!
NJSLS:S: Motion & Stability: Forces & Interactions: K-PS2-1; 3-PS2-1

Electricity and Magnetism (Grades 2 - 5)
It’s a hair-raising exploration! Using lots of hands on experiments and models, learn about the structure of atoms, positive and negative charges, and static electricity.
NJSLS:S: Motion & Stability: Forces & Interactions: 3-PS2-2
Matter and Its Interactions: 5-PS1-1
**NEW Adaptations and Environments** *(Grades 2 - 4)*
Close examination of animals reveals how they have developed unique solutions to challenges in their environment in order to find food, protect themselves, and find a mate. Observe live animals, learn about their natural habitats, then identify specific evolved traits in the animals.

NJSLS:S: **Heredity: Inheritance and Variation of Traits:** 3-LS3-2
From **Molecules to Organisms: Structures and Processes:** 4-LS1-1

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**Owl Pellet Dissection** *(Grades 2 - 5)*
Explore the diet of our favorite raptors by dissecting the undigested remains of their prey. Pairs team up to dissect their own owl pellet and identify what the owl consumed. This workshop is a great investigation of animal adaptations and introduction to the food web.

NJSLS:S: **Biological Evolution: Unity & Diversity:** 3-LS4-3
From **Molecules to Organisms: Structures & Processes:** 4-LS1-1

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**The States of Matter** *(Grades 2 - 6)*
Using super-cold liquid nitrogen, common household items, and volunteers, we demonstrate how things change from solid to liquid to gas. Observe the demonstrations and provide explanations for the changes in this really cool exploration of matter.

NJSLS:S: **Matter and Its Interactions:** 2-PS1-1, 2-PS1-4, 5-PS1-1, MS-PS1-4

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**Balls and Tracks** *(Grades 3 - 7)*
What forces of science help ski jumpers become champions? Using marbles and ramps, this hands-on program introduces the fundamental principles of gravitational forces and projectile motion. Investigate the path that a launched projectile takes, discover the patterns of this motion, and use data to predict the distance of a final launch!

NJSLS:S: **Motion & Stability: Forces & Interactions:** 3-PS2-2, **Energy:** MS-PS2-2

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**Swell Cells** *(Grades 5 - 8)*
Explore the crosscutting concept of structure and function in the human body, from the cells up. Build a model cell and learn how cells with similar structures form tissues. These tissues then create organs, whose job is to create systems that make the body work.

NJSLS:S: From **Molecules to Organisms: Structures & Processes:** MS-LS1-1, MS-LS1-2, MS-LS1-3

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**Energy: Use It and Lose it** *(Grades 6 - 9)*
Energy comes in many forms. We use it and lose it, every day. Through hands-on stations, use models and complete experiments to track energy flow in a series of transformations that produce both useful actions and energy losses.

NJSLS:S: **Energy:** MS-PS3-5, HS-PS3-2

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**NEW BRAAAINS! You and the Zombie** *(Grades 6 - 9)*
Zombies are everywhere these days! Join the Zombie Response Team as research scientists to help the government determine how a mutated strain of the zombie virus is altering zombie behavior. By identifying and explaining differences in behavior and capabilities of zombies and humans, gain a better understanding of how the brain works.

NJSLS:S: From **Molecules to Organisms: Structure and Processes** MS-LS1-3

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**Chemistry of the Stars** *(Grades 6 - 10)*
How do astronomers determine the chemical composition of stars millions of light years away? Learn about atomic spectra, flame tests, and other scientific tools used to uncover the underlying structure and function of the elements that compose all matter. Collect, analyze, and interpret the patterns of spectra from fluorescing elements.

NJSLS:S: **Matter and Its Interactions:** MS-PS1-1
Earth’s Place in the Universe: HS-ESS1-3

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**Cow Eye Dissection** *(Grades 6 - 10)*
Follow light on its journey through the eye. Students will pair off to perform cow eye dissections and gain a deeper understanding of the structure and function of the human eye.

NJSLS:S: From **Molecules to Organisms: Structures & Processes:** MS-LS1-3, MS-LS1-8
Biological Evolution: Unity & Diversity: MS-LS4-2

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**The Right Stuff: The Science of Materials** *(Grades 6 - 10)*
Explore the exciting world of materials science by learning about the properties and structures of metals, ceramics, and polymers (plastics). See metal that “remembers” its shape and tin foil being made right before your eyes. Learn how the underlying structure of a material determines its function and suitability for a specific need.

NJSLS:S: **Matter and Its Interactions:** MS-PS1-1; MS-PS1-3
Motion and Stability: Forces & Interactions: HS-PS2-6
TRAVELING AFTER-SCHOOL PROGRAMS

Outside of structured class time, science lessons take on a whole new element of fun! We can bring hands-on, science-based programs one hour per week to your location. A workshop series provides project-based learning supported by development of critical thinking, collaboration, innovation, and problem solving over an extended period of time. Choose one or multiple sessions and select a range of topics, or build on the same topic over several weeks.

We can configure TAP workshops to meet your needs. Contact an LSC representative for assistance planning a unique and unforgettable after-school science program for your school: 201.253.1310.

GRADES 1 - 12
LENGTH Single week or multi-week series
Some popular topics include:

Forensic Science
Crack a case with the same techniques real forensic scientists use, such as checking for fingerprints, comparing fibers, DNA analysis, the science of ballistics, and more.

Growing Into Science
Learn about a multitude of STEM career opportunities, and see how science fits into your future! We provide opportunities for exciting science learning using experiential, hands-on models that cannot always be replicated in the traditional school environment.
No permission slips required! Connect your classroom to an exciting, interactive STEM program via videoconferencing. Electronic Field Trips are structured online learning experiences taught by STEM instructors and delivered directly to your school using such platforms as FieldTripZoom, Google Hangouts, or Skype. Engaging students in high-quality science topics has never been so easy.

VIDEOCONFERENCE TECHNICAL REQUIREMENTS
To ensure a successful program, the client must schedule a test connection no later than two weeks prior to the scheduled program. We cannot guarantee a last-minute test connection, so please include the test in your plans.

IP OR SIP CONNECTION:
- Hardware: Videoconference Codec (Polycom, Tanberg/Cisco, or Lifesize)
- Connection Rate: 512 kbps and up
- Camera
- Microphone
- Speakers
- Display Device (projector, LCD screen, or SMART Board)
- IP address and meeting ID will be sent to you via email once the test connection date has been confirmed.

INTERNET CONNECTION:
- Computer
- Wired internet connection recommended
- Webcam
- Microphone
- Speakers
- Display device (projector, LCD screen, or SMART Board)
- Internet web link will be sent to you via email once test connection date has been confirmed.
NEW STEM DEMONSTRATIONS
What better way to hook young minds on science than through explosions, wild animals, and bizarre phenomena? These short curricular enhancements set a high bar for educational exploration and excitement.

GRADES 3 - 8
LENGTH 25 minutes
MAXIMUM 30 students per connection

Glowing Rocks
Have you ever looked at rocks—really looked at them under different types of light sources? Take a look at rocks in a whole new way and make your own extraordinary rock.
NJSLS:S: Structure and Properties: 5-PS1-3

Cow Eye Dissection
Illustrate the interactions of light as it enters the eye to allow objects to be seen, then interpreted by the brain.
NJSLS:S: Waves and Their Applications in Technologies for Information Transfer: 4-PS4-2, MS-PS4-2

Chemical Reactions
Choose one of the following reactions to support your students’ learning:
• Decomposition
• Single Replacement
• Double Replacement
• Combustion
NJSLS:S: Matter and Its Interactions: 5-PS1-4, MS-PS1-5

Animal Adaptations
Animals from our collection illustrate that in a particular habitat, some organisms can survive well, some struggle to survive, and some cannot survive at all. Patterns of interactions among organisms can be predicted.
NJSLS:S: Interdependent Relationships in Ecosystems 3-LS4-3, MS-LS2-2

ELECTRONIC FIELD TRIPS
These full-length lessons draw on the excitement of LSC exhibition galleries and animals and the expertise of our STEM Education staff to bring fresh excitement to your NJSLS:S curriculum topics.

GRADES 2 - 8
LENGTH 45 minutes
MAXIMUM 35 students per connection

NEW Ants: The Original Farmers
Get excited when the ants come marching one by one. Leaf-cutter ants will astonish you with their expertise in farming to support the survival of the group and their proficiency in organizing matter in the environment.
NJSLS:S: Interdependent Relationships in Ecosystems: 3-LS2-1
Matter and Energy in Organisms and Ecosystems: 5-LS2-1
Matter and Energy in Organisms and Ecosystems: MS-LS2-4

NEW Pollinators: Honey Bees
Have you thanked a bee today? Pollinators provide an essential service to the ecosystem. At least a third of the world’s agricultural crops depends upon pollination provided by insects and other animals. Honey bees produce and store honey, but they also help to make other favorite foods. Design a pollination device that works just as hard as a busy bee.
NJSLS:S: Ecosystems: Interactions, Energy, and Dynamics: 2-LS2-2
NJSLS:S: Engineering Design: MS-ETS1-2

NEW When Darwin Met Mendel: Inheritable Traits
In this fictitious scenario, get to know a fellow by the name of Charles Darwin. Later during your travels you happen to meet an intriguing monk named Gregor Johann Mendel. What could you learn from these two individuals? It just might blow your mind!
NJSLS:S: Natural Selection and Evolution: HS-LS4-2

NEW Biodiversity: Natural Selection
You are part of a group of field researchers and are sent to Darwin Island. The research revolves around observing a species and its interactions with its surrounding environment. Report on your findings to the Society of Virtual Learning.
NJSLS:S: Natural Selection and Adaptations: MS-LS4-4

NEW 3D Design
Learn the basics of 3D design. Prerequisites:
• Each participant will need a computer
• Participants must download open source software (TinkerCad)
A document with directions on how to download TinkerCad will be provided.
NJSLS:S: Engineering Design: K-2-ETS1-2, 3-5-ETS1-3

NEW Circuits: Light It Up! Kit
(Grades 4 - 8)
To understand complex machines like computers and robots, we must first figure out the basic relationship between atoms and electricity. Construct your own circuits and build an understanding of electricity, insulators, and conductors.
NJSLS:S: Forces and Interactions: MS-PS2-3
Engineering Design: MS-ETS1-1
Chemistry of Mixtures, Solutions, and More
Learn the differences between chemical and physical changes, then separate materials based on their properties and learn about the roles of reactants and products.
NJSLs:S: Structure and Property of Matter: 5-PS1-4
NJSLs:S: Chemical Reactions: MS-PS1-2

Geometry in Nature
Classify different kinds of materials by their observable properties.
NJSLs:S: Structure and Properties of Matter: 2-PS1-1, 5-PS1-3

Forensic Science: Careers
Apply forensic science to uncover, identify and individualize potential evidence. Explore the diverse career paths under the forensic science umbrella.
NJSLs:S: MS-ETS1-4

Forensic Science: Gotham Detective Kit
(60 min)
This program includes a kit and a 45-to-60-minute videoconference. Conduct an investigation and analyze evidence to build a case against one of the city's notorious criminal masterminds before it's too late.
NJSLs:S: Matter and Its Interactions: MS-PS1-3, Structure and Function: HS-LS1-3

It’s a Gas!
Is the glass half empty, or half full? Scientifically speaking, the glass is always full—of matter. A gas is one of the four fundamental states of matter. Explore the properties of gases.
NJSLs:S: Structure and Property of Matter: 5-PS1-1, 5-PS1-2, MS-PS1-1, MS-PS1-4

Plants (Grade 5)
These amazing organisms do so much for the environment. But how? In this program, construct a model to support the argument that plants get the materials they need for growth chiefly from air and water. For older scientists, the role of photosynthesis is explored.
NJSLs:S: From Molecules to Organisms: Structures and Processes: 5-LS1-1, MS-LS1-6, HS-LS1-5

Renewable Energy (Grades 4 - 8)
As such nonrenewable energy sources as coal and oil dwindle, we need to look to other sources such as sun, wind, and water. Explore our Energy Quest gallery and experiment with a variety of renewable energy sources.
NJSLs:S: Energy: 4-PS3-4, MS-PS3-4

Weathering and Erosion (Grades 4 - 8)
Earth is constantly changing. Although some changes happen quickly, others occur over long periods of time. Using "The Forces of Change" animation in Our Hudson Home, explore how the local terrain has changed over the eons.
NJSLs:S: History of Earth: MS-ESS2-2
Earth's Systems: Processes That Shape the Earth: 4-ESS1-1, 4-ESS2-2
Teachers face new challenges as the NJSLS are adopted and implemented. With an increased emphasis on evidence-based learning, exploration of science phenomena, and scientific discourse, educators need professional development experiences that reflect these new focal points of learning. Liberty Science Center can partner with your school or district to offer engaging and effective professional development programs tailored to implementing the NJSLS.

You can even combine PD with student programs, including Electronic Field Trips and Laboratory Workshops, to observe and learn from LSC educators in real time, with real students.

To learn more, contact Mary McDonald at mmcdonald@lsc.org or 201.253.1214.

Last year, 1,200 science teachers participated in LSC’s Professional Development programs.
NJSLS:S Overview: Teaching Science in Three Dimensions
This workshop introduces the NJSLS:S, highlighting key shifts in content and practices that the new standards bring to classrooms. Become familiar with teaching through the three strands of NJSLS:S: Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts. Review your current science lessons and make amendments to reflect NJSLS:S teaching and learning practices. Successive workshops will focus in depth on each Science Practice, Disciplinary Core Ideas, and various Crosscutting Concepts.

Teaching Science with Crosscutting Concepts
**FOCUS:** Crosscutting Concepts across the various Disciplinary Core Ideas. Take part in exemplary science investigations that highlight various aspects of these concepts, then modify existing science lessons to be better aligned to NJSLS:S.

Planning NJSLS:S Aligned Science Units and Lessons
**FOCUS:** Planning a unit of lessons that align to the three strands of the NJSLS:S. Engage in science investigations that are part of the sample science unit. Then reflect on this learning and modify existing science lessons to be better aligned to NJSLS:S.

Integrating NJSLSS:S with Common Core ELA and Math Standards
**FOCUS:** Learning synergies between NJSLSS:S and Common Core ELA and Math Standards. Engage in exemplary investigations which illustrate Mathematics and Computational Thinking, Engaging in Argument from Evidence, and Obtaining Evaluation and Communicating Information. Gain mastery in modifying existing science lessons to emphasize connections between NJSLSS:S and Common Core ELA and Math Standards.

Problem-Based Learning through the NJSLSS:S Engineering Practices
**FOCUS:** Integrating the NJSLSS:S Engineering Practices in the science classroom. Participate in problem-based science investigations that use the NJSLSS:S Engineering Practices. Reflect on this learning, then modify science units and curriculum to integrate NJSLSS:S Engineering Practices.

Asking Questions and Science Investigation Design/Implementation
**FOCUS:** The first and third Science Practices: Asking Questions and Planning and Carrying Out Investigations. Take part in NJSLSS:S-based investigations that highlight the efficacy of these two Science Practices. Reflect on the science investigations in order to modify existing science lessons to be aligned to these Science Practices.

Analyzing and Interpreting Data
**FOCUS:** The Science Practice of Analyzing and Interpreting Data as well as the Crosscutting Concept of Patterns. Conduct science investigations that highlight the importance of data in science teaching and learning. Reflect on these investigations to plan modifications of current science lessons for best NJSLSS:S alignment.

Developing and Using Models
**FOCUS:** The Science Practice of Developing and Using Models as well as the Crosscutting Concept of Systems and System Models. Deepen understanding of these aspects of NJSLSS:S and participate in engaging science lessons. Upon reflection on the workshop sample investigations, modify existing science lessons in order to make them better aligned to NJSLSS:S.

Evidence-Based Explanations and Argumentation
**FOCUS:** Two Science Practices—Constructing Explanations and Engaging in Argument from Evidence. Conduct investigations that require collecting data and other evidence that will form the foundation for constructing explanations and engaging in evidence-based science argumentation. Based on this learning, modifying existing science lessons to be better aligned to NJSLSS:S.
NEW 3-HOUR INTERDISCIPLINARY WORKSHOPS

Inquiry-Based Learning in STEM and Humanities
Deepen your understanding of how inquiry-based learning looks in STEM and Humanities classrooms. Dive into lessons that connect across disciplines.

Revamping Claims, Evidence, and Reasoning for an Interdisciplinary Classroom
Examine how argumentation works in different disciplines through hands-on and cooperative explorations. Learn how to strengthen your lessons using evidence-based explanations to better align with the Common Core Standards and NJSLS:S.

Design Differentiated Assessments across Disciplines
Learn how to plan and implement differentiated, engaging assessments to monitor student progress. Explore effective techniques for creating formative and summative assessments in diverse STEM and Humanities classrooms.

Knowing Your Community: Using Local Phenomena in Interdisciplinary Learning
Community-based learning can help engage and motivate your students. Examine local ecosystems, history, and culture through standards-based activities. Learn how to incorporate these community assets into your lesson plans to make learning relevant to students across all disciplines.

Where in the World?
Using Map-Based Learning in Science and Social Science Classrooms
Explore the world of online and paper maps that offer a deeper look at core ideas in science and social science. Learn how to support students’ curiosity and develop their critical thinking skills through map-based learning. Reflect on the workshop samples to plan modifications of current lessons to effectively include maps.

Making the Most of Your Field Trip
Integrating Disciplines at LSC
Discover how to enhance your LSC field trip experience by taking an interdisciplinary approach. Examine select exhibits through skills and content that connect to multiple disciplines. Plan integrated field trip activities that will challenge your students to think about the symbiotic relationships between science, social studies, math, and English.

3-HOUR PROFESSIONAL DEVELOPMENT WORKSHOPS
K - Grade 8 Teachers

It’s All in the Question
Effective hands-on science instruction encourages students to make observations, manipulate data, construct explanations, and design solutions. Learn how to stimulate student thinking by helping them make predictions, plan and carry out investigations, and respond to open-ended questions.

Science Grabbers
Prepare a hands-on survival kit with activities for all science disciplines. Plan and conduct science investigations in various content areas and explore cause-and-effect relationships, energy transfer, and properties of matter.

Earth, Moon, and Stars
Explore interrelated concepts in Earth, space, and physical science with a focus on how forces such as gravity interact with planets, the Moon, stars, and people on Earth. Collect and analyze data on planetary cause and effect; develop, scale, and use models to understand relative sizes in the solar system; and compare patterns and cycles.

The Human Body: Getting to Know Me
Amaze your students with comparative exercises that offer a deeper look into the structure and function of their own bodies. Explore skeletal development, the senses, and human information processing.

Matter, Matter, Everywhere
Spark critical thinking and good communication skills as you investigate the structures and properties of solids, liquids, and gases. Measure, combine, and classify changes and reactions in substances by touching, manipulating, and even tasting the results. Sweet!

The L.A.W.S. of Weather
Discover how weather develops as land, atmosphere, water, and sunlight interact. Conduct easy experiments on the properties of air, create a model water cycle in a cup, and construct and test simple weather instruments. Use these instruments to gather and analyze meteorological data.

Eco-Awareness
Use hands-on activities to explore natural materials and resources. Examine the beneficial and harmful impacts humans can have on local and global ecosystems. Explore system models that illuminate the delicate balance found in ecosystems.

LSC.org            201.253.1310              sales@lsc.org                  TEACHER PROFESSIONAL DEVELOPMENT WORKSHOPS
What’s So Simple about Simple Machines?
Explore new ways to teach a simple machines unit with emphasis on readily available materials. Define and explore problems that can be addressed by simple machines and design solutions based on the efficacy of particular machines that address a particular design challenge. Collect data to explain how simple machines work and use these concepts to think about how simple machines can be used to streamline everyday tasks.
NJSLS (Science): PS2A: Forces and Motion; PS2B: Types of Interactions

3-HOUR PROFESSIONAL DEVELOPMENT WORKSHOPS
Grade 7 - 12 Teachers

NEW The Power of Mapping Data
Amaze your students with the power of mapping and manipulating data. Investigate online mapping technology Geographic Information Systems (GIS), which promotes visualization and manipulation of spatial data. Infinitely adaptable to exploring different science content areas, online GIS promotes digital literacy and critical thinking skills. With a focus on the Crosscutting Concept of Scale, Proportion, and Quantity and the Science Practices of Asking Questions and Analyzing and Interpreting Data, you will reflect on innovative ways to bring mapping and data analysis to your classroom.
NJSLS:S Disciplinary Core Ideas such as LS4.D Biodiversity and Humans, ESS3.A Natural Resources, ESS3.B Natural Hazards, and ESS3.D Global Climate Change

NEW Citizen Science in the Classroom
From BioBlitzes to backyard mapping to galaxy discovery, explore how your classroom can benefit from citizen science projects. With a focus on the Science Practices of Analyzing and Interpreting Data and Using Mathematics and Computational Thinking, reflect on how to develop a citizen science project that aligns with NJSLS:S, promotes student collaboration, and engages students in solving real-world problems through scientific research.
NJSLS:S Disciplinary Core Ideas such as LS2.A Interdependent Relationships in Ecosystems, LS2.C Ecosystem Dynamics, Functioning, and Resilience

Math and Science Connection Workshop
Learn to collect, analyze, and interpret data. Explore patterns, proportion, and quantitative analysis. Work with early calculators, study the applications of probability, explore Platonic solids, and construct flexagons. Learn about Fibonacci numbers, graphing collected data, the golden mean, and more.
NJSLS:S: Interdependent Relationships in Ecosystems: HS-LS2-2

Intermediate Science Sampler
It’s one of our most popular programs for middle school teachers. Use activities to initiate discussion and introduce areas of scientific inquiry, from topology and color vision to a simulation of the spread of communicable disease. Use observable data to draw conclusions and deepen understanding of scientific concepts.
NJSLS:S: Structure, Function and Information Processing: MS-LS1-8
Explorations in Ecology
Uncover the basics of ecology using math, simulations, and graphs to understand predator-prey relationships, population growth, photosynthesis, biome comparisons, and endangered species. This in-depth view of ecological principles is appropriate for grade 6 - 9 teachers.
NJSLS:S: Interdependent Relationships in Ecosystems: MS-LS2-2; Matter and Energy in Organisms and Ecosystems: MS-LS1-6

Hidden Worlds Revealed through the Microscope
Learn to use microscopes more effectively by examining pennies, feathers, fingerprints, and preserved and living organisms. Explore concepts of scale, structure, and the functions of tiny items and organisms. Plan and implement investigations that provide meaningful data about the intricacies of items visible only on a microscopic scale.
NJSLS:S: Structure, Function and Information Processing: MS-LS1-1

Exploring Matter: The Chemistry of the Universe
Collect, analyze, and interpret data on the physical and chemical properties of matter as well as changes produced by chemical combinations. Create a brochure about a favorite chemical, use enzymes to convert milk into cheese, make a pH indicator from cabbage leaves, investigate the incredible absorption power of disposable diapers, and extract DNA from wheat.

Plants and Insects: Perfect Together
Explore insect senses and behaviors, then discover how plants reproduce, grow, make food and in some cases even capture and consume insects. Analyze and interpret data related to plant and animal structures, their functions, and their interconnectedness.
NJSLS:S: Structure, Function and Information Processing: MS-LS1-1; Inheritance and Variance of Traits: HS-LS3-3

The Nervous System and Behavior
Examine the biological basis of behavior by studying the neuron, nerve impulse, and anatomical structure of vertebrate nervous systems, with an emphasis on the brain. Exciting activities cover visual perception, illusions, learning and memory experiments, reflexes, measuring the speed of a nerve impulse, and constructing a model human brain. Particular emphasis is placed on exploring concepts of biological cause and effect as well as the structure and function of the central nervous system.
NJSLS:S: Structure, Function and Information Processing: MS-LS1-8

FULL-DAY PROFESSIONAL DEVELOPMENT
5-Hour Teacher Workshops

Unpacking the NJSLS:S—Planning 3-Dimensional STEM Lesson Elements
As you implement the new standards, LSC can partner with you to evaluate and adapt your curricular models, lesson design, and pedagogy to capitalize on your current strengths and incorporate NJSLS:S requirements. This course can be customized in content emphasis, grade level bands (K - 4, 5 - 8, 9 - 12) and length (one day or multi-day) to complement your school district’s needs and schedule.

Teach Science Using Multiple Intelligences
Discover how the eight intelligences can be focused for science instruction. Complete a multiple intelligence inventory and develop strategies to use in lesson design and implementation. Learn how to incorporate all facets of students’ intelligence in science and engineering instruction.
NJSLS:S: Multiple intelligences can be applied to all science standards.

Integrating Science, Math, and Literacy: Activities for Pre-K to Grade 4
Connect mathematics, literacy, and science concepts. Using a wide variety of materials and objects, investigate topics in life, physical, Earth, and space sciences, as well as in early engineering and design practices.
NJSLS:S: PS1 Matter and Its Interactions, LS2 Ecosystems: Interactions, Energy, and Dynamics, ESS2 Earth’s Systems

Effectively Integrating Technology in Science Teaching
Gain hands-on experience with technologies found in many classrooms, including those students bring to school, and learn about the fundamental pedagogy underlying their use. Discover cutting-edge methods to more effectively engage students in science and engineering practices.
NJSLS:S: This workshop addresses all Engineering Design Performance Expectations for middle school and high school with the goal of assisting teachers with effectively using technology to improve student learning.
Parents and teachers are vital to our children’s future and we applaud their dedication to making each school year enriching and memorable. Please join us for a free, enjoyable, and informative LSC preview event. Learn how our programs and robust hands-on experiences can focus and improve student learning and support teachers.

PARTICIPANTS WILL ENJOY:
• Two professional development hours
• Breakfast and networking
• Exploring our labs
• Live demonstrations
• STEM program and workshop previews
• Free raffles
• A complimentary film
• A 20% discount at the gift shop
• Free exploration of the center for the rest of the day
• Discount for family members to visit the center while you’re at the event*

Teachers & Parents
10:00 am - 1:00 pm
September 23, 2017
March 24, 2018
May 5, 2018

Teachers
10:00 am - 1:00 pm
January 20, 2018
June 3, 2018

The event is free, but space is limited. Register at lsc.org/preview or email Lauren Rose at lrose@lsc.org.

*Bring your family to explore the center while you’re at the event at a discounted rate of $11.75 per person. Accompany your guests to the Box Office for the discounted rate. Inform the Box Office attendant that you are with the preview event to ensure you receive the special rate. Adults only at the preview event, please! Thank you for your cooperation.

Liberty Science Center is a registered professional development provider with the NJ Department of Education; provider #1033.

Parking is available in our convenient, on-site lot at $7 per car.
There’s No Place Like the SURE House

Explore the new SURE House! Designed by Stevens Institute of Technology students, the house won the 2015 Solar Decathlon, sponsored by the US Department of Energy.

The SURE team merged the efficient indoor-outdoor rooms and open floor plan of a 60s-style beach cottage with state-of-the-art building science, the latest renewable energy technologies, and fiber-composite materials repurposed from the boat-building industry. The result is a building armored against extreme weather that uses 90% less energy than its conventional cousins, powers itself through clean solar energy, and becomes a hub for emergency power to the neighborhood in the aftermath of a storm.

Your group can explore the SURE House as part of a workshop on clean energy, electronics, or meteorology. Topics may include:

- Exploring Renewable Energy
- Introduction to Electronics
- Energy Audits
- Insulation Lab
- Green Roof Construction
- Beach Erosion
- Tropical Storm Systems

When you call to book your group visit, be sure to inquire about adding a trip to the SURE House. sales@lsc.org; 201.253.1310