



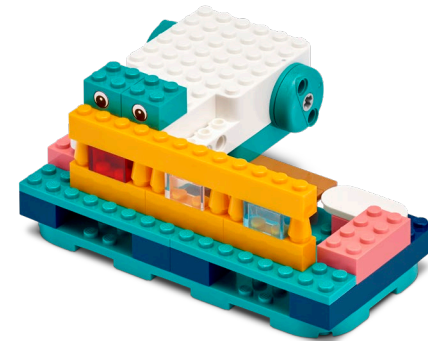
education™

LEGO® Education Guide to Learning for After School

Keep students engaged all in your program with our LEGO® Education Learning. This guide is designed to help you organize and set your program up for success.

Consider the length of your program:

- All day session (6 hours)
- 1/2 day session (3 hours)
- 1-2 hour session



Our lessons are designed for 1-hour sessions to allow you to organize how you include these lessons each day as part of the total learning experience. We have grouped lessons by topic to make it easy to integrate. However, you can teach the lessons in any order you like; they are not progressive.

If you are hosting a half-day or all-day learning event, consider creating a daily plan for students to plan when you will use LEGO Education learning. See some recommendations on what to include below and additional samples at the end of the guide.

We recommend including different options for movement, exploration, and collaboration during the day to add to our already designed lesson. See our example plan for some ideas.

Example Learning Day with Recommended Options to Include in Your Plan

Use this sample learning day as inspiration for designing your own learning sessions.

- Start the day with a warm-up stretch or exercise to include movement.
- Discuss the daily goals and tasks with students.
- Introduce the day's challenge, which can be a way to introduce the LEGO Education lesson.
- Ask students to review a relevant reading (article or book) or complete research on the topic.
- Review new vocabulary to focus on for the day and ideas introduced in the reading or research.
- Take a stretch break for a short brain break and to include movement.
- Start the LEGO Education lesson, working through the 5 Es of the lesson. Consider places where students might need a break.
- Host a mini-showcase where students share out their work and ideas.
- Include time for clean up and inventorying the set
- Give students time for a daily debrief to share reflections on the day.



Determine procedures for each learning session:

- Distributing and collecting materials
- Sharing ideas amongst students
- Grouping students
- Showcasing student learning
- Providing feedback

Gather and Prepare Materials:

Prior to your first lesson, ensure your LEGO Education materials are sorted, organized, and all hardware is charged. When applicable based on the materials you are using, ensure devices are ready with the appropriate app or software.

Access all the learning materials including the student slides and teacher facilitation notes on the LEGO Education Teacher Portal at teach.legoeducation.com. Be prepared to have a computer and projector to facilitate the lesson.

Consider how you plan to have students document their learning. A design engineering notebook is a great way to have students capture their learning over time.

Don't forget to gather the other materials you might use to support the learning such as readings, videos, various craft materials, etc.



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Recommended Learning by Grade

Topic	Lesson
Forces and Interaction	Dino Birthday Bash Students will investigate the effects of pushes and pulls on the motion of an object.
	Feeding Time Students will conduct an investigation to compare the effects of different push strengths on the motion of an object.
	Muddy Rhino Students will design a solution to change the direction of a moving object with a push or a pull, and then test if it works as intended.
Energy and Sunlight	Park Picnic Students will design and build a structure that will reduce the warming effect of the sunlight.
Plants, animals, and survival	Farm Friends Road Trip Students will build a model to describe what animals and plants need to survive.
	Forest Play Day Students will use a model to represent the relationship between the needs of animals and the places they live.
Earth and Human Activity	A Home for Baby Bird Students will create a model to show how animals can change the environment to meet their needs.
	Animal Hotel Students will build a model to show the different needs of different animals.
	Bad Weather Bunny Students will use the information from a weather forecast to prepare for severe weather.
	Flower Friends Students will create a solution that reduces the impact of humans on other living things in the local environment.
Engineering Design	Duck Crossing Students will define a simple problem and solve it by developing an object or tool.
	Clean Machine Students will develop a model to illustrate how the shape of an object helps it function as needed to solve a given problem.
	Roll or Fly Students will analyze different objects designed to solve the same problem to compare strengths and weaknesses.

Topic	Lesson
Waves and their applications	Dim Dance Party Students will make observations to explain that objects in darkness can be seen only when illuminated.
	Light Monster Students will build a device that uses light to solve the problem of communicating over a distance.
	Secret Celebration Students will use materials to build a device that uses sound to solve the problem of communicating over a distance.
Plant and animal needs, survival, growth and behavior	Perfect Hiding Spot Students will design a solution to a human problem by mimicking how animals use their external parts to help them survive.
	Worms for Dinner Students will design a solution to a human problem by mimicking how animals use their external parts to help them meet their needs.
	Best of Nests Students will build a model to show how parent birds help their offspring survive.
	Dragon Care Students will use a model to demonstrate understanding of patterns in behavior of parents and offspring that help offspring survive.
Heredity	Flower Families Students will make observations and explain that young plants are like, but not exactly like, their parents.
	Monster Daycare Students will use observations to explain that offspring are like, but not exactly like, their parents.
Earth's place in the Universe	What the Sun Sees Students will use a model to describe patterns of the sun that can be predicted.
	Sunshine Parade Students will use a model to explain the relationship between the amount of daylight and the time of year.
Engineering Design	Rocky Road Skateboard Students will define a problem that can be solved through the development of an improved object and test their solution.
	Windy Valley Students will develop a physical model to illustrate how the shape of a house impacts its function.
	Car with Arms Students will analyze data from tests of two objects designed to solve the same problem to compare strengths and weaknesses of the two designs.

Topic	Lesson
Classification and observable properties	Kitty Greetings Students will investigate the properties of different materials.
	Sort It Out Students will describe and classify materials according to their observable properties.
	Troll Under the Bridge Students will test different materials used to build a bridge and analyze how the properties of the materials impact the effectiveness of the bridge.
	Jungle Adventure Students will explain how an object made from a set of pieces can be disassembled and made into a new object.
	Fun Place Space Students will make observations to describe how an object made of a small set of pieces can be disassembled and made into a new object.
Ecosystems	Hide the Seeds Students will use a model to describe how an animal can function to disperse seeds.
Diversity, animals, and habitats	Animal Rescue Team Students will create a model to describe the diversity of life in a single habitat.
Earth Systems	Beach House Builder Students will compare solutions designed to slow or prevent water from changing the land.
	Bird's Eye View Students will develop a model to represent the shapes and kinds of land and bodies of water in an area.
Engineering Design	Spin Spectacular Students will ask questions and make observations about a situation people want to change to define a simple problem that can be solved by developing an improved object.
	Beach Chicken Students will develop a physical model to illustrate how the shape of an object helps it function.
	Puck and Bot Students will develop a simple model to illustrate how the shape of an object functions to solve a given problem.
	Mini Mixer Students will analyze tests from two objects designed to solve the same problem by comparing strengths and weaknesses of how each performs.

Topic	Lesson
Motion, Forces and Interactions	Sweet-Tooth Squirrel Students will use evidence to explain the effect of balanced and unbalanced forces on an object.
	Golfing Over the Edge Students will make observations of an object's motion to provide evidence that a pattern can be used to predict future motion.
Life cycles and growth	From Egg to What Students will develop a model of the unique life cycle of an animal and compare some common aspects of all life cycles such as birth, growth, reproduction and death.
Ecosystems	Protect Baby Elephant Students will use a model to construct an argument that living in a group helps elephants protect their offspring.
Heredity	Fire and Horns Students will use evidence to explain how traits are inherited from parents and can vary among offspring.
Diversity, fossils, habitats, and environmental change	Fossil Detective Students will analyze and interpret information from fossils to provide evidence of organisms and the environments in which they lived long ago.
	Spot the Bug Students will construct an explanation for how variations in the colors of the same species of insects may provide advantages for individuals that help them survive.
	Home at Last Students will make a claim about the likelihood of different animals surviving in a specific environment.
	Hungry, Hungry Lionfish Students will make a claim about the merit of a solution to a problem caused when an invasive species changes an environment and the animals living in it.
Earth and Human Activity	Teeny Tiny Home Students will make a claim about the merit of a design solution that reduces the impacts of a local weather-related hazard.
Engineering Design	Truck Rally Define a simple design problem reflecting a want that includes specified criteria for success and constraints on materials and time.
	Legs for Fetch Students will create solutions to a problem and test to compare how well they perform.
	Grabber Arm Students will plan and carry out tests to identify aspects of a model that can be improved.

Topic	Lesson
Energy	Energy Racer Students will use evidence to explain that the faster an object moves, the more energy it has.
	Feel the Beat Students will make observations to provide evidence that energy can be transferred from place to place by sound.
	Crush the Core Students will ask questions and predict outcomes about the changes in energy that occur when objects collide.
	Disco Snail Students will create, test and refine a device that converts energy from one form to another.
Waves and their applications	Control the Roll Students will generate and compare multiple solutions for transferring information to safely park airplanes at an airport.
Internal and external structures, survival, growth, and behavior	Plant Powers Students will explain the function of external structures that support the survival and growth of plants and animals.
	Ra-Ra-Rattlesnake Students will construct an argument that animals have external structures that function to support survival.
	Navigating the Unknown Students will use a model to investigate how animals receive information through their senses and process it in order to respond to their environment.
Earth's place in the Universe	Deep Down Underground Students will use a model to explain that changes happen in a landscape over time.
Earth and human activity	Nature Party Students will explain that energy is derived from natural resources and describe how its use affects the environment.
	Lemonade Shake Students will create and compare solutions to reduce the impact of earthquakes.
Engineering Design	Turning Towers Students will define a simple design problem and develop a solution that includes specified criteria for success and constraints.
	Ocean Disco Students will generate and compare multiple solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
	Bug Bot Race Students will carry out fair tests in which variables are controlled and failure points are considered in order to identify aspects of a prototype model that can be improved.

Topic	Lesson
Matter and its interactions	Stink Squad Students will use and develop models to describe that smell is connected to bulk matter and is made of particles too small to be seen.
	Slow-Down Race Students will develop a model to describe particles in the air that are too small to be seen.
	Snacking Seagull Students will make observations to provide evidence that regardless of the change that occurs when the elements of a model are mixed, the total weight is conserved.
	Wheel of Properties Students will make observations to identify materials based on their properties.
Forces and Interactions	Down with Gravity Students will support an explanation that gravity pulls objects down, toward the center of the Earth.
Energy	Sun Snack Students will use a model to describe that energy in animals' food was once energy from the sun.
	Energy Chain Students will build a model to describe that energy in animals' food was once energy from the Sun.
Ecosystems	Circle of Soil Students will develop a model to describe the movement of matter among plants, animals and decomposers in an ecosystem.
Earth and human activity	Desert Island Community Students will model ways individuals and communities use scientific ideas to protect Earth's resources and the environment.
	Twin Scoops Students will explain how communities can use scientific ideas to protect Earth's resources and the environment.
Engineering Design	Critter Crossing Students will define a simple design problem that reflects a need with specified criteria for success.
	Hungry Machine Students will generate and compare multiple solutions to a problem based on how well each meets the criteria of the problem.
	Life on a New Planet Students will plan and carry out fair tests in which variables are controlled and failure points are considered in order to identify aspects of a model or prototype that can be improved.

Topic	Lesson
Living things, cells, body systems, and environment	Cell City Students will develop and use a model to represent the ways parts of a cell contribute to the function of the whole cell.
	More than a Nucleus Students will develop and use a model to describe the function of a cell as a whole and the ways parts of cells contribute to the function.
	Ostrich Dance Students will use a model to explain how characteristic animal behaviors affect the probability of successful reproduction.
	Feathers, Fur, and Family Students will use models to support an explanation for how characteristic animal behaviors affect the probability of successful reproduction.
	Big Fish in a Little Pond Students will construct an explanation for how environmental factors influence the growth of organisms.
	Supercharged Plants Students will construct an explanation for the role of photosynthesis in the flow of energy on Earth.
	Rapid Reaction Students will explain that senses respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
	Bee-ware Students will use a model to explain that sensory receptors respond to inputs by sending messages to the brain for immediate behavior or storage as memories.
Heredity	Aliens Alike and Not Quite Students will 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.

Topic	Lesson
Ecosystems	Fish Food Students will analyze the effects of resource availability on different organisms and populations of organisms in an ecosystem.
	Rivals and Allies Students will describe patterns of interactions among organisms across multiple ecosystems.
	Move the Matter Students will develop a model to describe the cycling of matter among living and nonliving parts of an ecosystem.
	Chickens in Space Students will develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
	Forest Showdown Students will support an argument that changes to the components of an ecosystem affect populations and will then evaluate design solutions for maintaining biodiversity.
	Bats on the Brink Students will evaluate competing design solutions to solve a problem related to maintaining biodiversity.
	Blades and Barnacles Students will evaluate competing design solutions for maintaining biodiversity using agreed upon criteria and constraints.
Fossils, evolutionary relationships, adaptation and reproduction	Conceal the Meal Students will construct an explanation that describes how variations of traits in a population increase some individual's probability of surviving in a specific environment.
	Polar Paws Students will describe how genetic variations of traits in a population increase some individuals' probability of surviving in a specific environment.
	Trait Selector Students will explain how humans can influence the inheritance of desired traits in organisms.
	Frosty Fur and Frozen Feet Students will use a model to show how natural selection may lead to increases and decreases of specific traits in populations over time.

Topic	Lesson
Matter and its interactions	Troll Stole My Soup Students will develop a model that describes changes in particle motion, temperature, and state of a substance when thermal energy is added or removed.
	A Breath of Fresh Space Students will use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
Forces and Interactions	Push Power Students will apply Newton's third law to design a solution to a problem.
	Double the Push Students will 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.
	Hit It, Move It Students will plan an investigation to provide evidence that the change in an object's motion depends on the sum of forces acting on the object and the mass of the object.
Energy	Spinning and Winning Students will investigate and describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
	Kinetic Kicker Students will construct a device to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
	Energy Booster Students will use a model to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

LEGO® Education Science: Grade 6-8 Recommendation

Earth and Space Science

Topic	Lesson
Earth's place in the Universe	Building Space Students will develop and use a model of the Earth-Sun-Moon system to describe the cyclic pattern of eclipses of the Sun.
Earth's systems	Windy City Students will analyze an area and design solutions to forecast and mitigate the effects of a hurricane.
Earth and human activity	Shaking Signals Students will develop a device to obtain data about earthquakes and mitigate their effects.
	Food Festival Fix Students will design a method for minimizing and monitoring a human impact on the environment.
	Save the Salmon Students will design a method for monitoring and minimizing a human impact on the environment.
	Population Pressure Students will construct an argument that explains how increases in human population impact Earth's resources.

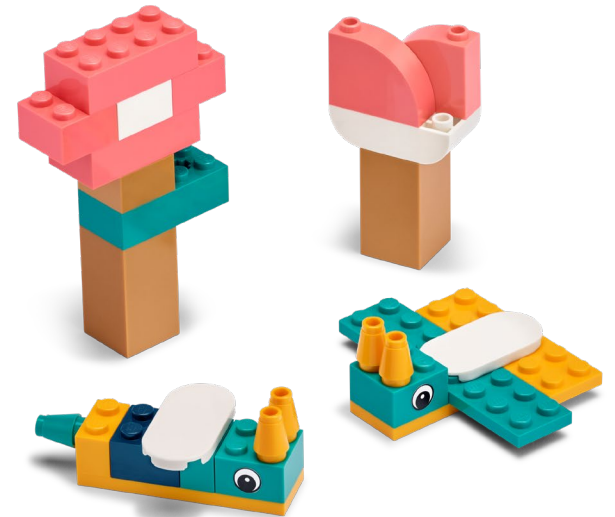
Topic	Lesson
Engineering Design	Robotic Restaurant MS-ETS1-1 Students will define the criteria and constraints of a design problem, taking into account ways the environment may limit possible solutions.
	Loch Ness Express MS-ETS1-1 Students will describe the components of a problem and design a solution by defining criteria and constraints including potential impacts on humans and the environment.
	Cow on the Roof MS-ETS1-2 Students will evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of a given problem.
	Operate in Color MS-ETS1-4 Students will generate data through testing to help them plan an optimal design process.
	Game of Goals MS-ETS1-4 Students will use a model to generate data for iterative testing and modification such that an optimal design can be achieved.
	Up Top Robot MS-ETS1-4 Students will develop a model for iterative testing and modification such that an optimal design can be achieved.

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Additional Sample Daily Schedules

Example Learning Outline for Grade 2 Students in a 2 Hour Session Using the Flower Friends Lesson

1. Open with a **Stretch Activity**.
2. Review **Daily Goals**: Create a solution that reduces the impact of humans on other living things.
3. Overview **Challenge** for the day: How can we share a home with bees and butterflies.
4. **Read** a book about bees or butterflies (non-fiction).
5. **Start the LEGO Education Lesson**
 - Introduce the topic and challenge to solve
 - Have students collaborate to build and explore with the model
 - Discuss findings and ideas
6. Take a **stretch break** for a short brain break and to include movement.
7. **Finish LEGO Education Lesson**
 - Elaborate on learning to take ideas further
 - Explain ideas
8. Host a **mini-showcase** where students share out their work and ideas.
9. Include time for **clean up and inventorying** the set.
10. Give students time for a **daily debrief** to share reflections on the day.



Example Learning Structures for Students Working Across Grade Bands

While the lessons are recommended based on specific grade bands, we recognize that sometimes students are grouped together in grade bands. Here are some recommendations on how you could structure learning to ensure that students experience different learning experience year after year with LEGO Education.

When students are working together with other grades, we suggest putting K-2, 3-5, and 6-8 together. Here is a way to then loop the learning over multiple years to ensure the K students, for example, don't experience the same lesson over three years.

- Teach Grade K lessons in year 1
- Teach Grade 1 lessons in year 2
- Teach Grade 2 lessons in year 3
- Teach Grade 3 lessons in year 1
- Teach Grade 4 lessons in year 2
- Teach Grade 5 lessons in year 3
- Teach Grade 6 lessons in year 1
- Teach Grade 7 lessons in year 2
- Teach Grade 8 lessons in year 3

Alternatively, you could also focus on a certain science topic area each year:

- Focus on Life Science in year 1
- Focus on Earth and Space Science in year 2
- Focus on Physical Science and Design Engineering in year 3