**LEGO® Education
STEAM Learning Progression**

SPIKE™ Essential Grade 1

Introduction

LEGO® Education believes that students learn best through play—by actively doing, exploring, and experimenting. This approach empowers them to become creative and engaged lifelong learners, which is essential for success in their future careers and lives.

Read this Introduction to explore ways to use this learning progression and find activities that support your learners.

This learning progression organizes activities in a recommended sequence that supports students' successful learning with LEGO® Education SPIKE™ Essential. For classroom convenience, it also clusters activities that use the same model.

Following the recommended sequence ensures that students build the necessary knowledge and experience for each successive activity. However, you may also choose activities according to your students' needs and prior knowledge/experience.

Some activities are reprinted or modified from published LEGO Education sources. Others are developed especially for these learning progressions.

Each activity
- ☑ contains anticipated timing, topics, relevant standards, learning objectives, and a ready-to-use prompt.
- ☑ is labeled with one or more topics, such as Forces and Motion (science), Modifying Programs (computer science), or Narrative Writing (ELA).
- ☑ lists the relevant standards, beginning with the most important standard in the learning. For example, a science activity will list NGSS standards first, while a computer science activity will list CSTA standards first.

To find what you need,
- ☑ scan the Topic(s) & Standards column or search with terms like *Forces and Motion* or *CSTA*.
- ☑ explore and choose from selected paths on page 3.
- ☑ use the **Key** below to locate activities of different lengths and levels of instructional support.
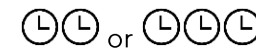- ☑ use the **Additional Resources** below to locate more support.

Key

1 Numbers show the recommended order in which to use activities.

🕐 Activities that will take approximately 20–30 mins

LESSON Longer activities with full lesson support

PROMPT Short activities to quickly expand or extend the learning

🟩 Activities that use only bricks and require no hardware/software

🕐🕐 or 🕐🕐🕐 Activities that will take approximately 45 or 90 mins

MORE DETAILS Links that lead to lesson details and teaching support

Additional Resources (See the [LEGO® Education Community](#))

- ☑ *SPIKE™ App Help* Definitions and directions for using the coding blocks located in the HELP section of the LEGO® Education SPIKE™ App
- ☑ [*Curriculum Integration Guide*](#) SPIKE Essential activities organized by domain Also contains a protocol for integrating activities into your curriculum

- ☑ [*Coding Blocks in LEGO® Education SPIKE™ Essential Lessons*](#)
- ☑ [*Basic Coding Concepts in LEGO® Education SPIKE™ Essential Lessons*](#)
- ☑ [*Troubleshooting with LEGO® Education SPIKE™ Essential*](#)
- ☑ [*Computational Thinking in LEGO® Education SPIKE™ Essential Lessons*](#)

LEGO education™

	COMPUTER SCIENCE PROGRESSION	SCIENCE PROGRESSION	SKILLBUILDERS AND EXTENSIONS
GRADE 1 Complete the full STEAM Progression in Activities 1–53 *OR* choose from one of the paths.	*Boat Trip* *(Activities 5–7)*	*Illumination* *(Activities 19–21)*	Design Engineering (Activities 1-2, 8-10, 13, 23, 25, 26, 29, 33, 35, 39, 40-41, 45, 48, 50, 52)
	Arctic Ride *(Activities 10–12)*	*Musical Vibration* *(Activities 29–31)*	Meet the Hardware (Activities 4, 14, 22, 43)
	Cave Car *(Activities 15–17)*	*The Great Desert Adventure* *(Activities 45–47)*	ELA/Literacy (Activities 7-9, 13, 16, 18, 21, 25-26, 28-31, 35, 39, 42, 44, 47, 49, 51, 53)
	Animal Alarm *(Activities 23–25)*	*Transparency* *(Activities 48–49)*	Math (Activities 11-12, 17, 20-21, 24, 27, 30-31, 36-38, 46, 49, 51)
	Underwater Quest *(Activities 33–35)*	*Communicate with Light and Sound* *(Activities 50–51)*	
	Treehouse Camp *(Activities 40–42)*	*Using Ideas from Nature* *(Activities 52–53)*	

#	Activity Name	Topic(s) and Standards	Objectives Students will	Prompt
1 ⏱	**PROMPT** Brick-tionary with Bricks	**DESIGN ENGINEERING** **NGSS K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	• Identify a model as a representation of an object or phenomenon. • Understand ways to use models to communicate ideas for solving problems.	Use a simple hands-on game activity to introduce students to the LEGO® Education SPIKE™ Essential set and the engineering concept of modeling. Organize groups of 4 and provide each student with LEGO® bricks and a stack of cards labeled with recent vocabulary study or familiar objects. Use pictures if your students aren't ready to read the cards. Have students take turns privately reading a card and then building a model of it for partners to guess. Emphasize that the model represents, or stands for, the idea on the card. **SAY/ASK** *Take turns drawing a card. Don't show it to anyone! Then use LEGO bricks to build what you see on it. What is your model? Have your classmates try to guess.*
2 ⏱	**PROMPT** Memory Game	**DESIGN ENGINEERING** **NGSS K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	• Build models by memory from an example. • Duplicate their model and compare both models.	Extend students' familiarity with models with a fun memory game. Prepare a simple model. Then provide each student with the **same** bricks that you used. Display the model for 10 seconds and then hide it. Prompt students to use their bricks to create an exact copy of the model. Guide them to compare their completed copy with the original. Play several rounds. **SAY/ASK** *Look carefully at my model. Now I'm going to hide it. Use your bricks to build the same thing that I built. Next, let's look at the two models. How are they the same? Different?*
3 ⏱	**PROMPT** Guess My Brick	**DEVICE/INTERNET SECURITY** **CSTA 1A-NI-04** Explain what passwords are and why we use them, and use strong passwords to protect devices and information from unauthorized access.	• Define the purpose of passwords. • Identify the features of a strong password.	Introduce students to the concept of passwords with a bricks-only activity. Organize pairs to create a password with LEGO bricks. Provide bricks. Student A chooses a brick as the password and then hides all the bricks. Student B guesses the brick by naming its color. Partners then take turns making more complex passwords by adding criteria, such as number of studs (bumps), special use (e.g., wheels, gears), etc. **SAY/ASK** *Take turns using bricks as passwords. First, choose one brick as your password. Hide it and all the bricks. Can you partner guess the color? Next, make the passwords harder. Add more things to guess, like the number of bumps on the brick. Can you partner guess?*

| 4 🕐 | **PROMPT** Meet the Motor | **SEQUENCES/LOOPS** **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem. **COMPUTING TERMINOLOGY** **CSTA K–2 1A-CS-02** Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). | • Follow instructions to create a program. • Explore programming a motor. • Use appropriate terminology when using hardware. | Introduce students to the motor in their set. Display it and have them predict what the element does. Then prompt them to complete *The Motor* tutorial in their LEGO® Education SPIKE™ App. Regroup students and lead discussion about where they might see motors used in the real world. **SAY** *Connect a small motor to your hub. Then create the program to make the motor turn.* **MORE DETAILS** *The Motor* tutorial in the START section of the SPIKE App, available on the web or downloaded. |

		Boat Trip

#	**Activity Name**	**TOPIC(S) and Standards**	**Objectives** Students will	**Prompt**
5 🕐 🕐	**LESSON**	**SEQUENCES/LOOPS** **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem. **COMPUTATIONAL THINKING** **CSTA K–2 1A-AP-08** Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. **SCIENCE SKILL PRACTICE: FORCES AND MOTION (Push/Pull)**	• Follow instructions to create programs with sequences. • Identify the main characters in a story. • Practice helping a story character. • Participate in collaborative conversations. • Create step-by-step instructions (algorithms) to program tasks like pushing the boat in the water. • Identify and fix errors in a program (test and debug).	After students built the Boat Trip model, introduce them to step-by-step program sequences as they program the model to push the boat in the water. **SAY/ASK** *Maria and Sofie are going on a boat trip! How will they get the boat into the water? Build and program the model to help them. Notice how the program is a set of step-by-step instructions.* **MORE DETAILS** *Boat Trip* lesson or access in the LEGO® Education SPIKE™ App.
6 🕐	**PROMPT** More with Computer Science	**COMPUTATIONAL THINKING** **CSTA 1A-AP-14** Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops.		Introduce debugging as a method for fixing a program if it doesn't produce the desired results. Share the sample programs. Prompt students to find the mistake in each one. **SAY/ASK** *Maria and Sofie want to launch the boat but are having problems. Can you help? Try these two programs and see if you can find the mistakes, then tell how you fixed them.* **Then try this>** *Maria and Sofie want to hear birds but only hear a cat. Can you fix the program so they can hear birds?*

#	Activity Name	Topic(s) and Standards	Objectives Students will	Prompt
7 🕐	**PROMPT** More with ELA	**NARRATIVE WRITING** **CCSS.ELA-Literacy.W.1.3** Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure. **COMPUTATIONAL THINKING** **CSTA K–2 1A-AP-08** Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.	• Write a story that uses sequence words to tell events in order. • Use a background and motor block to program parts of the story	Ask students to use the Boat Trip model to create a new story about Maria and Sofie's adventure. It should include two different events told in order. Have them start by modifying the program to include a motor block and a background (Display Image) block that helps them tell a story by showing its setting. Then have them write their story, using sequence words like *first, next,* and *then* to show the order. **SAY** *Maria and Sofie want to take another trip on their boat. Write a story for them. Include two different events that happen in order. First, add a background and a motor to your program. Then write your story. Use time words like* first, next, *and* then *to show what happens when.* **MORE DETAILS** *Display Image* and *Motor* blocks in the Help section of the LEGO® Education SPIKE™ App, available on [the web](#) or downloaded.

#	Activity Name	Topic(s) and Standards	Objectives Students will	Prompt
8 🕐	**PROMPT** More with ELA and Computer Science	**DESIGN ENGINEERING** **NGSS K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **COMPUTATIONAL THINKING** **CSTA K–2 1A-AP-08** Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. **SPEAKING AND LISTENING** **CCSS.ELA-Literacy.SL.1.4** Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.	• Build and program a model that represents an experience. • Use the model to share key details of the experience.	Have students think of a great experience they had and some key details of the experience that they enjoyed. Then prompt them to build and program their model to share one or more of the key details. **SAY/ASK** *Think of something you did recently that you really enjoyed. What made it great? Build and program a model that shows something specific that you really liked.*

#	Activity Name	Topic(s) & Standards	Objectives Students will	Prompt
9 🕐	**PROMPT** **More with ELA and Computer Science** 🟩🟩	**COMPUTATIONAL THINKING** **CSTA 1A-AP-11** Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. **DESIGN ENGINEERING** **NGSS K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	• Design and build an object through a collaborative process. • Break down tasks to identify all the parts.	Lead students to explore decomposing, which involves breaking a task into its subtasks. Elicit ideas about times students tried something new. Then organize pairs and have them build an object together, with Student A building the first half and Student B completing the second half. Prompt them to combine their two halves and then discuss the importance of knowing all the small steps in the overall task. **SAY/ASK** *Think of a time you tried something new. What was hard about it? What could make it easier? Now work with a partner to build something. One of you will build the first half and the other will build the second half. What steps are in building each half? How does knowing all the steps help you put them together?*

		Arctic Ride		
#	**Activity Name**	**TOPIC(s) & Standards**	**Objectives** Students will	**Prompt**
10 🕐🕐	**LESSON**	**COMPUTATIONAL THINKING** **CSTA 1A-AP-11** Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. **DESIGN ENGINEERING** **NGSS K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **LANGUAGE** **CCSS.ELA-Literacy.L.1.1.I** Use frequently occurring prepositions **SCIENCE SKILL PRACTICE: HABITATS (Polar)**	• Use directional vocabulary to describe a sequence. • Break a problem down into smaller parts. • Practice helping a story character. • Participate in collaborative conversations.	After students build the Arctic ride model, prompt discussion about what the Arctic is like. Then have students program their model to travel in the Arctic so Leo can see some polar bears. Ask them questions about where they want to go that require directional words like *left*, *right*, and *straight*. **SAY/ASK** *Leo is going on an Arctic adventure to see polar bears. How can he use his snowmobile to get there? What is it like in the Arctic? Tell me where Leo will go. Use words like* left, right, *and* straight. **MORE DETAILS** *Arctic Ride lesson* or access in the LEGO® Education SPIKE™ App.
11 🕐	**PROMPT** **More with Math**	**COMPUTATIONAL THINKING** **CSTA 1A-AP-11** Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.	• Break a problem down into smaller parts. • Estimate and measure length with a LEGO brick	Extend the *Arctic Ride* lesson to math as partners try to reach each other's second destination. Have students first estimate the distance to the destination, using a 2x4 LEGO®

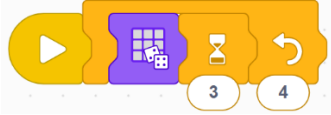| #	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
		MEASUREMENT AND DATA **CCSS.MATH.Content.1.MD.A.2** Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.	as the unit. • Express length as a number of units.	brick as the measurement unit. Then students can create a program to travel to the destination. SAY *With your partner, tell each other where Leo's next trip goes. Then use LEGO® bricks to measure the distance of each trip. Say how far it is by counting the number of bricks.*
12 (clock icon)	**PROMPT** **More with ELA**	**RESEARCH FOR WRITING** **CCSS.ELA-Literacy.W.1.7** Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).	• Research the Arctic using provided sources. • Write (or draw & label) an informational how-to text as a sequence of instructions.	Prompt students to learn more about exploring the Arctic, and then work together to create a how-to brochure. Provide appropriate research sources. If you wish, share page templates for a brochure. Encourage labeled drawings or dictation according to students' writing development. SAY *Learn more about exploring in the Arctic. Then work with your partner to create a how-to document. Tell your ideas as step-by-step instructions. Add drawings if you like.*

#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
13 (clock icon)	**PROMPT** **More with ELA and Computer Science**	**SEQUENCES/LOOPS** **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem. **DESIGN ENGINEERING** **NGSS K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **SPEAKING AND LISTENING** **CCSS.ELA-Literacy.SL.1.4** Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.	• Define success criteria to help evaluate a solution. • Compare and contrast different solutions to determine which one meets the specified need. • Engage effectively in a range of collaborative discussions.	Have students apply their experience from helping Maria, Sofie, Leo, and Daniel to solve problems in different stories. Have students create their own stories for the team. Model use of the Display Image block random setting (with dice) to create unexpected backgrounds in the LEGO® Education SPIKE™ App. Ask students to run the block when starting the program, and then to start a story with the setting they see. SAY/ASK *Think about the stories Maria, Sofie, Daniel, and Leo shared with you. Create a new one for them. Use the random image block in the App to choose a place. Then tell the story.* MORE DETAILS *Display Image block* in the Help section of the LEGO® Education SPIKE™ App, available on the web or downloaded.

#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
14	**PROMPT**	**COMPUTING TERMINOLOGY** **CSTA K–2 1A-CS-02** Use appropriate	• Follow instructions to create a program.	Introduce students to the Light Matrix. Display it and have them predict what the element does. Then prompt them to

(clock) Meet the Light Matrix	terminology in identifying and describing the function of common physical components of computing systems (hardware).	• Use appropriate terminology when using hardware.	complete *The Light* tutorial in their LEGO® Education SPIKE™ App. Regroup students and lead discussion about where they might see lights like this used in the real world. **SAY** *Connect the light to your hub. Then create the program to turn it on.* **Then try this>** *Use the steps to show a pattern on the light.* **MORE DETAILS** *The Light* tutorial in the START section of the LEGO® Education SPIKE™ App, available on the web or downloaded.

	Cave Car		
#	**Activity Name**	**TOPIC(S) & Standards**	**Objectives** Students will	**Prompt**
15 (clock) (clock)	**LESSON**	**DEVELOP PROGRAMS** **CSTA 1A-AP-12** Develop plans that describe a program's sequence of events, goals, and expected outcomes. **WAVES: LIGHT** **NGSS 1-PS4-2** Make observations to construct an evidence-based account that objects can be seen only when illuminated.	• Describe a program's sequence of events, goals, and expected outcome. • Explore objects that can be seen if light is available. • Practice helping a story character. • Participate in collaborative conversations.	After students build and program the cave car model, have them describe their programming steps and their learning about the role of light in seeing objects. **SAY/ASK** *Daniel wonders what lives inside a dark cave. What do you think is hiding in the dark? Build and program a cave car for Daniel. Why does he need a light to see objects in the dark cave?* **MORE DETAILS** *Cave Car* lesson or access in the SPIKE App
16 (clock)	**PROMPT** More with Computer Science and ELA	**SEQUENCES** **CSTA 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem. **NARRATIVE WRITING** **CCSS.ELA-Literacy.W.1.3** Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.	• Identify repetition in stories and games. • Use a loop block to include repetition in a program.	As a class, read a story that includes repeated phrases or play a game that includes repeated actions like head, shoulders, knees and toes. Discuss the repetition. Then have students apply repetition to programming by creating a repeating pattern with the motor or Light Matrix. Share a sample code with multiple repeated steps and introduce the loop block as a way to reduce the number of blocks needed. **SAY** *Now that we've explored repetition in a [story/game], let's use it for our programs. Here's a program that repeats a task many times. Here's another way to do it, with a Repeat block. You can repeat a task a specific number of times, like 3 or 5, or you can repeat it forever.*

				MORE DETAILS *The Light* tutorial in the START section and the Control Blocks (Forever or Repeat Loop) in the Help section of the LEGO® Education SPIKE™ App, available on the web or downloaded.
17 ⏱	**PROMPT** **More with Computer Science and Math**	**SEQUENCES** **CSTA 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem. **COLLECT DATA** **1A-DA-06K-2** Collect and present the same data in various visual formats. **REPRESENT AND INTERPRET DATA** **CCSS.MATH.Content.1.MD.C.4** Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	• Collect and analyze data on colors in a random pattern. • Create different types of charts or graphs to present information. • Use computing tools to create and present data in various forms. • Represent data organized by color and express which categories show more or less frequently than others.	Explore loops further with students. Have students program the Light Matrix to give a random display. Sample code: repeats 4 times Then have students use tick marks to record each color shown, placing these in a data table. Ask them which colors appear more or less frequently. If you wish, introduce the Bar Graph block in the SPIKE App and challenge students to show their results in a bar graph with bars for each color. **SAY/ASK** *Program your Light Matrix to show its lights in a random pattern. Count how many times each color shows. Write marks for each time in a table. Which colors show more often? Which ones show less often?* ***Then try this>*** *Use a Bar Graph block to record the colors in your SPIKE App.* **MORE DETAILS** *The Light* tutorial in the START section and *Bar Graph Blocks* in the Help section of the SPIKE App, available on the web or downloaded.
18 ⏱	**PROMPT** **More with ELA**	**INFORMATIVE WRITING** **CCSS.ELA-Literacy.W.1.2** Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. **RESEARCH FOR WRITING**	• Use research to learn what animals that live in caves eat, look like, and do when "playing." • Write an informative paragraph about an animal that lives in a cave,	Provide appropriate sources and have students research animals that live in caves. Prompt students to write an informational paragraph about some animals that live in the cave, including description of what they look like, eat, and do for play. If you wish, share examples or videos of young animals "playing," like kittens with a ball of yarn or baby

| | | CCSS.ELA-Literacy.W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).

SCIENCE SKILL PRACTICE: ANIMAL SURVIVAL NEEDS | including facts from research.
• Build a model to show something about the cave animal. | bears. If time allows, ask students to build a model of one animal and program it to eat or "play."

SAY/ASK *Learn about animals that live in caves. Choose one animal. Write a paragraph that explains what it looks like, what it eats, and how it "plays."*
Then try this> *Build a model of your animal and program it to eat or "play."* |

		Illumination		
#	**Activity Name**	**TOPIC(S) & Standards**	**Objectives** Students will	**Prompt**
19 Ⓛ Ⓛ	**LESSON**	WAVES: LIGHT **NGSS 1-PS4-2** Make observations to construct an evidence-based account that objects can be seen only when illuminated. SEQUENCES/LOOPS **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem.	• Use and develop programs with sequences and simple loops. • Build a model flashlight that can illuminate darkened areas. • Observe the effect of light on objects in a darkened space. • Use evidence from observations to explain that objects can only be seen when light is present.	Have students explore illumination by building Sofie a flashlight and using it to light an object inside a dark space. (See the lesson for science background and directions to build a pinhole viewer.) SAY/ASK *Sofie thinks something is under her bed. Can you help her see it? Build her a light to help her see it. Program it to make light in a dark space.* MORE DETAILS *Illumination* lesson or access in the LEGO® Education SPIKE™ App
20 Ⓛ	**PROMPT** **More with Science and Computer Science**	WAVES: LIGHT **NGSS 1-PS4-3** Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light. SEQUENCES/LOOPS **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem.	• Predict how materials will respond to different colors of light. • Investigate the effect of different colors of light on objects made of different materials. • Program the Light Matrix to produce light of different colors.	Prompt students to learn more about light by exploring the effect of different light colors on objects made of different materials (e.g., paper, metal, wood, etc.). Ask students to first predict what will happen with different colors of light and then to test to confirm or revise. Have them use the Light Matrix to produce the different colors of light and then test on various objects to see the effect. SAY/ASK *What might happen if you shine different colors of light on different materials, like paper or metal? Use the Light Matrix to create the different lights and then test your thinking. What happens?*

#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
21 🕐	**PROMPT** More with Math and ELA	**INFORMATIVE WRITING** **CCSS.ELA-Literacy.W.1.2** Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. **OPERATIONS: ADD AND SUBTRACT** **CCSS.MATH.Content.1.OA.B.3** Apply properties of operations as strategies to add and subtract.	• Write an illustrated guide of nighttime lights in the community. • Count the total light sources. • Group lights into human-made and natural, and add each category.	Brainstorm with students about light sources they might see outside a school or home window soon after it gets dark (streetlights, car headlights, neon signs, fireflies, stars). If students mention the moon as a light source, review that it's reflecting light from the sun and makes no light of its own. Have students create pages for an illustrated nighttime guide for their community. As needed, provide a page template with a window sentence frame such as *I see _____ outside. It makes light.* Then have students count all the light sources. If your students are ready, guide them to sort into natural and human-made sources. **SAY/ASK** *Look out the window just before dark. What examples do you see of light, like car headlights or signs? Create some pages for a guide to your community. Use drawings and labels.* **Then try this>** *Count the light sources. Put them in groups for made by people or made by nature. How many are in each group?*

#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
22 🕐	**PROMPT** Meet the Color Sensor	**COMPUTING TERMINOLOGY** **CSTA K–2 1A-CS-02** Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).	• Follow instructions to create a program. • Use appropriate terminology when using hardware.	Introduce students to the Color Sensor. Display it and have them predict what the element does. Then prompt them to complete *The Color Sensor* tutorial in their LEGO® Education SPIKE™ App. Regroup students and lead discussion about where they might color sensors used in the real world. **SAY** *Connect the Color Sensor and the Motor to your hub. Create the program to use the Color Sensor to turn on the motor.* **MORE DETAILS** *The Color Sensor* tutorial in the START section of the LEGO® Education SPIKE™ App, available on the web or downloaded.

		Animal Alarm		
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt

23 ⓛ ⓛ	**LESSON**	**SEQUENCES/LOOPS** **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem. **WAVES: SOUND** **NGSS 1-PS4-4** Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. **DESIGN ENGINEERING** **NGSS K-2-ETS 1-3** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	• Identify cause and effect. • Develop a program to solve a problem. • Use appropriate terminology when using hardware. • Practice helping a story character. • Participate in collaborative conversations.	After students build the animal alarm, have them program it to meet Leo's needs. Reinforce that he wants to know when different kinds of animals come by so that he can see them. **SAY/ASK** *Leo doesn't want to miss any of the animals walking by his campsite while he's asleep. Build an animal alarm to tell him when animals go by. Program it to make a sound when a blue animal comes by.* ***Then try this>*** *Program again for a red animal.* **MORE DETAILS** *Animal Alarm* lesson or access in the LEGO® Education SPIKE™ App
24 ⓛ	**PROMPT** **More with Math and Computer Science**	**MEASUREMENT AND DATA** **CCSS.MATH.Content.1.MD.C.4** Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another. **COLLECT DATA** **CSTA 1A-DA-06** Collect and present the same data in various visual formats.	• Collect and analyze data on different animals that walk by the camp. • Interpret data to compare how many more or less are in one category than another. • Use coding blocks and computing tools to create and present data in visual form.	Using the animal alarm, have students use the *Add One to Bar Graph Block* to count how many creatures walk by Leo's camp. Discuss the data, asking students to use words like *more* or *less* when comparing how many of each color were noticed. Reinforce that technology can help us gather data. **SAY/ASK** *Leo wants to know how many animals walk by. He also wants to know how many of each color. Use the Add One to Bar Graph Block to count what the Color Sensor sees as creatures walk by. Tell me which colors it counted. Use words like* more *or* less *to say how many of each color. How did the coding block help you get the information?* Sample code that counts one color at a time. **MORE DETAILS** *The Add One to Bar Graph* block in the Help section of the LEGO® Education SPIKE™ App, on the web or downloaded.
25 ⓛ	**PROMPT** **More with ELA**	**INFORMATIVE WRITING** **CCSS.ELA-Literacy.W.1.2** Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. **DESIGN ENGINEERING**	• Observe to gather evidence for the natural phenomena that moving at night helps some animals to survive. • Build and program a model to show how a nocturnal	Provide appropriate research materials about different nocturnal animals. Have students research and then write about animals that could walk by Leo's campsite, and how moving at night helps them meet needs like staying safe or getting food. Prompt them to build a model of one animal and program it to demonstrate how it moves at night.

	NGSS K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **STRUCTURE AND FUNCTION** **NGSS 1-LS1-1** Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. **SCIENCE SKILL PRACTICE: NOCTURNAL ANIMALS** Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.	animal moves. • Write an informative paragraph to explain learning about nocturnal animals.	**SAY** *Learn about animals that could walk by Leo's campsite. Build a model of one animal and program it to show how it moves at night.*

#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
26 🕒	**PROMPT** More with ELA	**NARRATIVE WRITING** **CCSS.ELA-Literacy.W.1.3** Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure. **DESIGN ENGINEERING** **NGSS K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	• Design, build, and program a model of hidden treasure. • Write a story about finding a hidden treasure and what to do with it. • Describe two sequenced events, using time words to show the right order.	Share a quick story prompt: *Maria, Sofie, Leo, and Daniel found a secret treasure map. It's led them to some hidden treasure.* Ask students to build and program a model of the hidden treasure the team finds. Then have them write a story about the search *or* what the team does with the treasure. **SAY** *Build and program a model of the hidden treasure that Maria, Sofie, Leo, and Daniel find. Then write a story about their adventure. You can write about their search for the treasure OR you can write about what they do with the treasure they found. Include at least two events and use time words to show the right order.*
27 🕒	**PROMPT** Brick Patterns 	**MATH SKILL PRACTICE: PATTERNS**	• Create patterns with LEGO® bricks. • Identify the missing piece of a pattern.	Tell students that they're going to create patterns with LEGO® bricks. Prompt them to create different types of patterns (e.g., color, shape, size, etc.). Then have them create a pattern with a missing part. Ask partners to identify the missing piece of each other's pattern. **SAY/ASK** *Make a pattern using LEGO bricks. For example, you can repeat colors, shapes, or sizes. Then make a pattern that's missing one part. Take turns seeing if your partner can tell what piece is missing.*

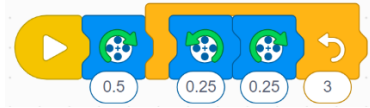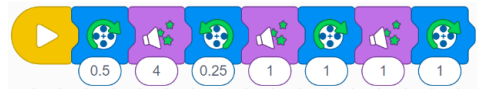| #	Activity Name	Topic(s) & Standards	Objectives Students will	Prompt
28 🕐	**PROMPT** **More with Computer Science and ELA**	**COMPUTING TERMINOLOGY** **CSTA 1A-AP-15** Using correct terminology, describe steps taken and choices made during the iterative process of program development. **LANGUAGE** **CCSS.ELA-Literacy.L.1.5.C** Identify real-life connections between words and their use (e.g., note places at home that are cozy).	• Use icon blocks to program a random sound generator. • Connect computing terminology to everyday uses of the words. • Use correct terminology to explain how different blocks in the provided code work.	Have students create and program a random sound generator to help the four friends play music for a dance party. Share the Music Block and point out the random option (with dice on it). Ask students how this code works. Introduce/review computing terminology such as *Wait Block* and connect it to everyday uses such as *waiting* for a light to turn green or a special school *event*. Then prompt students to use the correct words to describe the blocks: *event block, music block, wait block, loop block*. **SAY/ASK** *Maria, Sofie, Daniel, and Leo want to have a dance party. They all want to play different kinds of music. To make everyone happy, use the Music Block and program it to play random music. How does the code block work?*

		Musical Vibration		
#	**Activity Name**	**TOPIC(S) & Standards**	**Objectives** Students will	**Prompt**
29 🕐🕐	**LESSON**	**WAVES: SOUND** **NGSS 1-PS4-1:** Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **DESIGN ENGINEERING** **NGSS K-2-ETS 1-1** Ask questions, make observations, and gather information about a	• Build a model drum that uses vibration to make a sound when struck. • Plan and conduct investigations to test if vibrating materials produce sound. • Use evidence from their investigation to support	Build background about vibration (see the lesson for ideas). Have students use the model drum as inspiration to plan and investigate the vibration needed to make sound. Then have them program the drum to use in their investigation. Invite them to explain their investigation and what they learned. **SAY/ASK** *Maria plays piano. She wants to make more music. Can you build her something to play on? Think about different instruments. What should they do to make sound?*

		situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. **SEQUENCES/LOOPS** **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem.	the idea that vibrating materials can make sound.	*Plan a way to find out. Then build and program the drum model to help you test. Share what you learn with the class.* **MORE DETAILS** *Musical Vibration* lesson or access in the LEGO® Education SPIKE™ App
30 ⏲	**PROMPT** **More with Math**	**MATH SKILL PRACTICE: PATTERNS** **SEQUENCES/LOOPS** **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem. **COLLECT DATA** **1A-DA-07** Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions.	• Use loop blocks to create musical patterns. • Create sound patterns for a piece of music. • Describe patterns in code and in a piece of music.	Extend students' work with patterns to music. Share songs with repeating melodies or words, sometimes known as a *chorus*. Ask students what the pattern is (*The same sounds or words happen after each verse.*). Show students the musical score and circle the sections that repeat. Explain that scores are a way to visualize (see) musical patterns. Code is another way to express the patterns in a piece of music. Then have students help Maria create music with a repeating pattern. Ask them to add a Color Sensor to their model and program it to play one sound or song when blue is detected and a different sound or song when red is detected. Have them create a song that has a pattern. If you wish, provide a starting sound pattern with repetition, and have students remix the program to create their own. **SAY** *Help Maria create music that includes a repeating pattern. Add a Color Sensor to your model. Program it to play one sound or song when the sensor sees blue and another when it sees red. Then mix the colors in a pattern to make music!* **MORE DETAILS** *The Music* or *Sound Effect* blocks in the Help section of the SPIKE App, available on the web or downloaded.
31 ⏲	**PROMPT** **More with Math and ELA**	**INFORMATIVE WRITING** **CCSS.ELA-Literacy.W.1.2** Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. **MEASUREMENT AND DATA**	• Explain sounds observed throughout a day, recording times and explanatory information in a log. • In a log, record times that sounds occur, using hour and half-hour increments.	Provide blank paper logs with one hour and half-hour marks. Have students use theirs to keep a written, visual, or audio log of sounds they observe at different times of the day (humming of a refrigerator, a television, a bird calling or flapping its wings, a squeaking playground swing, thumping of a bouncing ball). Prompt them to write, draw (e.g., circle or use arrows on a picture), or say the time when they observed the sound and what object or material they think is vibrating to produce each sound.

		CCSS-MATH.Content.1.MD.B.3 Tell and write time in hours and half-hours using analog and digital clocks.		SAY/ASK *What sounds do you hear during the day or evening? Use a log to record them. Write or draw what you hear in the log. Then use a clock image or numbers or words to write what time it was when you heard the sound. Draw or write what was vibrating to make the sound.*

#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
32 🕐	PROMPT Sequences and Loops with Bricks	SEQUENCES/LOOPS CSTA K–2 1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem. COMPUTING TERMINOLOGY CSTA K–2 1A-AP-15 Using correct terminology, describe steps taken and choices made during the iterative process of program development.	• Use movement to demonstrate understanding of loops in coding. • Use correct terminology to explain how different blocks will create different loop results.	Assign a movement to a brick color and prompt students to complete that action (e.g., stand up, sit down, palms up/down, hands up/down, face forward/back, etc.) when you show that brick color. Repeat the prompt; this time using another brick as a signal to repeat the movement (loop). Note the repeated motion to help prepare students for using a loop in their programming. If you wish, explain the difference between the *Repeat Loop* block (a *for* loop) that repeats all the blocks inside it a certain number of times and the *Forever Block* (a *while* loop) that repeats all the blocks inside it forever. SAY *When I show this color brick, I want you to* [insert specific action]. *When I show this special brick, I want you to do the action again and again. In coding, we use a loop block to tell the program to do something again and again.* MORE DETAILS *Repeat Loop* or *Forever Loop (Control Blocks)* in the Help section of the LEGO® Education SPIKE™ App, available on the web or downloaded.

			Underwater Quest	

#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
33 🕐🕐	LESSON	SEQUENCES/LOOPS CSTA K–2 1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem. DESIGN ENGINEERING	• Understand that an action can be repeated. • Recognize and use patterns. • Develop programs that use simple loops (repetitions) to address a problem.	After students build the submarine model, have them apply their learning from the looping activity to program it for repeated motion. SAY/ASK *Maria is curious to explore life below the sea. How can she use her submarine to travel underwater? Build her a submarine. Then use loops to program it to move certain*

		NGSS K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **SCIENCE SKILL PRACTICE: FORCES AND MOTION** (Push)	• Practice helping a story character. • Participate in collaborative conversation.	*ways over and over. How did that make Maria's search easier?* **MORE DETAILS** *Underwater Quest* lesson or access in the SPIKE App
34 🕐	**PROMPT** **More with Computer Science**	**COMPUTATIONAL THINKING** **CSTA 1A-AP-14** Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops.	• Modify an existing program to make the solution work properly.	Share examples of programs that need debugging (fixing) to work correctly. Start by prompting students to compare code, using the first example and the code provided in *Underwater Quest*. Ask what has changed about the program. (The sound block has been removed.) Then share another example and ask students to test to identify why this program won't work. **SAY/ASK** *Let's look at some code examples. For the first one, what did I change? For the second one, why won't this program work? What can you change to fix the problem?*
35 🕐	**PROMPT** **More with ELA**	**PERSUASIVE WRITING** **CCSS.ELA-Literacy.W.1.1** Write opinion pieces in which they introduce the topic or name the book they are writing about, state an opinion, supply a reason for the opinion, and provide some sense of closure. **RESEARCH FOR WRITING** **CCSS.ELA-Literacy.W.1.7** Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). **CCSS.ELA-Literacy.W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. **DESIGN ENGINEERING**	• Research to learn about ocean wildlife like turtles. • Express their findings in a persuasive paragraph or through a model. • Build and program a model that demonstrates problems facing turtles.	Extend students' underwater study by having them research why it's important to look after wildlife like turtles. Prompt them share their findings in a short paragraph expressing their opinion OR in a model they design, build, and program. If you wish, provide background from the Oceans Fact Sheet and Sea Turtle Presentation Deck or other materials. **SAY** *Let's learn more about the turtles that Maria sees underwater. They need our help to stay safe and healthy. After you explore more about them, tell us what you learned. You can write a short paragraph saying WHY we should protect turtles OR you can build and program a model to show a problem that turtles have.* **MORE DETAILS** *Build the Change Oceans Fact Sheet* and learning materials in *Build the Change – Biodiversity and Climate Change, Case Study 4*

		NGSS K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.		

		Taking Shape		
#	**Activity Name**	**Topic(s) & Standards**	**Objectives** Students will	**Prompt**
36 ⏲		**Geometry** **CSSS.MATH.Content.1.G.A.1** Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.	• Use LEGO® bricks to identify the defining attributes of geometric shapes.	Provide LEGO® bricks and ask students to create shapes with them. Prompt students to make each shape as accurate as possible, for example, with the correct corners, edges, or equal sides. Lead discussion about each shape's attributes. **Say/Ask** *Let's build some shapes with our LEGO bricks. I'll name the shape and you build it. Make your shape as close to a real one as you can. Show corners or edges if they should be there. Show sides that are the same if the real shape has these. What are the shapes like?*
37 ⏲	**Prompts** **More with Math** 🟩🟩🟩	**CCSS.MATH.Content.1.G.A.2** Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.	• Use LEGO bricks to create composition shapes.	Next, have students build two of the same shape with their bricks and put the two shapes together in a composite shape. What makes the new shape a composite? (*It's made of two different shapes.*) Prompt students to make as many composites of different shapes and sizes as possible. **Say/Ask** *Now, build another shape just like one of the first. Put them together, using all the bricks. Keep combining shapes into new shapes. What are the new shapes like?*
38 ⏲		**CSSS.MATH.Content.1.G.A.3** Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.	• Use LEGO® bricks to partition rectangles into halves and quarters. • Explain that the resulting shares are smaller than the original shape.	Now, have students build a rectangle with their bricks. (If necessary, review the attributes of a rectangle.) Ask them to partition (separate) the rectangle into two halves. Then ask them to partition again to make fourths. Prompt students to compare and guide then to understand the new shares are smaller than the original rectangle. Repeat with different size rectangles and circles. **Say/Ask** *Build a rectangle with LEGO® bricks. Separate it to make two equal halves. And again, to make four equal quarters. How are these shares different than the rectangle?*

#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
39 🕐	**PROMPT** More with ELA	**DESIGN ENGINEERING** **NGSS K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **NARRATIVE WRITING** **CCSS.ELA-Literacy.W.1.3** Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.	• Practice communication skills through collaborative retellings. • Retell a familiar story with a beginning, middle, and end. • Design and build models to represent the beginning, middle, and end of the story.	Organize pairs to collaboratively retell a familiar story. Prompt them to build three models—one each to represent the beginning, middle, and end. If time allows, invite pairs to use their models to retell the story to the class. Ask them to use time order words to show the order of events. **SAY** *With your partner, retell a familiar story. Then build three models, one that shows the beginning, one that shows the middle, and one that shows the end. Use time order words to show the order that parts of the story happen.*

				Treehouse Camp
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
40 🕐 🕐	**LESSON**	**MODIFY PROGRAMS** **CSTA K–2 1A-AP-14** Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. **DESIGN ENGINEERING** **NGSS K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	• Identify and fix errors in a program (test and debug). • Test to ensure the program works correctly. • Practice helping a story character. • Participate in collaborative conversations.	After students build the treehouse, prompt them to program its roof to open. Guide them to understand that the provided program doesn't work, and they will need to debug (fix) it. **SAY** *Sofie is looking forward to seeing the moon from her treehouse! Build the treehouse model. Then try the program that makes the treehouse roof open. Oh no! It doesn't work. Look carefully at the program. Find the problem and fix it, so that Sofie gets a great view of the sky.* **MORE DETAILS** *Treehouse Camp* lesson or access in the LEGO® Education SPIKE™ App
41 🕐	**PROMPT** More with Computer Science	**SEQUENCES/LOOPS** **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem. **DESIGN ENGINEERING** **NGSS K-2-ETS1-3** Analyze data from tests of two objects designed to solve the same	• Use sensors to make the treehouse roof open and close automatically. • Practice testing coding solutions to compare strengths and weaknesses.	Prompt students to include a sensor (e.g., tilt, distance, force, color) in Sofie's treehouse to open and close the roof automatically. Direct them to try at least two different ways of using the sensor, and then compare the strengths and weaknesses of each solution. **SAY/ASK** *Let's make Sofie's treehouse roof open and close automatically. Code a sensor to help her. Try two different*

		problem to compare the strengths and weaknesses of how each performs.		*ways of using the sensor. Which works better? Tell me what's good or not good about each way you tried.* **MORE DETAILS** *Tilt, Distance, Force, or Color Sensor* blocks *(Event Blocks)* in the Help section of the LEGO® Education SPIKE™ App, available on the web or downloaded.
42 ⏲	**PROMPT** **More with ELA**	**SPEAKING AND LISTENING** **CCSS.ELA-Literacy.SL.1.5** Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.	• Describe Sofie's treehouse through labeled drawings.	Have students write a description of Sofie's treehouse by drawing a picture of it and labeling the parts. **SAY** *What is Sofie's treehouse like? Draw a picture. Use words to label the different parts, like the roof.*

#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
43 ⏲	**PROMPT** **Meet the Gyro Sensor**	**SEQUENCES/LOOPS** **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem. **COMPUTING TERMINOLOGY** **CSTA K–2 1A-CS-02** Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).	• Follow instructions to create a program. • Use appropriate terminology when referring to hardware.	To prepare students for the next activity, introduce them to the Gyro Sensor that is built into the hub. Use gesture to clarify tilting and explain that the Gyro Sensor recognized movement like this. Then have students complete the Built-In Gyro Sensor tutorial activity. **SAY** *Learn how to use the Gyro Sensor that is built into the hub. Connect a motor to the hub with Port A. Write the program to use the Gyro Sensor to make the motor turn. Tilt the hub and see what happens.* **MORE DETAILS** *The Gyro Sensor* tutorial in the START section of the SPIKE App, available on the web or downloaded.
44 ⏲	**PROMPT** **More with ELA**	**COMPUTING TERMINOLOGY/DEVELOP PROGRAMS** **CSTA K–2 1A-AP-15** Using correct terminology, describe steps taken and choices made during the iterative process of program development. **NARRATIVE WRITING** **CCSS.ELA-Literacy.W.1.3** Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.	• Use appropriate terminology when describing programming steps. • Tell stories prompted by random animal sounds.	Have students play some sounds to help Sofie start some storytelling around the campfire. Prompt them to program the *Animal Sounds Block* using the random option (with dice) and use the Gyro Sensor to start the program (with a tilt or other motion). As different animal sounds play, have students write stories about the animal for Sofie to tell. **SAY** *Sofie wants to tell some stories about animals at a campout. Help her choose the animals by playing some different animal sounds. Use the Animal Sounds Block set to the play different sounds (look for the dice). Then use the Gyro Sensor to start the program. For each animal sound you hear, write a short story that Sofie can tell her friends. Then tell me about your code and the sensors you used.*

			MORE DETAILS *The Gyro Sensor* tutorial in the START section and the *Tilt Sensor Block (Event Blocks)* in the Help section of the LEGO® Education SPIKE™ App, both available on the web or downloaded.

			The Great Desert Adventure	

#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
45 Ⓛ Ⓛ Ⓛ	**LESSON**	**DESIGN ENGINEERING** **NGSS K-2-ETS1-1** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. **DESIGN ENGINEERING** **NGSS K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **COMPUTATIONAL THINKING** **CSTA K–2 1A-AP-11** Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. **SEQUENCES** **CSTA K–2 1A-AP-12** Develop plans that describe a program's sequence of events, goals, and expected outcomes.	• Apply their engineering design skills to solve a problem. • Break down the problem to identify what's needed in a strong solution. • Describe a program's sequence of events, goals, and expected outcome.	Have students use their learning from the previous activities to help the team get to the pyramids. Prompt them to design, build, program, and test their solution, using at least one motor or sensor. **SAY** *It's time for another great adventure. Create a way for Sofie, Daniel, Maria, and Leo to get to the pyramids. Use at least one motor or sensor. Design, build, program and test your solution.* **MORE DETAILS** *The Great Desert Adventure* lesson or access in the SPIKE App
46 Ⓛ	**PROMPT** **More with Math**	**MEASUREMENT AND DATA** **CCSS.MATH.Content.1.MD.C.4** Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in	• Create a data table to show the number of bricks of each color used in a model. • Use icon blocks to	After their adventure to the pyramids, have students disassemble their models and organize the pieces by color. Prompt them to create a data table that shows the number of bricks of each color used. Ask students to compare data with others describing where they used more or less. If you

#	Activity Name	Topic(s) & Standards	Objectives Students will	Prompt
		each category, and how many more or less are in one category than in another. **COLLECT DATA** **1A-DA-06K-2** Collect and present the same data in various visual formats.	program a bar graph that shows the data visually.	wish, students may use the Bar Graph Block to show the data in their SPIKE App. **SAY** *Take apart your desert model. Sort the pieces by color. Then make a table to show how many of each color you counted. You can do that a paper table. Or you can do it in the SPIKE App, using the Bar Graph blocks.* **MORE DETAILS** *Bar Graph Blocks* in the Help section of the LEGO® Education SPIKE™ App, available on the web or downloaded.
47 🕐	**PROMPT** More with ELA	**NARRATIVE WRITING** **CCSS.ELA-Literacy.W.1.3** Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.	• Write a story that includes two or more sequenced events. • Use time order words to show the events in order.	Have students write a story about why the team decided to visit the pyramids, how they got there, and what they saw when they arrived. **ASK/SAY** *Why do you think the team wanted to visit the pyramids? Now that they have your model, what was their trip like to get there? What did they see at the pyramids? Brainstorm about these questions. Then write a story with at least two main events. Use time words to put them in order.*

	Transparency

#	Activity Name	Topic(s) & Standards	Objectives Students will	Prompt
48 🕐 🕐	**LESSON**	**WAVES: LIGHT** **NGSS 1-LS4-3** Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. **DESIGN ENGINEERING** **NGSS K-2-ETS1-1** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. **SEQUENCES/LOOPS**	• Plan and conduct an investigation to compare how different materials affect a beam of light. • Use evidence from tests to answer a question about choosing a material for a sunshade. • Build a model light source with which to test what happens when different materials are placed in a beam of light. • Develop programs that solve a specific problem.	Extend students' exploration of the desert by looking at effects of a hot sun. Have them build, program, and test a light that Leo can use to find the best materials for making a sunshade. **SAY** *After the* Great Desert Adventure, *Leo wants some shade. What materials should he use? Build a light and use it to test different materials.* **MORE DETAILS** *Transparency* lesson or access in the SPIKE App

#	Activity Name	Topic(s) & Standards	Objectives Students will	Prompt
		CSTA K–2 1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem.		
49 ⓛ	**PROMPT** More with ELA and Math	**INFORMATIVE WRITING** **CSSS.ELA-Literacy.W.1.2** Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. **RESEARCH WRITING** **CSSS.ELA-Literacy.W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. **SPEAKING AND LISTENING** **CSSS.ELA-Literacy.SL.1.5** Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings. **NUMBERS AND OPERATIONS-COUNTING** **CSSS.MATH.Content.1.NBT.A.1** Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral. **SCIENCE SKILL PRACTICE: WAVES–LIGHT (Transparency)**	• Use information from experiences to identify uses for transparent and translucent materials. • Write and illustrate a page that provides facts about ways to use transparent and translucent materials. • Count and number pages collected in book form.	Help students apply their learning about the concepts/ terms *transparent* (all light goes through) or *translucent* (some light goes through) materials. If you wish, review with examples like a transparent drinking glass and a translucent piece of tissue paper. Then have students create one page of an illustrated book about how they and their families use transparent or translucent items. Collect the pages into a class book and have students collaborate to count and number the pages. Students may include the LEGO® Minifigures if they wish. **SAY/ASK** *Write and draw one page of an illustrated book about using transparent (all light goes through) or translucent (some light goes through) materials. Remember that* transparent *means that "all the light goes through, like with a glass window."* Translucent *means that "some light goes through, like with fabric or a piece of tissue paper." Add your page to a class book. Then count and number the pages.*

	Communicate with Light and Sound			
#	**Activity Name**	**TOPIC(S) & Standards**	**Objectives** Students will	**Prompt**
50 ⓛ ⓛ	**LESSON**	**WAVES: LIGHT AND SOUND** **NGSS 1-PS4-4** Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. **DESIGN ENGINEERING**	• Design and build devices to communicate over a distance, one using light and one using sound. • Describe specific features of each design idea. • Explain how they tested	Have students explore light and sound waves by building and programming devices that Daniel and Sofie can use to communicate across the distance between their homes. Guide students to make two devices, one using light and one using sound.

#	Activity Name	Topic(s) & Standards	Objectives Students will	Prompt
		NGSS K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. **SEQUENCES/LOOPS** **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem.	their ideas and improved their designs.	**SAY/ASK** *Before their next adventure, Daniel is thinking about communication. Daniel lives across the street from Sofie. What can he use to send messages to her? Build and program something he can try. Make one model that uses light and one that uses sound.* **MORE DETAILS** *Communicate with Light and Sound* lesson or access in the LEGO® Education SPIKE™ App
51 ⏲	**PROMPT** More with ELA and Math	**INFORMATIVE WRITING** **CSSS.ELA-Literacy.W.1.2** Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. **NUMBERS AND OPERATIONS-COUNTING** **CSSS.MATH.Content.1.NBT.A.1** Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.	• Write and illustrate flashcards to teach a secret code to others. • Number the cards in the best order for learning and remembering them.	Have students write and draw the codes they created for Daniel and Sofie on flashcards. Have them use colors, numbers, pictures, and sound words (e.g., "bark") to make the flashcards. Encourage them to share the flashcards with their friends and family to explain how their codes can be used to communicate. **SAY/ASK** *Make flashcards to help Daniel and Sofie learn the code you made for them. Try them with your family. Which cards are important to learn first? Number the cards in this order to help everyone use them correctly.*

		Using Ideas from Nature		
#	**Activity Name**	**TOPIC(s) & Standards**	**Objectives** Students will	**Prompt**
52 ⏲⏲	**LESSON**	**STRUCTURE AND FUNCTION** **NGSS 1-LS1-1** Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external structures to help them survive, grow, and meet their needs. **DESIGN ENGINEERING** **NGSS K-2-ETS1-1** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	• Identify external body parts that animals use to grow and survive. • Design a solution to a human problem that mimics an external animal structure. • Describe the design, including its materials and how it works to solve a human problem.	Have students learn about biomimicry, or solving human problems by applying something that happens in nature. (See the lesson for examples). Prompt them to choose a human problem to solve and brainstorm ways to solve it. Encourage students to draw their ideas, and then to build and program a model of their solution. Elicit explanations. **SAY/ASK** *Daniel, Sofie, Leo, and Maria learned that some lightbulbs were made using ideas from how fireflies make light. Let's learn about other ideas we get from nature. What problem would you like to solve for people? Find a solution idea in nature. Then build and program a model to show it. Share and explain how your model works.*

		SEQUENCES/LOOPS **CSTA K–2 1A-AP-10** Develop programs with sequences and simple loops, to express ideas or address a problem.		**MORE DETAILS** *Using Ideas from Nature* lesson or access in the LEGO® Education SPIKE™ App
53 ⏲	**PROMPT** **More with ELA**	**PERSUASIVE WRITING** **CCSS.ELA-Literacy.W.1.1** Write opinion pieces in which they introduce the topic or name the book they are writing about, state an opinion, supply a reason for the opinion, and provide some sense of closure.	• Write an ad or flyer to persuade people to use an invention. • Use labeled drawings and words to supply reasons.	Have students develop their design drawing for an idea from nature into a flyer or ad for their invention. Ask them to use arrows, circles, and labels to explain how the invention works. They can also add a few words or a sentence telling people why they should use the invention. **SAY** *See if you can get other people to use your invention. Create an ad or a flyer. Use your design drawings or make new ones. Use arrows, circle, and labels to explain how your invention works. Tell people why they should use it.*