

# LEGO® Education STEAM Learning Progression



# SPIKE™ Essential Grade 2

## 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), Modify 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 (also 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](#)


## GRADE 2


Complete the full STEAM Progression in Activities 1–53  
OR  
choose from one of the paths.





COMPUTER SCIENCE PROGRESSION	SCIENCE PROGRESSION	DESIGN ENGINEERING PROGRESSION	SKILLBUILDERS AND EXTENSIONS
<a href="#"><u>The Fast Lane</u></a> (Activities 8–10)	<a href="#"><u>Redesigning to Make New Objects</u></a> (Activities 13–15)	<a href="#"><u>The Fast Lane</u></a> (Activities 8–10)	Meet the Hardware (Activities 2, 3–4, 5–7, 28–29)
<a href="#"><u>Classic Carousel</u></a> (Activities 11–12)	<a href="#"><u>Classify and Choose</u></a> (Activities 24–26)	<a href="#"><u>Classic Carousel</u></a> (Activities 11–12)	ELA/Literacy (Activities 10, 12, 15, 18, 25, 30, 32, 37, 40, 52)
<a href="#"><u>Rebuild the World with Video Food Production</u></a> (Activity 16)	<a href="#"><u>Habitats</u></a> (Activities 38–40)	<a href="#"><u>Rebuild the World with Video Food Production</u></a> (Activity 16)	Math (Activities 7, 15, 18, 20, 22, 25, 33, 47)
<a href="#"><u>The Perfect Swing</u></a> (Activities 17–20)	<a href="#"><u>Biodiversity and Climate Change</u></a> (Activities 41–44)	<a href="#"><u>The Perfect Swing</u></a> (Activities 17–20)	
<a href="#"><u>Snack Stand</u></a> (Activities 21–22)	<a href="#"><u>Pollination</u></a> (Activities 45–47)	<a href="#"><u>Snack Stand</u></a> (Activities 21–22)	
<a href="#"><u>Twirling Teacups</u></a> (Activities 27–30)	<a href="#"><u>Bees</u></a> (Activities 48–49)	<a href="#"><u>Twirling Teacups</u></a> (Activities 27–30)	
<a href="#"><u>The Spinning Ferris Wheel</u></a> (Activities 31–33)	<a href="#"><u>Protection from Wind</u></a> (Activities 50–53)	<a href="#"><u>The Spinning Ferris Wheel</u></a> (Activities 31–33)	
<a href="#"><u>Remix the Ride</u></a> (Activity 34)		<a href="#"><u>Remix the Ride</u></a> (Activity 34)	
<a href="#"><u>The Most Amazing Amusement Park</u></a> (Activities 35–37)		<a href="#"><u>The Most Amazing Amusement Park</u></a> (Activities 35–37)	




#	Activity Name	TOPIC(s) and Standards	Objectives Students will	Prompt
1 	<b>PROMPT</b> <b>Back-to-Back with Bricks</b> 	<b>SEQUENCES</b> <b>CSTA 1A-AP-12</b> Develop plans that describe a program's sequence of events, goals, and expected outcomes.	<ul style="list-style-type: none"> <li>Investigate what makes a sequence by practicing creating step-by-step instructions.</li> <li>Understand the importance of clear steps and directions.</li> </ul>	<p>Use a simple follow-the-steps activity to introduce students to the coding concept of sequencing. Organize pairs and provide each partner with the same 5–6 bricks.</p> <p><b>SAY/ASK</b> <i>Build a model. Without showing the model, tell your partner the exact steps to build it. What happens?</i></p> <p><b>MORE DETAILS</b> <a href="#">Basic Coding Concepts</a></p>
2 	<b>PROMPT</b> <b>Get Moving with the Motor</b> 	<b>SEQUENCES/LOOPS</b> <b>CSTA K–2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.  <b>COMPUTING TERMINOLOGY</b> <b>CSTA K–2 1A-CS-02</b> Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).	<ul style="list-style-type: none"> <li>Follow instructions to create a program.</li> <li>Explore programming a motor.</li> <li>Use appropriate terminology when using hardware.</li> </ul>	<p>Introduce students to the motor in their set as they apply bricks-only sequencing to a simple computer program.</p> <p><b>SAY</b> <i>Connect a small motor to your hub. Add an axle and any piece you like to the end of it. Then create a program to move the piece in two different directions and at two different speeds.</i></p> <p><b>MORE DETAILS</b> The Motor tutorial in the <b>START</b> section of the LEGO® Education SPIKE™ App, available on <a href="#">the web</a> or downloaded.</p>

#	Activity Name	TOPIC(s) and Standards	Objectives Students will	Prompt
		<b>The Color Sensor</b> <b>MORE DETAILS</b> The Color Sensor tutorial in the <b>START</b> section of the SPIKE App, available on <a href="#">the web</a> or downloaded.		
3 	<b>PROMPT</b> <b>Get Moving with the Color Sensor</b>	<b>SEQUENCES/LOOPS</b> <b>CSTA K–2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.  <b>COMPUTING TERMINOLOGY</b> <b>CSTA K–2 1A-CS-02</b> Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).	<ul style="list-style-type: none"> <li>Follow instructions to create a program.</li> <li>Use appropriate terminology when using hardware.</li> </ul>	<p>Introduce the Color Sensor as students use sequences and loops in a program to create movement if colors are sensed.</p> <p><b>SAY</b> <i>Connect a small motor and the Color Sensor to your hub. Add an axle and any piece you like to the end of it. Create a program that uses the Color Sensor to move the piece when blue is detected.</i></p> <p><b>Then try this&gt;</b> <i>Add two movements. Trigger each with a different color.</i></p>
4 	<b>PROMPT</b> <b>Making Music</b>	<b>COMPUTING TERMINOLOGY</b> <b>CSTA K–2 1A-CS-02</b> Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).		<p>Extend Color Sensor programming to include making sounds.</p> <p><b>SAY</b> <i>Connect the Color Sensor to the hub. Create a program that plays a sound when the sensor turns blue.</i></p> <p><b>Then try this&gt;</b> <i>Program music for a story you built or wrote.</i></p>


		<h3 style="text-align: center;">The Light Matrix</h3> <p style="text-align: center;">           MORE DETAILS <i>The Light Matrix</i> tutorial in the <b>START</b> section of the LEGO® Education SPIKE™ App, available on <a href="#">the web</a> or downloaded         </p>		
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
5 ⌚	<b>PROMPT</b> Creating Patterns	<p><b>SEQUENCES/LOOPS</b>  <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p> <p><b>COMPUTING TERMINOLOGY</b>  <b>CSTA K-2 1A-CS-02</b> Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).</p>	<ul style="list-style-type: none"> <li>Follow instructions to create a program.</li> <li>Use appropriate terminology when using hardware.</li> </ul>	<p>Introduce the Light Matrix as students learn to program it to show color according to input from the Color Sensor.</p> <p><b>SAY</b> <i>Connect the Color Sensor and the Light Matrix to your hub. Program the Light Matrix to show a color when the Color Sensor senses blue.</i></p> <p><b>Then try this&gt;</b> <i>Create a pattern with the Light Matrix. Program the Color Sensor to change the Light Matrix when different colors are sensed.</i></p>
6 ⌚	<b>PROMPT</b> Sending Signals	<p><b>COMPUTING TERMINOLOGY</b>  <b>CSTA K-2 1A-CS-02</b> Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).</p>		<p>Extend students' programming to send coded signals with the Light Matrix.</p> <p><b>SAY</b> <i>Make a secret code to send with the Light Matrix! Connect the Color Sensor and the Light Matrix to your hub. Send your secret code to a teammate across the room or table. See if your teammate can decode the message.</i></p>
7 ⌚	<b>PROMPT</b> Matrix Multiplication	<p><b>MATHEMATICAL OPERATIONS</b>  <b>CCSS.MATH.Content.2.OA.C.4</b> Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.</p>	<ul style="list-style-type: none"> <li>Use the Light Matrix to find the number of lights in an array of 3 columns and 3 rows.</li> <li>Say an equation to reflect what they see.</li> </ul>	<p>Extend students' use of the Light Matrix to simple multiplication. Organize pairs. Prompt students to program the Light Matrix to show two groups of three lights. Then have them describe this as an addition problem (3+3). Lead practice with other groups such as 2+2+2. Discuss how to use multiplication to find the same answer.</p> <p><b>SAY/ASK</b> <i>Connect the Light Matrix to your hub. Program the Light Matrix to show two groups of three lights. Use a math sentence to describe what you see. How many lights are there?</i></p>

		<b>The Fast Lane</b>		
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
8 (L) (L)	<b>LESSON</b>	<p><b>DESIGN ENGINEERING</b>  <b>NGSS K-2-ETS1-1</b> 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.</p> <p><b>SEQUENCES/LOOPS</b>  <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p>	<ul style="list-style-type: none"> <li>• Develop and modify programs with sequences and simple loops to solve a problem.</li> <li>• Practice brainstorming to generate ideas.</li> <li>• Practice helping a story character.</li> <li>• Describe key ideas or details from a text.</li> </ul>	<p>Have students generate and modify a program using the Color Sensor and Light Matrix.</p> <p><b>SAY</b> <i>Help Leo enter the amusement park with the Fast Lane! Create and test the program that turns on the light when Leo shows his yellow ticket to the Color Sensor.</i></p> <p><b>MORE DETAILS</b> <a href="#">The Fast Lane</a> lesson or access in the LEGO® Education SPIKE™ App.</p>
9 (L)	<b>PROMPT</b> <b>More with Computer Science</b>	<p><b>IMPACTS OF TECHNOLOGY</b>  <b>CSTA 1A-IC-16</b> Compare how people live and work before and after the implementation or adoption of new computing technology.</p>	<ul style="list-style-type: none"> <li>• Consider how technology has changed the way we live and act.</li> <li>• Develop a model to explain the process of entering the park without a sensor or scanner.</li> <li>• Practice brainstorming to generate ideas.</li> </ul>	<p>Have students build and program a new model to show the experience of entering the park without scanning technology.</p> <p><b>SAY/ASK</b> <i>What was it like to collect tickets before we had the technology to scan them? Build an experience Leo would have entering the park if he couldn't scan his ticket. Could you use other technology? Change your build or make a totally new entrance.</i></p>
10 (L)	<b>PROMPT</b> <b>More with ELA</b>	<p><b>SPEAKING/LISTENING</b>  <b>CCSS.ELA-Literacy.SL.2.5</b> Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.</p>	<ul style="list-style-type: none"> <li>• Create a story using video.</li> <li>• Practice helping a story character.</li> <li>• Describe key ideas or details from a text.</li> </ul>	<p>Extend students' exploration of Leo's experience through speaking and listening in a video.</p> <p><b>SAY</b> <i>Create videos of different things Leo can do while he's waiting in line to enter the amusement park.</i></p>


		Classic Carousel		
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
11	  LESSON	<p><b>SEQUENCES/LOOPS</b>  <b>CSTA 1A-AP-12</b> Develop plans that describe a program's sequence of events, goals, and expected outcomes.</p> <p><b>DESIGN ENGINEERING</b>  <b>NGSS K-2 ETS 1-1</b> 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.</p> <p><b>SKILL PRACTICE: FORCES AND MOTION</b></p>	<ul style="list-style-type: none"> <li>• Develop and modify sequence of events and outcomes of programs.</li> <li>• Improve and refine a prototype as part of the design process.</li> <li>• Practice helping a story character.</li> <li>• Describe key ideas or details from a text.</li> </ul>	<p>Have students use sequencing and the engineering design process to build and program a spinning ride for Sofie.</p> <p><b>SAY</b> <i>Create a new spinning ride for Sofie to try! Then create and modify the program to move the ride.</i></p> <p><b>MORE DETAILS</b> <a href="#">Classic Carousel</a> lesson or access in the LEGO® Education SPIKE™ App</p>
12	 PROMPT More with ELA	<p><b>NARRATIVE WRITING</b>  <b>CCSS.ELA-Literacy.W.2.3</b> Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.</p>	<ul style="list-style-type: none"> <li>• Develop a story focused on retelling events.</li> <li>• Practice helping a story character.</li> <li>• Describe key ideas or details from a text.</li> </ul>	<p>Extend students' exploration of Sofie's experience through story writing that contains temporal words.</p> <p><b>SAY</b> <i>Write a story about Sofie's experience at the amusement park. Include time words to show the order that things happen.</i></p>

		Redesigning to Make New Objects		
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
13	  LESSON Part A	<p><b>STRUCTURE &amp; PROPERTIES OF MATTER</b>  <b>NGSS 2-PS1-3</b> Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.</p> <p><b>DESIGN ENGINEERING</b>  <b>NGSS K-2-ETS1-1</b> Ask questions, make observations, and gather information about a</p>	<ul style="list-style-type: none"> <li>• Develop a program to address a problem.</li> <li>• Build a model of a kitchen tool and reassemble its pieces as a second tool.</li> <li>• Use model observations to explain how a set of pieces can be assembled and disassembled to form different objects.</li> </ul>	<p>Have students explore structure by building Leo a kitchen tool and then using the <b>same</b> pieces to build him a second tool. Guide them to redesign the model, not the program. If you wish, encourage students to draw their ideas.</p> <p><b>SAY</b> <i>Leo wants to make something for his dog to eat. Help him build the tools he needs in the kitchen. Then take it apart. Use the <b>same</b> pieces to build another tool for Leo! Change the model, not the program.</i></p>

		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.		<b>MORE DETAILS</b> <a href="#">Redesigning to Make New Objects</a> lesson or access in the LEGO® Education SPIKE™ App
14 Ⓛ Ⓛ	<b>LESSON</b> <b>Part B</b>	<p><b>SEQUENCES/LOOPS</b> <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p> <p><b>MODIFY PROGRAMS</b> <b>CSTA 1A-DA-05</b> Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data.</p>	<ul style="list-style-type: none"> <li>Retrieve and modify an existing program to use a tool in a different way.</li> <li>Iterate and test a program to address a problem.</li> </ul>	<p>Extend students' exploration to program their second tool. Encourage them to try adding lights, sounds, or a motor.</p> <p><b>SAY/ASK</b> <i>Now program Leo's second tool. Make it work a different way, like with lights, sounds, or a motor. Try it a few different ways. Does the tool still work if the program is different?</i></p> <p><b>MORE DETAILS</b> <a href="#">Redesigning to Make New Objects</a> lesson or access in the SPIKE App</p>
15 Ⓛ	<b>PROMPT</b> <b>More with Math and ELA</b>	<p><b>MEASUREMENT AND DATA</b> <b>CCSS.MATH.Content.2.MD.A.1</b> Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.</p> <p><b>INFORMATIVE WRITING</b> <b>CCSS.ELA-Literacy.W.2.2</b> Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.</p>	<ul style="list-style-type: none"> <li>Measure one of their kitchen tools with classroom measurement tools.</li> <li>Create written or video-taped illustrated directions for how to use the kitchen tool.</li> </ul>	<p>Have students create numbered and illustrated directions for one of the tools they created. Provide tools (e.g., rulers, yardsticks, meter sticks, and measuring tapes) so students can label their illustration with length measurements.</p> <p><b>SAY/ASK</b> <i>Create numbered directions for how to use one of Leo's tools. Include at least one illustration labeled with the length of the tool. Share your directions in writing or in a video. Trade directions with a classmate and try to follow them. What happens?</i></p>


#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
16 Ⓛ	 <b>LESSON</b> <b>Food Video Production</b>	<p><b>DESIGN ENGINEERING</b> <b>NGSS K-2-ETS1-2</b> 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.</p> <p><b>COMPUTATIONAL THINKING</b> <b>CSTA K-2 1A-AP-11</b> Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.</p>	<ul style="list-style-type: none"> <li>Design and build a model tripod to meet specific user needs.</li> <li>Break down the problem to identify what's needed in a strong solution.</li> <li>Program the model to meet at least one identified need, like a hands-free start and stop.</li> </ul>	<p>Have students design a tripod to help Video Food Producer, Rie, capture video of her recipes. Consider recommending a sensor that allows for easily starting and stopping the tripod.</p> <p><b>SAY</b> <i>Design, build, program and iterate on a tripod that will help Rie capture video of making her recipes. She wants to show different angles at different heights so that her viewers understand all the steps in the recipe.</i></p> <p><b>MORE DETAILS</b> <a href="#">Rebuild the World with Food Video Production</a></p>








		<h2 style="text-align: center;">The Perfect Swing</h2>		
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
17 (L) (L)	<b>LESSON</b> <b>Part A</b>	<p><b>DESIGN ENGINEERING</b>  <b>NGSS K-2-ETS 1-2</b> 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.</p> <p><b>SEQUENCES/LOOPS</b>  <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p>	<ul style="list-style-type: none"> <li>• Gather information about the needs or wants of others.</li> <li>• Change a solution to meet the needs or wants of others.</li> <li>• Practice helping a story character.</li> <li>• Describe key ideas or details from a text.</li> </ul>	<p>After students build the model swing, have them create and modify a program to meet Maria's needs. Reinforce that she wants a swing that doesn't go very fast. Guide students to change only the program.</p> <p><b>SAY/ASK</b> <i>Build the swing. Will Maria like it? She doesn't want a ride that goes too fast. Create a program that makes the swing work for her. Change it so it works even better. For now, just change the program. We'll get to the model soon!</i></p> <p><b>MORE DETAILS</b> <a href="#">The Perfect Swing</a> lesson or access in the LEGO® Education SPIKE™ App</p>
18 (L) (L)	<b>PROMPT</b> <b>More with Math and ELA</b>	<p><b>LANGUAGE</b>  <b>CCSS.ELA-Literacy.L.2.1</b> Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.</p> <p><b>MEASUREMENT AND DATA</b>  <b>CCSS.MATH.Content.2.MD.10</b> Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.</p> <p><b>COLLECT DATA</b>  <b>CSTA 1A-DA-06</b> Collect and present the same data in various visual formats.</p>	<ul style="list-style-type: none"> <li>• Collect and analyze data on likes and dislikes.</li> <li>• Create different types of charts to present information.</li> <li>• Use computing tools to create and present visual artifacts.</li> </ul>	<p>Have students interview their classmates to learn what they like and don't like about different amusement park rides. Establish common criteria, such as "rides that go fast" or "rides that spin around," so students can show yes/no answers as the data in different charts and graphs. Review familiar picture and bar graphs from students' math studies. If you wish, have them use the Bar Graph Blocks to show results in the SPIKE App.</p> <p><b>SAY</b> <i>Talk to some classmates. Ask what they like or don't like about different amusement park rides. Use yes or no questions like "Should rides go faster? Should they go slower?" "Should they spin you around?" Write down the answers. Then show them in a bar graph and a picture graph you create on the computer or with your SPIKE App.</i></p> <p><b>MORE DETAILS</b> Bar Graph Blocks in the <b>HELP</b> section of the SPIKE App, available on <a href="#">the web</a> or downloaded.</p>

<p>19</p> <p>⌚</p> <p>⌚</p>	<p><b>LESSON</b></p> <p><b>Part B</b></p>	<p><b>SEQUENCES</b>  <b>CSTA 1A-AP-12</b> Develop plans that describe a program's sequence of events, goals, and expected outcomes.</p> <p><b>MODIFY PROGRAMS</b>  <b>CSTA 1A-DA-05</b> Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data.</p>	<ul style="list-style-type: none"> <li>• Change a solution to meet the needs or wants of others.</li> <li>• Retrieve and modify an existing program to use a tool in a different way.</li> <li>• Design and test prototypes to ensure they meet a need.</li> </ul>	<p>Have students use the information and data from their interviews to build a new swing for their classmates. Guide them to open and retrieve their code from <i>The Perfect Swing</i> lesson and modify it for the new swing.</p> <p><b>SAY/ASK</b> Now, use what you learned from classmates to build a new swing they will like. What should it be like? Open the code you made for Maria's swing. What will need to change to make your new swing move?</p> <p><b>MORE DETAILS</b> <a href="#">The Perfect Swing</a> lesson or access in the LEGO® Education SPIKE™ App</p>
<p>20</p> <p>⌚</p>	<p><b>PROMPT</b></p> <p><b>More with Computer Science and Math</b></p>	<p><b>MODIFY PROGRAMS</b>  <b>CSTA 1A-DA-05</b> Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data.</p> <p><b>MEASUREMENT AND DATA</b>  <b>CCSS.MATH.Content.2.MD.A.1</b> Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.</p>	<ul style="list-style-type: none"> <li>• Retrieve and modify an existing program to use a model in a different way.</li> <li>• Use appropriate tools to count and measure the different heights on the Ferris wheel.</li> </ul>	<p>Provide measuring tools. Have students program their swing to stop at different heights, such as halfway or a fourth of the way to the top and measure the different heights. For an extra challenge, have students measure the swing at the top and subtract the other values to compare the differences.</p> <p><b>SAY</b> Daniel wants to swing really high! His friends are curious how high he can go. Help them determine different heights the swing can reach by measuring the distances from the ground.</p> <p><b>Then try this&gt;</b> Measure from the top to the new heights.</p>

		<b>Snack Stand</b>		
#	Activity Name	Topic(s) & Standards	Objectives Students will	Prompt
<p>21</p> <p>⌚</p> <p>⌚</p>	<p><b>LESSON</b></p>	<p><b>DESIGN ENGINEERING</b>  <b>NGSS K-2-ETS1-3</b> Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.</p> <p><b>COMPUTATIONAL THINKING</b>  <b>CSTA K-2 1A-AP-11</b> Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.</p>	<ul style="list-style-type: none"> <li>• Practice testing prototypes to ensure that they meet a need.</li> <li>• Modify and remix a solution.</li> <li>• Practice helping a story character.</li> <li>• Describe key ideas or details from a text.</li> </ul>	<p>After students build the model snack stand, have them create and modify a program so that Daniel gets a new snack when he presents his blue ticket. Guide them to break down the problem into its parts before they begin to program.</p> <p><b>SAY/ASK</b> Oh no! Daniel dropped his snack. Help him get a new one from the snack stand! What problems must you solve? Create and test a program so the Color Sensor reacts to Daniel's blue ticket. Be sure he can reach his new snack.</p> <p><b>MORE DETAILS</b> <a href="#">Snack Stand</a> lesson or access in the SPIKE App</p>

<p>22</p> <p></p>	<p><b>PROMPT</b></p> <p><b>More with Math</b></p>	<p><b>MEASUREMENT AND DATA</b>  <b>CCSS.MATH.Content.2.MD.10</b> Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.</p> <p><b>COLLECT DATA</b>  <b>CSTA 1A-DA-06</b> Collect and present the same data in various visual formats.</p>	<ul style="list-style-type: none"> <li>• Collect and analyze data on likes and dislikes.</li> <li>• Create different types of charts to present information.</li> <li>• Use computing tools to create and present visual artifacts.</li> </ul>	<p>Have students program the Color Sensor to react to other colors that represent snacks Daniel's friends want. Then have them use the collected data from the snack stand to create a bar graph on paper, with manipulatives, or with the Bar Graph block in their LEGO® Education SPIKE™. Discuss which color was used the most, least, etc., and some different ways to display the data with computing tools.</p> <p><b>SAY</b> <i>Daniel and his friends want different snacks. Give each snack type a blue, yellow, red, or green ticket, and then let the friends each select two snacks from the stand. Change your program so the Color Sensor reacts to these colors. Show the snack choices in a picture or bar graph on the computer or in the SPIKE App.</i></p> <p><b>MORE DETAILS</b> Bar Graph Blocks in the <b>HELP</b> section of the LEGO® Education SPIKE™ App, available on <a href="#">the web</a> or downloaded.</p>
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#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
<p>23</p> <p></p>	<p><b>PROMPT</b></p> <p><b>Attribute Sort with Bricks</b></p> 	<p><b>SKILL PRACTICE</b>            Sort and classify to preview NGSS 2-PS1-1.</p>	<ul style="list-style-type: none"> <li>• Sort their bricks based on different attributes.</li> <li>• Categorize groups.</li> <li>• Compare groups.</li> </ul>	<p>Share the prompt. Reinforce that we can observe properties like color, texture, hardness, and flexibility with our senses. After students sort the bricks, discuss the groups they created and why. Lead them in comparing the different ways that the class created groups and restate any observable properties.</p> <p><b>SAY/ASK</b> <i>The team needs help sorting their materials before they can build things. Explore the materials. What are they like? Help the team create different groups based on the characteristics they see in the materials.</i></p>

#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
 <p><b>Classify and Choose Materials</b></p>				
<p>24</p> <p> </p>	<p><b>LESSON</b></p> <p><b>Part A</b></p>	<p><b>STRUCTURE &amp; PROPERTIES OF MATTER</b>  <b>NGSS 2-PS1-1</b> Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.</p>	<ul style="list-style-type: none"> <li>• Describe the properties of different kinds of materials.</li> <li>• Plan and conduct an investigation to classify materials by their</li> </ul>	<p>Have students apply their learning from the Skill Practice activity as they select materials for a chicken coop that will keep Daniel's chickens safe. Then have them program the coop with an automatic door triggered by the Color Sensor.</p>

		<p><b>SEQUENCES/LOOPS</b>  <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p>	<p>properties.</p> <ul style="list-style-type: none"> <li>• Collect and record data on the properties of materials.</li> <li>• Build and program a model that incorporates materials with appropriate properties for building a chicken coop.</li> <li>• Create, test, and modify programs to address a need.</li> </ul>	<p><b>SAY</b> Daniel got some chickens. Help him build a chicken coop where they'll be safe and comfortable. Add an automatic door that opens and closes to keep the chickens safe. Create a program that uses the Color Sensor to control the door. Test and make the program work even better!</p> <p><b>MORE DETAILS</b> <a href="#">Classify and Choose Materials</a> lesson or access in the LEGO® Education SPIKE™ App</p>
<p><b>25</b>  <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">L</span></p>	<p><b>PROMPT</b>  <b>More with ELA and Math</b></p>	<p><b>INFORMATIVE WRITING</b>  <b>CCSS.ELA.Literacy.W.2.2</b> Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.</p> <p><b>MEASUREMENT AND DATA</b>  <b>CCSS.MATH.Content.2.MD.A.1</b> Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.</p> <p><b>MATH PRACTICES</b>  <b>CCSS.MATH.Practice.MP5</b> Use appropriate tools strategically.</p>	<ul style="list-style-type: none"> <li>• Draw and label drawings to explain the steps and sequence to build their chicken coop.</li> <li>• Use appropriate tools to count and measure the LEGO® Elements needed to build their coop.</li> </ul>	<p>Have students create and illustrate directions to build their chicken coop. Review that such directions should include a list of the materials needed. Provide measuring tools so students can determine the length of any LEGO® Elements.</p> <p><b>SAY</b> Create instructions to build your chicken coop. Include labeled drawings that show the building steps in the right order. List the materials you'll need, including how many of each material. Measure and list the lengths of any LEGO® pieces.</p>
<p><b>26</b>  <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">L</span>  <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">L</span></p>	<p><b>LESSON</b>  <b>Part B</b></p>	<p><b>STRUCTURE &amp; PROPERTIES OF MATTER</b>  <b>NGSS 2-PS1-1</b> Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.</p> <p><b>SEQUENCES/LOOPS</b>  <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p>	<ul style="list-style-type: none"> <li>• Describe the properties of different kinds of materials.</li> <li>• Plan and conduct an investigation to classify materials by their properties.</li> <li>• Collect and record data on the properties of materials.</li> <li>• Build and program a model that incorporates materials with appropriate properties for building a new animal shelter.</li> <li>• Create, test, and modify</li> </ul>	<p>Now prompt students to investigate materials for a different animal shelter. Lead discussion about students' selected animals and what they might need to be comfortable and safe, as well as other ways to include technology like the chicken coop's automatic door.</p> <p><b>SAY</b> Daniel wants to make shelters for some other animals. Choose an animal. Design and build a shelter with materials to keep it safe and comfortable. Find a way to include something you can program, like you did the chicken coop's automatic door. Create, test, and improve the program.</p> <p><b>MORE DETAILS</b> <a href="#">Classify and Choose Materials</a> lesson or access in the SPIKE App</p>

		programs to meet needs.	
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		Twirling Teacups		
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
27 	<b>LESSON</b>	<p><b>DESIGN ENGINEERING</b>  <b>NGSS K-2-ETS1-1</b> 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.</p> <p><b>CREATE PROGRAMS</b>  <b>CSTA K-2 1A-AP-08</b> Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.</p> <p><b>SEQUENCES</b>  <b>CSTA K-2 1A-AP-12</b> Develop plans that describe a program's sequence of events, goals, and expected outcomes.</p>	<ul style="list-style-type: none"> <li>• Modify a solution while considering a specific goal or outcome.</li> <li>• Refine and improve the prototype.</li> <li>• Practice helping a story character.</li> <li>• Describe key ideas or details from a text.</li> </ul>	<p>After students build the spinning ride, prompt discussion about what Sofie and Leo might want the ride to do. For example, maybe they want space for their friends OR for all the seats to spin or move. Guide students to program the model to meet some of the new needs. If you wish, also allow them to redesign the model.</p> <p><b>SAY</b> <i>Sofie and Leo are excited to try a new spinning ride. Build the ride and program it to move. Then change your program to meet some new needs, like space for more of the friends. Make sure the seats spin or move so the ride is still exciting! Test and make your program work even better!</i></p> <p><b>MORE DETAILS</b> <a href="#">Twirling Teacups</a> lesson or access in the LEGO® Education SPIKE™ App</p>
28 	<b>PROMPT</b> <b>Gyro Sensor</b> 	<p><b>SEQUENCES/LOOPS</b>  <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p> <p><b>COMPUTING TERMINOLOGY</b>  <b>CSTA K-2 1A-CS-02</b> Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware).</p>	<ul style="list-style-type: none"> <li>• Follow instructions to create a program.</li> <li>• Use appropriate terminology when using hardware.</li> </ul>	<p>To prepare students for the next spinning ride 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.</p> <p><b>SAY</b> <i>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.</i></p> <p><b>MORE DETAILS</b> <i>The Gyro Sensor</i> tutorial in the <b>START</b> section and <i>Tilt Sensor Block</i> in the <b>HELP</b> section of the SPIKE App, available on <a href="#">the web</a> or downloaded.</p>
29 	<b>PROMPT</b>	<p><b>DESIGN ENGINEERING</b>  <b>NGSS K-2-ETS 1-2</b> Develop a simple sketch, drawing, or physical model to illustrate</p>	<ul style="list-style-type: none"> <li>• Design, program, and iterate on a model.</li> <li>• Program movement based</li> </ul>	<p>Have students apply their learning about the Gyro Sensor to build and program a simple spinning ride similar to their</p>


	<b>More with the Gyro Sensor</b>	how the shape of an object helps it function as needed to solve a given problem.  <b>SEQUENCES/LOOPS</b> <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.	on using the Gyro Sensor.	teacup model. Prompt them to program the ride to move different ways based on the tilt of the Gyro Sensor.  <b>SAY</b> <i>Build another spinning ride like the twirling teacups. Use the Gyro Sensor to start the spinning motion. To do that, program the ride to move different ways based on the tilt of the Gyro Sensor in the hub. Then tilt away!</i>
30 	<b>PROMPT</b> <b>More with ELA</b>	<b>RESEARCH WRITING</b> <b>CCSS.ELA-Literacy.W.2.7</b> Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).  <b>PERSUASIVE WRITING</b> <b>CCSS.ELA-Literacy.W.2.1</b> Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section.	<ul style="list-style-type: none"> <li>• Use research sources or personal experience to identify different amusement park rides.</li> <li>• Write a paragraph to persuade classmates why one ride is the best one.</li> </ul>	Have students research different rides in an amusement park, select their favorite, and write a persuasive paragraph about why it's the best ride. As needed, build prior knowledge and provide research sources, especially for students unfamiliar with amusement parks. Review persuasive writing features.  <b>ASK/SAY</b> <i>What do you think is your favorite amusement park ride? Research to learn about different rides. Then write a paragraph to persuade your friends why it's the best ride.</i>

		<b>The Spinning Ferris Wheel</b>		
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
31  	<b>LESSON</b>	<b>DESIGN ENGINEERING</b> <b>NGSS K-2-ETS1-1</b> 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.  <b>MODIFY PROGRAMS</b> <b>CSTA K-2 1A-AP-14</b> Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops.	<ul style="list-style-type: none"> <li>• Modify an existing solution to make it work properly.</li> <li>• Practice helping a story character.</li> <li>• Describe key ideas or details from a text.</li> </ul>	After students build the Ferris wheel, prompt discussion about how the team can ride it together. Guide students to try programming the model to stop at a quarter turn so each of the friends can get on. Encourage them to use loops.  <b>SAY</b> <i>The team wants to ride the Ferris wheel together. Help them stop the ride so each of the friends can get on. Use a loop in your program. See if you can make the ride stop after a quarter turn.</i>  <b>MORE DETAILS</b> <a href="#">The Spinning Ferris Wheel</a> lesson or access in the LEGO® Education SPIKE™ App; <i>Forever Loop</i> and <i>Repeat Loop (Control Blocks)</i> in the <b>HELP</b> section of the SPIKE App

<b>32</b> 	<b>PROMPT</b> <b>More with Loops</b>	<p><b>SEQUENCES/LOOPS</b>  <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p> <p><b>MODIFY PROGRAMS</b>  <b>CSTA 1A-DA-05</b> Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data.</p> <p><b>NARRATIVE WRITING</b>  <b>CCSS.ELA-LITERACY.W.2.3</b> Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.</p>	<ul style="list-style-type: none"> <li>• Follow instructions to create a program.</li> <li>• Modify the program with loops to make the Ferris wheel stop after each quarter turn.</li> <li>• Develop a story focused on retelling events.</li> </ul>	<p>Explain the two loop types available in the LEGO® Education SPIKE™ App. The Repeat Loop block (a <i>for</i> loop) repeats all the blocks inside it a certain number of times, like 3. The Forever Block (a <i>while</i> loop) repeats all the blocks inside it forever. Guide students to explore these different ways to make the Ferris wheel loop and to create stories for why the team might like each way.</p> <p><b>SAY/ASK</b> <i>Leo notices there are two different ways to make the Ferris Wheel loop. Explore the two looping options in the SPIKE App. How are they different? Create a story for how the friends might use each type of loop to create a fun ride.</i></p> <p><b>MORE DETAILS</b> <i>Forever Loop and Repeat Loop Blocks (Control Blocks) in the <a href="#">HELP</a> section of the LEGO® Education SPIKE™ App, available on <a href="#">the web</a> or downloaded.</i></p>
<b>33</b> 	<b>PROMPT</b> <b>More with Math</b>	<p><b>GEOMETRY</b>  <b>CCSS.MATH.Content.2.G.A.3</b> Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.</p>	<ul style="list-style-type: none"> <li>• Describe portions of the Ferris wheel circle as halves, thirds, or fourths</li> <li>• Modify an existing solution to make it meet different needs.</li> </ul>	<p>Prompt students to redesign the Ferris wheel so people can only ride on some of the seats. Have them try half the seats, a third of the seats, and then a fourth of the seats. Guide students to draw their thinking and explain the equal or unequal shares and shapes they created.</p> <p><b>SAY/ASK</b> <i>Imagine some of the Ferris wheel seats are broken, so you want people to ride on only part of the wheel. Start with half the seats, then try a third and a quarter. Draw your ideas, using shapes to show which parts of the Ferris wheel circle people can ride on. Explain why each drawing meets each situation. Which shapes are equal? Which are unequal?</i></p>

#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
<b>34</b>  	<b>LESSON</b> <b>Remix the Ride</b> 	<p><b>DESIGN ENGINEERING</b>  <b>NGSS K-2-ETS1-1</b> 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.</p>	<ul style="list-style-type: none"> <li>• Brainstorm to generate ideas for completing an amusement park ride.</li> <li>• Develop communication skills as they articulate their ideas for rebuilding and remixing an amusement park ride.</li> </ul>	<p>To prepare for the open-ended activities 35–36, have students use the engineering design process to brainstorm new ideas for an amusement park ride.</p> <p><b>SAY</b> <i>It's time to help get an unfinished ride ready for the amusement park! Work together to brainstorm ideas for the new ride.</i></p>


		<b>DEVELOP PROGRAMS</b> <b>CSTA K-2 1A-AP-13</b> Give attribution when using the ideas and creations of others while developing programs.	<ul style="list-style-type: none"> <li>Practice giving and receiving feedback.</li> </ul>	<b>MORE DETAILS</b> <a href="#">Remix the Ride</a> lesson
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		<b>The Most Amazing Amusement Park</b>		
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
<b>35</b> (L) (L)	<b>LESSON</b> <b>Part A</b>	<b>DESIGN ENGINEERING</b> <b>NGSS K-2-ETS1-1</b> 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.  <b>SEQUENCES</b> <b>CSTA K-2 1A-AP-12</b> Develop plans that describe a program's sequence of events, goals, and expected outcomes.	<ul style="list-style-type: none"> <li>Apply their engineering design skills to solve a problem.</li> <li>Practice helping a story character.</li> <li>Describe key ideas or details from a text.</li> <li>Break down the problem to identify what's needed to identify what's needed in a strong solution.</li> </ul>	Lead discussion to summarize or continue the brainstorming from <i>Remix the Ride</i> . Then have students design a new ride for the amusement park, using at least one motor or sensor. Encourage the class to suggest multiple ideas. If you wish, have students draw their ideas first. You might also provide additional materials to support further creativity.  <b>SAY</b> <i>Get ready to create a new ride for the amusement park. Explore ideas that include at least one motor or sensor, like the Color Sensor.</i>  <b>MORE DETAILS</b> <a href="#">The Most Amazing Amusement Park</a> lesson or access in the LEGO® Education SPIKE™ App
<b>36</b> (L) (L)	<b>LESSON</b> <b>Part B</b>	<b>COMPUTATIONAL THINKING</b> <b>CSTA K-2 1A-AP-11</b> Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.		Have students build their ideas for a new ride, then program and test to improve the ride.  <b>SAY</b> <i>Build your ideas and program your ride to be fun for the team. Remember to use at least one motor or sensor, and to test your program at least two times. Each time, find ways to make it work a little better.</i>  <b>MORE DETAILS</b> <a href="#">The Most Amazing Amusement Park</a> lesson or access in the SPIKE App
<b>37</b> (L)	<b>PROMPT</b> <b>More with ELA</b>	<b>NARRATIVE WRITING</b> <b>CCSS.ELA-LITERACY.W.2.3</b> Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.	<ul style="list-style-type: none"> <li>Write a paragraph for a story, describing thoughts and feelings about an event.</li> </ul>	Have students write a description of their amusement park rides, explaining why they're fun and exciting.  <b>ASK/SAY</b> <i>What makes your ride fun and exciting? Imagine Sofie, Daniel, Leo, or Maria is telling the others. Write a paragraph to describe the ride and their feelings about it.</i>




		<b>Habitats</b>		
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
38 (L) (L)	<b>LESSON</b> <b>Part A</b>	<b>BIODIVERSITY/HABITATS</b> <b>NGSS 2-LS4-1</b> Make observations of plants and animals to compare the diversity of life in different habitats.  <b>SEQUENCES/LOOPS</b> <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.	<ul style="list-style-type: none"> <li>Record observations of the types of plants and animals that live in different habitats.</li> <li>Compare the diversity of life in different habitats.</li> <li>Build a model that shows important features of a habitat, including plants and animals that live there.</li> <li>Retrieve and modify an existing program to use a tool in a different way.</li> </ul>	<p>You may want to assign habitats and then combine several student pairs to work together on building their habitat. Provide materials about the different habitats. Have students design, test, and iterate a model of a habitat including the animal(s) and plant(s) in it. Then guide them to program one animal model to move or make sounds like the real animal.</p> <p><b>SAY/ASK</b> <i>Sofie learned about the places giraffes live. She wonders about the other animals that live there. What about other places? Work with some classmates to learn about a habitat. Then build the plants and animals that live in it. Program one of them to move or make sounds.</i></p> <p><b>MORE DETAILS</b> <a href="#">Habitats</a> lesson or access in the LEGO® Education SPIKE™ App</p>
39 (L) (L)	<b>LESSON</b> <b>Part B</b>	<b>BIODIVERSITY/HABITATS</b> <b>NGSS 2-LS4-1</b> Make observations of plants and animals to compare the diversity of life in different habitats.  <b>DEVELOP PROGRAMS</b> <b>CSTA K-2 1A-AP-13</b> Give attribution when using the ideas and creations of others while developing programs.  <b>MODIFY PROGRAMS</b> <b>CSTA 1A-DA-05</b> Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data.	<ul style="list-style-type: none"> <li>Record observations of the types of plants and animals that live in different habitats.</li> <li>Compare the diversity of life in different habitats.</li> <li>Build a model that shows important features of a habitat, including plants and animals that live there.</li> <li>Retrieve and modify an existing program to use a tool in a different way.</li> </ul>	<p>Use a gallery walk or other familiar classroom routine to have students share their habitats. Prompt them to notice what's similar and different. Then have students remix their own program to add something new from another group, making sure to give credit to that group.</p> <p><b>SAY/ASK</b> <i>Sofie is investigating what's similar and different about the animals and plants in a habitat. Share habitats with your classmates. What's the same? What's different? Change your program to add something new you saw in another habitat. Remember to give credit to the group that gave you the idea.</i></p> <p><b>MORE DETAILS</b> <a href="#">Habitats</a> lesson or access in the SPIKE App</p>
40 (L)	<b>PROMPT</b> <b>More with ELA</b>	<b>PERSUASIVE WRITING</b> <b>CCSS.ELA-LITERACY.W.2.1</b> Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to	<ul style="list-style-type: none"> <li>Use research sources to learn about endangered plants and animals.</li> <li>Write or speak persuasively to ask people to help.</li> </ul>	<p>Provide learning materials about endangered animals or plants in the habitats represented in the class. Have students choose an example to explore, and then to write or speak persuasively asking for changes to help the animal.</p>

	connect opinion and reasons, and provide a concluding statement or section.		<p><b>SAY</b> <i>Some animals are in danger of disappearing. Learn about one of them. Then write or speak to ask people to help that animal. You can write a postcard from the animal, a written or recorded public service announcement (PSA), or a letter to your school newspaper.</i></p>
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		<b>Biodiversity and Climate Change</b>		
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
41 (L) (L)	<b>LESSON</b> <b>Animals, Habitats, and Climate Change</b>	<b>BIODIVERSITY/HABITATS</b> <b>NGSS 2-LS4-1</b> Make observations of plants and animals to compare the diversity of life in different habitats.	<ul style="list-style-type: none"> <li>Record observations of the habitats for different plants and animals.</li> <li>Compare the diversity of life in different habitats.</li> <li>Build, draw, or create a model of an animal and the important features of its habitat.</li> </ul>	<p>Distribute Animals Fact cards or guide students to research new animals that interest them. Once students choose and create an animal, have them create its habitat. Students may draw, use LEGO® elements, or create with other materials.</p> <p><b>SAY</b> <i>Learn about an animal you care about. Draw, build, or create it. Then create its habitat, including what it needs to eat, where it will get water, and where it will find shelter.</i></p> <p><b>MORE DETAILS</b> <a href="#">Build the Change - Biodiversity and Climate Change, Session 1</a></p>
42 (L) (L)	<b>LESSON</b> <b>Threats to Habitat from Climate Change</b>	<b>DESIGN ENGINEERING</b> <b>NGSS K-2-ETS 1-2</b> 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.	<ul style="list-style-type: none"> <li>Explore how habitats can change when the climate changes.</li> </ul>	<p>Guide students to explore the impact of climate change on habitats by removing aspects of their animal's habitat. Lead discussion about climate changes such as overheating, rising sea levels, or lack of water. Ask students to consider what will happen to the animal if these changes remove what the animal needs to survive.</p> <p><b>SAY/ASK</b> <i>Suppose the climate in your animal's habitat was too warm for plants to live or rising water covered its food. What would happen if there was nothing to eat?</i></p> <p><b>MORE DETAILS</b> <a href="#">Build the Change - Biodiversity and Climate Change, Session 2</a></p>
43 (L) (L)	<b>LESSON</b> <b>Polar Bears Part 1</b>	<b>BIODIVERSITY/HABITATS</b> <b>NGSS 2-LS4-1</b> Make observations of plants and animals to compare the diversity of life in different habitats.  <b>DESIGN ENGINEERING</b>	<ul style="list-style-type: none"> <li>Record learning and observations of animals that live in polar habitats.</li> <li>Build, draw, or create something that can</li> </ul>	<p>Share and build background about polar habitats, using the At the Poles Fact Sheet or materials of your choosing. Lead discussion about the problems that polar animals have because of climate change, like rising water, warmer water, more humans coming to fish, and pollution making plants and animals sick.</p>

		<p><b>NGSS K-2-ETS 1-2</b> 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.</p>	<p>protect polar animals from problems caused by climate change.</p>	<p><b>SAY/ASK</b> Learn about polar bears and other animals that live in their habitat. What problems do they have because of climate change?</p> <p><b>MORE DETAILS</b> <a href="#">Build the Change – Biodiversity and Climate Change, Case Study 1</a></p>
<p><b>44</b></p> <p>(L) (L)</p>	<p><b>LESSON</b> <b>Polar Bears</b> <b>Part 2</b></p>			<p>Have students create something to protect polar bears and other polar animals. They may draw, use LEGO® elements, or create with other materials that you provide.</p> <p><b>SAY</b> Think about the problems you discussed. Draw, build, or create a way to help the polar bears and the other animals that live in their habitat.</p> <p><b>MORE DETAILS</b> <a href="#">Build the Change – Biodiversity and Climate Change, Case Study 1</a></p>


		<h3 style="text-align: center;">Pollination</h3>		
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
<p><b>45</b></p> <p>(L) (L)</p>	<p><b>LESSON</b> <b>Part A</b></p>	<p><b>POLLINATION AND SEED DISPERSAL</b> <b>NGSS 2-LS2-2</b> Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.</p> <p><b>SEQUENCES/LOOPS</b> <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p>	<ul style="list-style-type: none"> <li>Explain how animals help plants spread pollen.</li> <li>Build an accurate model of the pollination process, with details showing pollen transfer through direct contact with a bird, a bat, or an insect.</li> </ul>	<p>Have students build a model to show one way that animals move pollen from one plant to another. Then have them program it to show when or how the pollination happens.</p> <p><b>SAY/ASK</b> Maria saw bees on the flowers of her apple tree. She wonders what they're doing. Can you help her learn? Build and program a model of an animal and some plants. Show how the animal moves pollen from one plant to another.</p> <p><b>MORE DETAILS</b> <a href="#">Pollination</a> lesson or access in the LEGO® Education SPIKE™ App</p>
<p><b>46</b></p> <p>(L) (L)</p>	<p><b>LESSON</b> <b>Part B</b></p>		<ul style="list-style-type: none"> <li>Build an accurate model of the seed dispersal process, with details showing pollen transfer through direct contact with a bird, a bat, or an insect.</li> </ul>	<p>Share background about ways that animals spread plant seeds, for example, by eating fruits and leaving the seeds in new places as droppings or having seeds stick to their bodies and later fall off in new places. Have students design, build, and program a model to show one of these ways.</p>

				<p><b>SAY</b> Sometimes animals spread the seeds plants make, which makes plants grow in new places. Learn about ways that animals spread seeds. Then design, build, and program a model that shows one of these ways.</p> <p><b>MORE DETAILS</b> <a href="#">Pollination</a> lesson or access in the LEGO® Education SPIKE™ App</p>
<p>47</p> <p>Ⓛ</p>	<p><b>PROMPT</b> More with Math</p>	<p><b>MEASUREMENT AND DATA</b> <b>CCSS.MATH.Content.2.MD.10</b> Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.</p>	<ul style="list-style-type: none"> <li>• Use a bar graph to learn about changes in monarch butterfly populations.</li> <li>• Add and subtract to find the difference in population between two years.</li> </ul>	<p>Share that monarch butterflies are important pollinators. Locate and provide a bar graph showing the changes in the population of these pollinators (search images for Monarch population in millions). Have students use the bar graph numbers (without the represented millions) to add and subtract the population of different years. For example, if the bar for 2015 says 42 and the bar for 2014 says 25, what is the difference in population between the two years?</p> <p><b>SAY</b> Butterflies also spread pollen from plant to plant. Learn about changes in the population of some butterflies. Then add and subtract to see how much change has happened between two years.</p>

<b>Bees</b>				
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
<p>48</p> <p>Ⓛ</p> <p>Ⓛ</p>	<p><b>LESSON</b> Bees and Other Insects</p>	<p><b>BIODIVERSITY/HABITATS</b> <b>NGSS 2-LS4-1</b> Make observations of plants and animals to compare the diversity of life in different habitats.</p> <p><b>DESIGN ENGINEERING</b> <b>NGSS K-2-ETS 1-2</b> 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.</p>	<ul style="list-style-type: none"> <li>• Record learning and observations of bees and other pollinators.</li> <li>• Build, draw, or create something that can protect bees from problems caused by climate change.</li> </ul>	<p>Share and build background about bees and pollination, using the Outdoor Fact Sheets or materials of your choice. Lead discussion about the problems that pollinators have because of climate change, like cities replacing forests, pavement replacing plants in people's yards, and dangers from people and vehicles. Have students create something to protect the pollinators. They may draw, use LEGO® elements, or create with other materials that you provide.</p> <p><b>SAY/ASK</b> Learn about bees and other pollinators. What problems do they have because of climate change? Draw, build, or create a way to help these animals.</p> <p><b>MORE DETAILS</b> <a href="#">Build the Change – Biodiversity and Climate Change, Case Study 2</a></p>

<p>49</p> <p>⌚</p>	<p><b>LESSON</b> <b>Bee Rescue</b></p>	<p><b>BIODIVERSITY/HABITATS</b> <b>NGSS 2-LS4-1</b> Make observations of plants and animals to compare the diversity of life in different habitats.</p> <p><b>DESIGN ENGINEERING</b> <b>NGSS K-2-ETS1-2</b> 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.</p>	<ul style="list-style-type: none"> <li>Record learning and observations about bees.</li> <li>Design and build a model of a tool to capture a queen bee.</li> <li>Program the model to meet at least one of the identified needs, like working quickly.</li> </ul>	<p>Explain that bees will follow their queen. Have students design a tool to help bee rescuers Julie and Jeff capture the queen bee so they can move a hive somewhere safer.</p> <p><b>SAY</b> <i>Julie and Jeff want to move a beehive somewhere safe. Design, build, program and iterate on a tool that they can use to capture the queen bee. They need it to work quickly because the queen moves fast. She might also be hiding in a dark spot away from light or from a smell she doesn't like.</i></p> <p><b>MORE DETAILS</b> <a href="#">Rebuild the World with Bee Rescue</a></p>
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		<b>Protection from Wind</b>		
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
<p>50</p> <p>⌚</p> <p>⌚</p>	<p><b>LESSON</b> <b>Part A</b></p>	<p><b>EARTH'S SURFACE/LANDFORMS</b> <b>NGSS 2-ESS2-1</b> Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.</p> <p><b>SEQUENCES/LOOPS</b> <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p>	<ul style="list-style-type: none"> <li>Design different solutions to slow or prevent wind from changing the shape of the land.</li> <li>Build a model to slow or prevent wind from changing the shape of the land.</li> </ul>	<p>Explain that wind can blow soil away, which makes problems for the animals that live on the land. Then have students build a model to protect the park from the wind.</p> <p><b>SAY/ASK</b> <i>Daniel, Sofie, Leo, and Maria felt a strong wind at the park. It blew a lot of the soil away. What could happen to the animals in the park? Can you help the team protect the soil? Design, build, program, and test a model to protect the park from the wind.</i></p> <p><b>MORE DETAILS</b> <a href="#">Protection from Wind</a> lesson or access in the LEGO® Education SPIKE™ App</p>
<p>51</p> <p>⌚</p> <p>⌚</p>	<p><b>LESSON</b> <b>Part B</b></p>	<p><b>DEVELOP PROGRAMS</b> <b>CSTA K-2 1A-AP-13</b> Give attribution when using the ideas and creations of others while developing programs.</p>	<ul style="list-style-type: none"> <li>Compare multiple class design solutions to slow or prevent wind from changing the shape of the land.</li> <li>Develop communication skills as they share and articulate their ideas for improving their models.</li> <li>Practice giving and receiving feedback.</li> </ul>	<p>Use a gallery walk or other familiar sharing routine for students to learn about each other's solutions for protecting the park's soil. Prompt discussion and voting on which solutions will work the best. Then have students iterate on their models to include ideas from other groups, reminding them to credit their classmates for borrowed ideas.</p> <p><b>SAY/ASK</b> <i>Share your ideas with classmates. Which ideas might work best? Then improve your own model and program to work better. Remember to give credit for any ideas you borrowed from other groups.</i></p>

				<p><b>MORE DETAILS</b> <a href="#">Protection from Wind</a> lesson or access in the LEGO® Education SPIKE™ App</p>
<p><b>52</b></p> <p>Ⓛ</p>	<p><b>PROMPT</b> More with ELA</p>	<p><b>RESEARCH FOR WRITING</b> <b>CCSS.ELA-Literacy.W.2.8</b> Recall information from experiences or gather information from provided sources to answer a question.</p> <p><b>INFORMATIVE WRITING</b> <b>CCSS.ELA-Literacy.W.2.2</b> Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.</p>	<ul style="list-style-type: none"> <li>• Use provided materials to learn about the effects of water erosion.</li> <li>• Use facts from research to orally explain one idea to slow or stop those effects.</li> </ul>	<p>Provide learning materials about ways that water erosion changes the shape of land. Have students learn about one example and orally present a solution to stop or slow it.</p> <p><b>SAY</b> <i>Learn about ways that water erosion can change the shape of land. Tell the class about one idea to stop or slow it.</i></p>
<p><b>53</b></p> <p>Ⓛ</p>	<p><b>PROMPT</b> More about Erosion</p>	<p><b>EARTH'S SURFACE/LANDFORMS</b> <b>NGSS 2-ESS2-1</b> Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.</p> <p><b>SEQUENCES/LOOPS</b> <b>CSTA K-2 1A-AP-10</b> Develop programs with sequences and simple loops, to express ideas or address a problem.</p>	<ul style="list-style-type: none"> <li>• Identify land features that make it exposed to wind or water erosion.</li> <li>• Use Tilt Sensor and Display Image Blocks to program random backgrounds in the SPIKE App.</li> </ul>	<p>Have students use the Tilt Sensor Block and the Display Image Block (dice option) to program random background scenes in the LEGO® Education SPIKE™ App. Lead discussion of the different scenes, asking students to identify which are exposed to wind or water erosion.</p> <div data-bbox="1239 795 1428 909" data-label="Image">  </div> <p>Here is a sample program.</p> <p><b>SAY/ASK</b> <i>Now that you know a bit about erosion from water and wind, put your learning together. Use the tilt sensor block to program a random background in your SPIKE App. Which scenes could be changed by wind erosion? Which could be changed by water erosion?</i></p> <p><b>MORE DETAILS</b> <i>Tilt Sensor Block (Event Blocks) and Display Images (Display Blocks) in the <a href="#">HELP</a> section of the SPIKE App, available on <a href="#">the web</a> or downloaded.</i></p>