LEGO® Education
STEAM Learning Progression

SPIKE™ Essential Grade 3

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, learning objectives, and a ready-to-use prompt.

To find what you need,

- ☑ scan the Learning Objectives & Prompts columns or 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 use only bricks and require no hardware/software

Activities that will take approximately 20–30 mins

or Activities that will take approximately 45 or 90 mins

LESSON Longer activities with full lesson support

MORE DETAILS Links that lead to lesson details and teaching support

PROMPT Short activities to quickly expand or extend the learning

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 3

Complete the full STEAM Progression in Activities 1–58

OR

choose from one of the paths.

COMPUTER SCIENCE PROGRESSION	SCIENCE PROGRESSION	SKILLBUILDERS AND EXTENSIONS
River Ferry (Activities 9–11)	*Rebuild the World with Racing* (Activities 17–18)	Design Engineering (Activities 6, 9, 12, 21, 23, 25, 28, 31, 37, 43, 45, 48, 53–56, 58)
Taxi! Taxi! (Activities 13–16)	*Preparing for the Weather* (Activities 24–27)	Meet the Hardware and Software (Activities 2–5, 7–8, 19–20)
Hovering Helicopter (Activities 21–23)	*Animal Behavior* (Activities 32–35)	ELA/Literacy (Activities 1–3, 6, 10–13, 22–23, 27, 31, 35, 39, 47, 50, 57)
Swamp Boat (Activities 28–30)	*Life Cycles* (Activities 40–42)	Math (Activities 11, 14–16, 26, 30, 35, 38, 42, 46, 49, 52)
Cable Car (Activities 37–39)	*Rebuild the World with Storytelling* (Activities 43–44)	
Big Bus (Activities 45–47)	*Solving Problems When Environments Change* (Activities 51–52)	
Get Around Town (Activities 48–50)	*Rebuild the World with Ocean Advocacy* (Activity 53)	
	Biodiversity and Climate Change (Activities 54–55)	
	Animals in Their Habitats (Activities 56–57)	

#	Activity Name	Objectives Students will	Prompt
1	**PROMPT** **Tallest Tower**	• Investigate what makes a sequence by practicing following step-by-step instructions. • Understand the importance of clear steps and directions. • Follow agreed-upon rules for collaborative work.	Use a simple follow-the-steps activity to introduce students to sequencing and the importance of working collaboratively. Organize pairs and provide each with the same bricks. Prompt pairs to build the tallest tower they can in 5 minutes. Then prompt them to build a second tower, taking turns adding to the tower, but **not** talking to each other. Lead discussion about why the second task is harder. If you wish, have students exchange verbal building directions. **SAY/ASK** *With your partner, build the tallest tower you can in 5 minutes. Now build another tower. Take turns adding to it. But don't talk to each other! What was different? Why?* ***Then try this>*** *Give your partner step-by-step building directions to create a tower.*
2	**PROMPT Meet New Blocks**	• Compare word and icon blocks to find the ones that do similar coding functions. • Explain how different software grammars can achieve the same result.	Introduce word coding blocks. From the SPIKE App Help section, first display some images of icon blocks and discuss what they do. Then display some word blocks and name some blocks that are similar. Prompt discussion. **SAY/ASK** *We're going to learn some new ways to code. If you've used icon blocks, you know some of these blocks. Now let's look at word blocks. What do you notice? Yes, there are many more. Which ones might do something similar to what you did with icon blocks? Which ones do something new?* **MORE DETAILS** 1) *The Motor* tutorial in the START section of the LEGO® Education SPIKE™ App, available on the web or downloaded. 2) *Coding Blocks in LEGO® Education SPIKETM Essential Lessons* (Units 1–2 use icon blocks; Units 3–5 use word blocks.)
3	**PROMPT Meet the Motor**	• Follow instructions to create a program. • Explore programming a motor. • Describe coding steps in sequence.	Introduce students to the motor in their set as they prepare to program it with word blocks. Using the Motor tutorial, have students start the motor. Then prompt them to describe the coding steps in words to a partner. **SAY** *Connect a small motor to your hub. Follow the tutorial steps to make it move. Then tell your partner step by step what the code does. Say what happens in order.* **MORE DETAILS** *The Motor* tutorial in the START section of the SPIKE App, available on the web or downloaded.

4	**PROMPT More with Word Blocks** 	• Follow instructions to create a program. • Explore programming a motor. • Use appropriate terminology when using hardware and software.	Extend students' exploration of word block coding with the tutorial in their App. Have them complete the tutorial to program the motor to move in different ways. **SAY** *Let's learn more about word block coding. Follow the tutorial to program it to move in different ways.* ***Then try this>*** *Program the motor to change directions and speed.* **MORE DETAILS** *Word Blocks* tutorial in the START section of the LEGO® Education SPIKE™ App, available on the web or downloaded.
5	**PROMPT Dancing Robot** 	• Follow instructions to create a program. • Explore programming a motor. • Use appropriate terminology when using hardware and software.	Extend motor programing through a dancing robot activity. **SAY** *Connect an axle to your motor. Build a small robot on the axle. Then connect the motor to the hub and program the motor to make the robot dance.* ***Then try this>*** *Now program the motor to move to the beat, playing slow and then faster music.* **MORE DETAILS** *Coding Blocks in LEGO® Education SPIKE™ Essential Lessons*
6	**PROMPT Rivet the Lonely Robot** 	• Design and build a model that can be a friend for Rivet the Lonely Robot. • Introduce and describe the new friend in the opening to a story.	Share with students that Rivet the Robot is lonely and bored. She's like a friend. Ask them to design and build a friend for Rivet so she won't be lonely anymore. Prompt discussion about what the friend might be like, how the two robots might meet, and what they might do together. Then have students write a story about the two robots. **SAY** *Rivet the Robot is lonely. Can you design a friend for her? Write a short story about the first time they meet. Describe what Rivet's new friend is like.* ***Then try this>*** *Add to your story with something the two friends could do together.*
7	**PROMPT Meet the Color Sensor** 	• Follow instructions to create a program. • Use appropriate terminology when using hardware and software.	Introduce the Color Sensor with the tutorial in the App. Once students have the motor moving with the Color Sensor, prompt them to describe the coding steps in words to a partner. **SAY** *Connect a motor and the Color Sensor to your hub. Follow the tutorial steps to make the motor move when the Color Sensor detects a specific color. Then tell your partner step by step what the code does. Say what happens in order.* **MORE DETAILS** *The Color Sensor* tutorial in the START section of the SPIKE App, available on the web or downloaded.

8	**PROMPT Meet the Light Matrix** 	• Investigate the Light Matrix. • Use word blocks to create sequences using the Light Matrix. • Use appropriate terminology when using hardware and software.	Introduce the Light Matrix as students program it to show light patterns. Invite them to share their work. **SAY** *The SPIKE team wants to use the Light Matrix in their adventures. Plug the Light Matrix into the hub and try programming it with word blocks to make light patterns. Show your patterns to other groups.* **MORE DETAILS** *The Light Matrix* tutorial in the START section of the LEGO® Education SPIKE™ App, available on the web or downloaded.

	**River Ferry**		
#	**Activity Name**	**Objectives** Students will	**Prompt**
9	**LESSON**	• Develop a sequence to solve a problem. • Decompose problems into smaller parts. • Recount an experience using relevant facts and descriptive detail. • Use the Light Matrix to send information to Daniel.	Use the *River Ferry* lesson to introduce decomposing problems into smaller sub-problems, a key skill in both programming and engineering design because it helps us understand the problem, focus on elements of it to solve, and identify constraints or criteria for success. **SAY** *Help Daniel create a program using the motor to move the ferry. That way he can reach the Spike Tower.* **MORE DETAILS** *River Ferry lesson* or access in the SPIKE App.
10	**PROMPT More with Computer Science**		Extend students' use of the Light Matrix by programming it to send signals for Daniel. If you want to include the added background prompt, use the Help section in the App to show students where to find backgrounds. **SAY** *Add the Light Matrix to the River Ferry model. Program it to show a green light when Daniel can safely leave the Ferry.* ***Then try this>*** *If you like, add a background to your program to show when Daniel arrives.* **MORE DETAILS** *The Light Matrix* tutorial in the START section; The Help section of the SPIKE App, available on the web or downloaded.
11	**PROMPT More with Math and ELA**	• Use a timetable to show departure, arrival, and ride times for the ferry. • In a few sentences, describe Daniel leaving, riding, and arriving on the ferry, using time words to show the sequence of events.	Ask students to create a ferry timetable, including departure and arrival times, and travel time. Then prompt pairs to use the timetables to discuss when to take Daniel or his friends should the ferry. If you wish, share a sample timetable such as for the school bus and sentence frames or exemplars.

			SAY/ASK *Make a timetable for when the ferry goes. Show the time it leaves, the time it arrives, and how long the ride is. Then use a few sentences to tell your partner about a day that Daniel can ride the ferry. Use time order words for when Daniel leaves one side, rides, and arrives on the other side.*

#	Activity Name	Objectives Students will	Prompt
12 🕒	**PROMPT** **More with ELA**	• Describe a story character by identifying a problem he or she has. • Design and build a solution to the character's problem.	Have student pairs identify a character from a story they are currently reading. Prompt them to design and build a way for the character to solve a story problem or complete a task. **SAY** *Leo and Maria love to tell stories. When they tell a story they like to think about how to help the characters. Think about the story we read. Design and build something to help one of the characters solve a problem or complete a task.*

	**Taxi! Taxi!**	
#	**Activity Name**	**Objectives** Students will	**Prompt**
13 🕒 🕒	**LESSON**	• Identify and fix errors in a program (test and debug). • Recount an experience using relevant facts and descriptive details.	After building the *Taxi! Taxi!* model, have students generate and modify a program to drive it to the museum and beyond. **SAY** *Leo needs help getting to the art museum. Help him create a program to move a taxi to the art museum using motor blocks.* ***Then try this>*** *Modify your program to make the taxi take Leo somewhere new. Tell your partner about the new place.* **MORE DETAILS** *Taxi! Taxi!* lesson or access in the LEGO® Education SPIKE™ App.
14 🕒	**PROMPT** **More with Math**	• Measure distances using a ruler. • Create programs based on measurements.	Have students create a map with new places Leo can visit. Provide rulers and prompt students to measure the distance to each place to the half or quarter of an inch. Then have them use their measurements to get code the taxi to reach each place. If desired, connect to the previous ***Then try this.*** **SAY/ASK** *Think about the new places you identified or other places Leo can go besides the art museum. Mark some of those places on a map. How far will Leo travel? Measure the distance to help Leo decide where to go.*

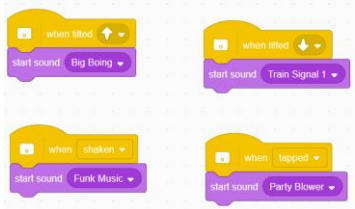
15	**PROMPT More with Math**	• Find the perimeter of an area using the side lengths.	Have students build a parking lot for the taxi, including a fence built by placing bricks side by side. Then prompt them to count the studs (bumps) around the entire fence. Define perimeter as the distance all around the fence. Have students count the studs on each side and add them together (for example, 10+10+10+10). Did they get the same amount with counting and by adding? If you wish, have students create new parking lot sizes and find the perimeter both ways. **SAY/ASK** *Build a parking lot for Leo's taxi. Give it a fence of LEGO bricks. Count the bumps on the bricks all the way around the fence. What did you count? Now count the bumps on each side and add them together? What did you count this time?* ***Then try this>*** *Build some other parking lot fences. Figure out the perimeter both ways. Did you get the same answers?*
16	**PROMPT More with Math**	• Explore two-dimensional shapes and angles. • Measure distances with a ruler. • Find the perimeter of an area using the side lengths.	Have students record the taxi's path, using the map they made in activity 14 or another map. Have students identify shapes in the path and use rulers to determine perimeters. **SAY/ASK** *Use a map of the path Leo's taxi takes. What shapes do you see in it? Use a ruler to measure the sides of the shapes and find the perimeter of each one.*

#	Activity Name	Objectives Students will	Prompt
17	 **LESSON** **Racing**	• Explore how design affects motion. • Consider how the speed of an object is related to the energy of an object. • Build and iterate on a design for a race car. • Program their race car to move.	Have students design, test, and iterate on a next level race car for Aurora. Encourage them to focus on the motion of the race car and discuss how the design could affect speed, for example because of friction or air resistance. If you wish, prompt students to also consider safety at high speeds and designing for sustainability. **SAY** *Design, build, program and iterate on a race car for Aurora. She wants to go fast. But she also wants to stay safe and be sustainable—not use too many tires for example.* **MORE DETAILS** *Rebuild the World with Racing*
18	**PROMPT More with Science and Computer Science**	• Create a chain reaction with a set of criteria. • Investigate using events to start a reaction. • Consider why the sequence of steps is important.	Leo, Maria, Sofie, and Daniel want to create a chain reaction that will move a ball. Have them use bricks like the links of a chain to represent the steps from the event that starts the reaction to the ball moving at the end. (You may want to display a chain to explain that a chain reaction is a connected series of events. Each event is connected to, and in this case caused by, the previous one.) Then have students motorize and program the chain reaction. Discuss the event block used and the steps/sequence for the chain reaction. **SAY/ASK** *Help the characters make a chain reaction to move a ball. Build the chain from bricks that stand for the steps needed to make the ball move. Then connect the*

			first brick to a motor. Use an event block to program the chain reaction. What is it important for the steps to happen in order?

The Gyro Sensor

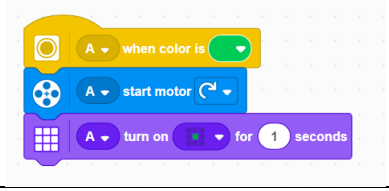
MORE DETAILS *The Gyro Sensor* tutorial in the START section of the LEGO® Education SPIKE™ App, available on the web or downloaded.

#	Activity Name	Objectives Students will	Prompt
19	**PROMPT** **Meet the Gyro Sensor**	• Follow instructions to create a program for the Built-in Gyro sensor. • Create word block sequences using sensors.	The characters want to investigate using the built-in Gyro Sensor to help their adventures. Ask them to connect the Light Matrix to the hub and then try programming the Gyro Sensor (using word blocks) to control the Light Matrix and cause it to create light patterns. As needed, use gesture to clarify tilt and/or have students complete the Build-In Gyro Sensor tutorial activity. **SAY** *Practice using the Gyro Sensor that is built into the hub. Connect the Light Matrix to the hub. Write a program with word blocks that uses the Gyro Sensor to make the Light Matrix create light patterns.*
20	**PROMPT** **More with the Gyro Sensor**	• Create a game that uses sound to get students moving. • Program and iterate the Gyro Sensor to act of the event in a program.	Have students design and program a game for Leo, starting by inventing rules for how to move (hop, skip, twirl, etc.) when a particular sound is played. Have students program the Built-In Gyro Sensor to make the different sounds based on how it is moved (tilted, shaken, etc.). As needed, show students how to find and use the When XX event blocks, which they'll need to use for the different motions they want. **SAY** *Help Leo invent a game that uses sounds to make you move. Program the Gyro Sensor to control sounds so that as it's tilted, shaken, and so on, different sounds are played. How should listeners move when they hear the sound? Should they hop, skip, twirl, or maybe jump?* 

	**Hovering Helicopter**		
#	**Activity Name**	**Objectives** Students will	**Prompt**
21 🕒 🕒	LESSON	• Describe the choices they've made when creating a program. • Create and test automated solutions. • Recount an experience using relevant facts and descriptive details.	Have students use programming and the engineering design process to build, program, and test a helicopter for Maria. **SAY** *Create, program, and test a helicopter to help Maria get to Spike Mountain for a hike!* **MORE DETAILS** *Hovering Helicopter* lesson or access in the LEGO® Education SPIKE™ App
22 🕒	PROMPT **More with ELA**	• Write a paragraph that includes sensory language to describe a character's experiences.	Extend students' exploration of Maria's experience through story writing that contains sensory language. **SAY** *Write a paragraph about Maria's hike. Use sense words to describe what she sees, hears, smells, and feel on her hike.*

#	**Activity Name**	**Objectives** Students will	**Prompt**
23 🕒	PROMPT **More with ELA**	• 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. **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.*

		**Preparing for the Weather**	
#	**Activity Name**	**Objectives** Students will	**Prompt**
24	**LESSON Part A**	• Build a model of a pet house designed to reduce the impact of a weather-related hazard. • Make a claim about how and why their design reduces the impact of the hazard to keep a pet safe. • Support the claim with evidence about the problems the hazard causes and reasons why the design addresses these problems. • Identify and fix errors in a program (test and debug).	Have students explore weather-related hazards and ways to reduce their impact. Prompt them to design and build a pet house that can withstand a weather-related hazard. If you wish, assign or share examples of hazards from which students can choose. **SAY** *Daniel learned that strong storms can damage pet houses. Help his design a pet house that keeps animals safe even in storms.* **MORE DETAILS** *Preparing for the Weather* lesson or access in the LEGO® Education SPIKE™ App
25	**LESSON Part B**		Extend students' exploration by inviting them to use their model as evidence of a claim about the problems the hazard causes and reasons that their model design addresses it. **SAY** *Now use your model to explain what problems you identified and how your design will address those problems.* **MORE DETAILS** *Preparing for the Weather* lesson or access in the SPIKE App
26	**PROMPT More with Math**	• Identify common shapes in pet house designs. • Compare designs to test and identify shapes that are strongest.	Lead discussion about the shape of the pet houses (most likely squares or rectangles. Prompt students to identify the common attributes (e.g., number of sides) of the shapes and to compare these to other shapes, building new models if needed. **SAY/ASK** *What is the best shape for the pet house to protect it against the weather? Share ideas as a class and identify common ideas. Build more models if you want to compare.*
27	**PROMPT More with ELA**	• Research the community's building safety rules to protect against severe weather. • Present research findings in writing, orally, or in video form.	Have students research how buildings are designed in their local area to reduce the impact of weather-related hazards. Invite them to share research through a preferred method, e.g., in writing, orally, or by video. As needed, direct students to appropriate research sources for local, state, or federal rules. Consider inviting a local builder to share. **SAY/ASK** *Find out how buildings are designed in our community to make them safe in strong storms or other bad weather. Then share your learning in writing, with an oral presentation, or through a video.*

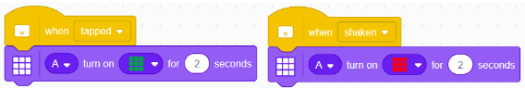
		**Swamp Boat**	
#	**Activity Name**	**Objectives** Students will	**Prompt**
28 🕒 🕒	**LESSON Part A**	• Identify the parts of an existing program that should be modified. • Carry out tests to identify where a program can be modified. • Recount an experience using relevant facts and descriptive details.	After students build the swamp boat, have them create and modify a program to meet Sofie's needs. Recall that she wants to find crocodile eggs, which could be near adult crocodiles. Then have them to program to find other animals. **SAY/ASK** *Sofie found crocodile eggs! Could there be crocodiles nearby? Build a swamp boat so she can find out. Program it to tell Sofie when crocodiles are nearby.* ***Then try this>*** *Change your program to find other animals.* **MORE DETAILS** *Swamp Boat* lesson or access in the LEGO® Education SPIKE™ App
29 🕒	**PROMPT More with Computer Science**	• Identify the parts of an existing program that should be modified. • Carry out tests to identify where a program can be modified.	Provide samples of code that won't help Sofie find the crocodiles. Ask them to debug each code. **SAY/ASK** *Why do you think the code isn't working? Study each example to find the problem. Then fix it.* Examples with explanations: 1) Change the lesson code to show the Color Sensor plugged into the wrong port, e.g., A if plugged into B. (This won't work because the Color Sensor won't get the code.) 2) Add a motor block into the code. (This won't work because the model has no motor.) 

30	**PROMPT More with Math**	• Create a bar graph to show how many of each kind of animal the boat finds. • Use bar graph word blocks to present animal data visually to show relationships between the number of each kind of animal found.	Have students track the number of animals Sofie's boat detects, creating a paper bar graph OR using the Bar Graph blocks in the LEGO® Education SPIKE™ App. Prompt them to use their bar graph to calculate how many more and fewer of each animal the boat encountered. **SAY/ASK** *Now do some math! Track the number of animals that Sofie's boat finds. Show the information in a bar graph, either on paper or in the SPIKE App. Then subtract to determine how many more of one kind than another.* **MORE DETAILS** *Coding Blocks in LEGO® Essential SPIKE™ Essential Lessons* or Bar Graph blocks in the HELP section of the LEGO® Education SPIKE™ App

31	**PROMPT More with ELA**	• Design and build a scene from a familiar story, including the setting and main events. • Identify and describe a scene from a story, referencing its place in the overall story. • Retell a story, using a model to show descriptive details about setting and events.	Using a story that the class is reading, ask students to build a scene. Their scene should show the setting and the major action/events in it, using motors to add movement where appropriate. If time allows, invite students to retell the story. **SAY** *Think about the story we read recently. Choose a scene to build. Show what the setting is like. Show the important events that happen in the scene. If those events include movement, connect your motor to make the model move.* ***Then try this>*** *Use the model as you retell the story to us.*

		**Animal Behavior**	
#	**Activity Name**	**Objectives** Students will	**Prompt**
32	**LESSON Part A**	• Build a model to explain the importance of a grazing animal and a watching animal for the animals' survival. • Make an argument that living in a group helps animals to defend group members. • Use their model to support the argument. • Identify the parts of an existing program that should be modified. • Carry out tests to identify where a program can be modified.	Have students use the Color Sensor in building the model African buffalo. Then have them create and modify a program that uses the Color Sensor to test how the buffalo responds when predators come near. Guide them to use debugging steps to identify and fix errors in the program. **SAY/ASK** *Maria sees that African buffalo live in large herds. She wonders why they live in groups rather than on their own. Build a model buffalo that includes a Color Sensor. Then create and test a program that uses the Color Sensor to warn the buffalo when predators come near. How can this help the buffalo stay safe?* **MORE DETAILS** *Animal Behavior* lesson or access in the SPIKE App
33	**LESSON Part B**		Have students revise their buffalo model to include a sensor that faces forward instead of down to the ground. Then prompt them to test how well this work to warn the buffalo of predators. (It will tell the buffalo about predators much more quickly,

			and therefore keep the individual buffalo safer. That buffalo can also warn the herd to move to safety.) **SAY/ASK** *Now, change your model so that the Color Sensor faces forward instead of down. Test how this works to warn the buffalo of predators. How can this help the buffalo stay even safer? How could it help the buffalo protect others in the herd?* **MORE DETAILS** *Animal Behavior* lesson or access in the LEGO® Education SPIKE™ App
34	**PROMPT More with Computer Science**	• Design a program using conditionals. • Design a program based on the user needs and criteria.	Ask students to create and build an animal alert system using the Color Sensor. They should program blue to be all clear (safe) and red to be alert (danger). This will help Maria continue to study animals safely. **SAY** *Maria wants to study more animals, but she knows that some animals are safer to be around than others. Help her create an animal alert to warn her which animals are safe and which could be dangerous.*
35	**PROMPT More Math and ELA**	• Write a story about two African buffalo and what happens to their herd when a predator is near. • Use graphing paper to show logical distances between a predator and two different buffalo.	Have students write a story about an animal herd, using their models as characters. Provide graphing paper and have students create a scaled illustration for their story, using units to show logical distances of what eating and watching animals notice. **SAY** *Write a story about an African buffalo herd. Use your two models as characters, including the one that only eats and the one that looks around for danger. Add a predator. Then make an illustration for your story on graphing paper. Use the graph squares as units – like feet -- to show distances. What would each of your buffalo notice? How far from the predator should they be on the illustration?*

#	Activity Name	Objectives Students will	Prompt
36	**PROMPT More with Science and Computer Science**	• Program the Light Matrix in response to specific instructions. • Use what they know about habitats to decide if an organism can survive in a particular habitat. • Use the Light Matrix to show their argument on whether the organism can survive in that habitat.	Have students further explore animal habitats and practice programming. Prompt them to connect the Light Matrix to the hub and program it to show green for *yes* votes and red for *no* votes. Provide a habitat and list of different organisms. Have students use their voting machine to say whether each organism would/wouldn't survive well in the given habitat. **SAY** *Build and program a voting machine. Connect the Light Matrix to your hub. Program the Light Matrix to vote yes (all green lights) when you tap the hub and vote no (all red lights) when you shake the hub. Now, think about a habitat and the living things. Vote yes if you think the living thing can survive in that habitat or no if you think it can't.* Sample program: 

		**Cable Car**	
#	**Activity Name**	**Objectives** Students will	**Prompt**
37 🕒🕒	**LESSON Part A**	• Design, build, and test a model cable car to meet specific needs. • Use sequences and loops to program their models. • Identify and fix errors a program to ensure it works as intended (test and debug).	Have students build, test, and program the Cable Car model. Then have them explore ways to improve it even more. **SAY** *Leo is nervous about crossing Spike Lake in the cable car today. Can Maria help him conquer his fears? Build, program, and test a cable car for Maria and Leo to ride. Then try to make it work even better!* **MORE DETAILS** *Cable Car* lesson or access in the LEGO® Education SPIKE™ App
38 🕒	**PROMPT** **More with Math**	• Investigate ¼, ½, ¾ fractions. • Create simple programs that include specific stops.	Prompt students to reprogram the Cable Car model to stop at ¼, ½, and ¾ of the way across the lake. **SAY** *Leo had so much fun on the cable car that he wants to continue to ride. Maria wants to try stopping along the way. Program the Cable Car model to stop halfway (½) through the trip. Then try ¼ of the way and ¾ of the way.*
39 🕒	**PROMPT** **More with ELA**	• Write a story including a clear sequence of events. • Use temporal words to explain what happens before, during, an after.	Have your students write a story about Leo and Maria's trip across Spike Lake in the cable car, using temporal words to show a clear sequence of events. **SAY** *Write a story about Leo and Maria's ride on the cable car. Describe what happens in a clear sequence of events. Tell what the friends did before, during, and after their trip.*

		**Life Cycles**	
#	**Activity Name**	**Objectives** Students will	**Prompt**
40 🕒🕒	**LESSON** **Part A**	• Explain that organisms have unique and diverse life cycles. • Develop a model showing the life cycle of one kind of organism as a pattern. • Describe differing cycles as having in common birth, growth, reproduction, and aging. • Identify and fix errors a program to ensure it works as intended (test and debug).	Lead students in learning about life cycles of different plants and animals. (See the lesson for background information.) Then organize pairs or groups to build models of four life stages for a given organism. **SAY** *Leo learned that tadpoles are baby frogs. He wonders how other animals and plants change as they grow. Learn about the life stages of one plant or animal. Then build some models that show these four life stages for Leo.* **MORE DETAILS** *Life Cycles* lesson or access in the LEGO® Education SPIKE™ App
41 🕒🕒	**LESSON** **Part B**		Have students build and program a rotating platform, on which their four models can rotate to show the life cycle of their chosen organism. Invite them to use the model to describe the life cycle it shows. **SAY** *Build and program a rotating platform for your models to show that all life cycles are a repeating pattern. Then share and explain your model to classmates.* **MORE DETAILS** *Life Cycles* lesson or access in the SPIKE App
42 🕒	**PROMPT** **More with Math and Computer Science**	• Create a bar graph to show how long an organism spends in each stage of its life cycle. • Use paper or bar graph word blocks to present the data visually in appropriate units, e.g., hours, days, week. • Use Bar Graph blocks to organize life stage data visually.	Provide appropriate research sources and have students find approximately how much time their chosen organism spends in each stage of its life cycle. Prompt them to represent their results in a paper bar graph or by programming with the Bar Graphs blocks in their App. Lead them in comparing graphs for multiple organisms. **SAY** *Learn how much time your chosen plant or animal spends in each stage of its life cycle. Show your results in the right unit—like minutes, hours, days, weeks—on a bar graph. You can make your bar graph on paper or with the Bar Graph blocks in your SPIKE App.* **MORE DETAILS** Bar Graph blocks in the HELP section of the SPIKE App, available on the web or downloaded.

#	**Activity Name**	**Objectives** Students will	**Prompt**
43 🕒		• Record learning and observations about bees. • Design and build a model of a tool to	Explain that stories are a way to share learning with people and a way for the storyteller to grow too. Have students create a story about plant growth, showing

	LESSON **Storytelling**	capture a queen bee. • Program the model to meet at least one of the identified needs, like working quickly.	three stages of growth. They may use LEGO® bricks or any other materials you provide. **SAY** *Rachel wants to tell a story about growth, using flowers for ideas and examples. Think about the different stages of a plant's growth. Tell that story with any plant or flower you like. Show at least three stages of growth. You can draw, build, craft, or create.* **MORE DETAILS** *Rebuild the World with Storytelling*
44	PROMPT **More with Computer Science**	• Use bricks to learn the coding concept of conditionals. • Sort bricks into labeled categories according to specific features.	To help students understand conditionals, have them gather 10 random pieces from their set. They should include a range of sizes, colors, etc. Then have students draw two circles on a piece of paper and label one *true* and one *false*. Share different statements and prompt students to sort their pieces into true or false. Example statements: The piece is blue. The piece is large. The piece has studs (bumps) on it.

		Big Bus	
#	**Activity Name**	**Objectives** Students will	**Prompt**
45	LESSON	• Improve a program to meet a specific need. • Test and evaluate solutions to determine whether they meet a specific need. • Recount an experience using relevant facts and descriptive details.	After students build the Big Bus model, have them program it to stop for Daniel at the green stop. Then have them improve their program to change the bus's route for other stops. Encourage them to use a Wait for block so the bus stops when picking up riders. **SAY** *Today is going to be an awesome day! Help Daniel get to the sports stadium to see the big game. Build and program a bus that stops for Daniel at the green stop. Then add some other stops. Try using a Wait For control block to make the bus wait for riders to get on.* **MORE DETAILS** *Big Bus* lesson or access in the LEGO® Education SPIKE™ App and Wait For (control) blocks in the HELP section of the App.

46	**PROMPT** **More with Math**	• Calculate the total distance a bus travels from a start line through three stops. • Calculate the fraction of the total distance represented by the distance between each stop.	Have students set three different bus stops 12 inches apart from a start line, and then add the total measurement. Prompt them to stop the bus at the different stops and record in a data table how far the bus drives. Then have students calculate the fraction of the total distance traveled in each distance between stops. Ask students to compare the calculation to what they see. The visualization should help students understand the ¼, ½, ¾ better. Discuss why ½ and 2/4 is the same. **SAY/ASK** *Program the bus to stop three times, each 12" from the start line or the previous stop. What is the total distance that the bus travels? What fraction of that distance represents the distance between each stop?*
47	**PROMPT More with ELA**	• Write a persuasive pamphlet telling readers why public spaces should be accessible for everyone. • Express an opinion and support it with reasons.	Have students write a pamphlet explaining why it's important for public spaces (e.g., buildings, buses, schools) to be accessible for all people, including those with a handicap. **SAY** *Why is it important for everyone to be able to use buses or other public places? Write a pamphlet explaining what you think. Include your opinion and also some reasons for it.*

	**Get Around Town**	
#	**Activity Name**	**Objectives** Students will	**Prompt**
48	**LESSON**	• Apply computational thinking skills to solve a problem. • Break down the problem to identify what's needed in a strong solution. • Apply engineering design skills to test a solution. • Practice helping a story character. • Describe key ideas or details from a text.	Have students design, build, program, and test a vehicle Daniel, Sofie, Maria, and Leo can use to reach the Spike Castle. **SAY/ASK** *The team is headed to Spike Castle! How can you help them get there? Design, build, program, and test a vehicle that the team can take to the castle.* **MORE DETAILS** *Get Around Town* lesson or access in the LEGO® Education SPIKE™ App

49	**PROMPT** **More with Math**	• Draw a scaled map of Spike Town that includes three routes to reach Spike Castle. • Measure each route to a ½ or ¼ inch and show this information in a data table. • Use the data table to describe how much specific routes are longer or shorter than others.	Have students create a map of Spike Town, including three routes from a starting point of their choice (e.g., school or home) to their destination of Spike Castle. Then prompt them to program their vehicle and practice the routes. Ask which route will be longer or shorter, and then have students measure to a ½ or ¼ inch to confirm or revise their predictions. Finally, have students create a data table with their measurements and use the data to describe how much a given route is longer or shorter than other routes. **ASK/SAY** *What are some different roads the team can take to reach Spike Castle? Make a map of Spike Town and show three different routes to the castle. Program your vehicle to try the three routes. Which one seem longer or shorter? Use a ruler to check your thinking, measuring to ½ or ¼ inch. Then show your findings in a data table and use the information to describe which routes are longer or shorter than the others.*
50	**PROMPT** **More with ELA**	• Recount events using relevant details, clearly expressing their feelings and ideas.	Have students write a story about how the team got to Spike Castle. Tell them to use dialogue and descriptions where appropriate. **SAY** *Write a story about the team's trip to Spike Castle. Describe what places and people look like. Add dialogue that tells what they say.*

	**Solving Problems When Environments Change**		
#	**Activity Name**	**Objectives** Students will	**Prompt**
51	**LESSON**	• Create a model showing how to solve a problem an animal faces when people build on wetlands. • Describe the problem their design addresses. • Make a claim about how well their design solves the problem for the animal. • Support their claim with evidence about the problem and the reason(s) why their design solves this problem. • Identify and fix errors a program to ensure it works as intended (test and debug).	Share background (See the lesson for some) about wetlands and how buildings can change them. Then have students brainstorm some problems from those changes and some possible solutions. Encourge students to draw their ideas and then invite them to use the drawing and models to explain their solution. **SAY** *Sofie learned that people will put a building in the wetland near her home. She's worried it will hurt the birds and other animals that live there. Learn about the wetlands and some problems animals in it could have if things change. How could you help? Build and program a way to solve one of those problems.* **MORE DETAILS** *Solving Problems When Environments Change* lesson or access in the LEGO® Education SPIKE™ App

52 🕒	**PROMPT More with Math**	• Express fractional parts of a whole visually with hands-on materials or a bar graph programmed with word blocks. • Use Bar Graph blocks to organize fraction data about endangered animals visually.	Share information from the U.S. Department of Agriculture: Wetlands provide habitat for about half of the fish, one-third of the birds, one-quarter of the plants, and one-sixth of the mammals in the United States that are threatened or endangered. Have students represent and compare these fractional parts of a whole by coloring squares, grouping bricks, or a similar activity. If you wish, have them program the Bar Graph blocks in their LEGO® Education SPIKE™ App to show the fractions in bar graph form. **SAY** *Many animals live in wetlands, including about ½ the fish, 1/3 of the birds, ¼ of the plants and 1/6 of the mammals (animals like fox or rabbits). Show what these fractions mean, using LEGO bricks, paper squares, or a bar graph programmed in your SPIKE App.* **MORE DETAILS** Bar Graph blocks in the HELP section of the LEGO® Education SPIKE™ App, available on the web or downloaded.

#	Activity Name	Objectives Students will	Prompt
53 🕒 🕒	 **LESSON** **Ocean Advocacy**	• Create a model showing a way to protect waterways. • Test and evaluate solutions to determine whether they meet the specific need. • Describe the problem their design addresses. • Make a claim about how well their design solves the problem. • Support their claim with evidence about the problem and the reason(s) why their design solves this problem.	Share that the ocean covers 70% of Earth's surface. Have students design, test, and iterate on a device to protect the waterways in their area. Prompt brainstorming with examples like a device to collect debris floating down a river or canal, or an innovative way to clean up the beach at a lake or shore. **SAY/ASK** *Design, build, program and iterate on a device to protect water in your area. Think about rivers, streams, lakes, or the ocean. How can you help? Explain how your idea works and what problems it will solve. Remember that waterways like rivers flow to the ocean eventually.* **MORE DETAILS** *Rebuild the World with Ocean Advocacy*

		**Biodiversity and Climate Change**	
#	**Activity Name**	**Objectives** Students will	**Prompt**
54 🕒 🕒	**LESSON Sea Turtles**	• Record learning and observations of animals that live in the ocean. • Build, draw, or create something that can protect sea turtles from problems caused by climate change. • Test and evaluate the solutions to determine whether they solve the problem.	Extend students' exploration of the ocean by sharing background about sea turtles, using the Sea Turtles Fact Sheet and Sea Turtle Presentation Deck or materials of your choosing. Lead reflection as a class on what has happened to turtles and animals threatened by temperature changes in general. Why are they struggling? What has happened to their habitat? Have students create something to protect these animals. They may draw, use LEGO® elements, or create with other materials that you provide. **SAY/ASK** *Learn about sea turtles and other animals that live in the ocean. What problems do they have because of climate change? Talk with your classmates. Then create something that can help protect our turtle friends against climate change. Use LEGO elements or any materials you wish.* **MORE DETAILS** *Build the Change – Biodiversity and Climate Change, Case Study 4; Also consider using or reviewing Build the Change – Biodiversity and Climate Change, Sessions 1 and 2*
55 🕒 🕒	**LESSON Tigers**	• Record learning and observations of animals that live in forest habitats. • Build, draw, or create something that can protect tigers from problems caused by rising sea levels. • Test and evaluate the solutions to determine whether they solve the problem.	Extend students' exploration of animals by sharing background about tigers, using the Forest Habitat Fact Sheet and Presentation Deck or materials of your choosing. Lead reflection as a class on what has happened to tigers and other animals threatened by rising sea level. Why are they struggling? What has happened to their habitat? Have students create something to protect these animals. They may draw, use LEGO elements, or create with other materials that you provide. **SAY/ASK** *Learn about tigers and other animals that live in the places where sea levels are rising. What problems do they have because of climate change? Talk with your classmates. Then create something that can help protect our tiger friends against climate change. Use LEGO elements or any materials you wish.* **MORE DETAILS** *Build the Change – Biodiversity and Climate Change, Case Study 3; Also consider using or reviewing Build the Change – Biodiversity and Climate Change, Sessions 1 and 2*

		Animals in Their Habitats	
#	**Activity Name**	**Objectives** Students will	**Prompt**
56 🕒 🕒	LESSON	• Build a model of an animal with moving part(s) that is adapted to a particular habitat. • Create a habitat model for their animal. • Use their model as evidence to make an argument about how the animal is well adapted to survive in its habitat.	Organize groups of 4 and assign/have them choose habitats. Lead students in learning about some habitats and the animals adapted to live in them. (See the lesson for some background or use habitats the class has studied.) Then have groups design their habitat, such as with sketches. Ask pairs in the group to each build and program an animal that lives in the habitat, and then prompt students to combine their work with the sketches. Invite groups to share their models/ sketches and explain how the plants/animals in the habitat can thrive there. **SAY** *Sofie, Daniel, Maria, and Leo visit a desert. They wonder how the animals and plants survive where it is so dry. With a group, design a habitat. Try drawing your ideas. Then work in pairs to design, build, and test an animal that lives in the habitat. Put the animals and sketches together, to tell classmates why the animals survive well in this place.* **MORE DETAILS** *Animals in Their Habitats* lesson or access in the LEGO® Education SPIKE™ App
57 🕒	PROMPT **More with ELA**	• Write a story about an animal transported to a new habitat and the problems this creates. • Include details from research that explain why the animal is not well adapted to the habitat.	Have students write a story in which their animal is transported to a different habitat and must deal with new surroundings for which it's not well adapted. Encourage them to make their story realistic by using details from research or their classmates' habitat models. **SAY** *Write a story about one of the animals your group built. Imagine the animals is moved to a different habitat where it's not well adapted. What will happen? Make your story realistic by using details from classmates' habitat models or by doing research.*

#	**Activity Name**	**Objectives** Students will	**Prompt**
58 🕒 🕒 🕒	**Predator and Prey**	• Design and build models that show the predator/ prey relationship. • Use the models to explain how each animal in the relationship has adapted.	Share information to explain the way predators have changed over time to improve as hunters and trappers, which has forced prey to adapt in order to escape and stay alive. (Use examples from class science studies if possible.) Then organize paired groups in which one will design and build a predator model and the other will design and build a prey model. Prompt groups to use their models to describe the relationship between a predator and its prey.

			SAY *Predators are made to eat their prey. Working in two groups, show this relationship with two models. One group should build the predator and another the prey. Then explain the models and their relationship to the class.*