

LEGO® Education STEAM Learning Progression



SPIKE™ Prime Grade 6

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™ Prime. 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.

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






Each activity

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

To find what you need,

- ☑ scan the Topic(s) & Standards column or search with terms like *Data & Analysis* or *CSTA*.
- ☑ use the **Key** below to locate activities of different lengths and levels of instructional support.
- ☑ use the **Additional Resources** below to locate more support.

 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*

☑ [LEGO® Education SPIKETM Prime FAQs](#)

☑ [LEGO® Education SPIKETM Prime Resources – Download vs. Streaming](#)

☑ [LEGO® Education SPIKETM Prime - Computer Science Courses](#)

#	Activity Name	TOPIC(s) and Standards	Objectives Students will	Prompt
1 	PROMPT Back to Back 	SKILL PRACTICE: DESIGN ENGINEERING, DECOMPOSING A PROBLEM, SEQUENCE OF EVENTS	<ul style="list-style-type: none"> 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. 	<p>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.</p> <p>SAY/ASK <i>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?</i></p> <p>Then try this> <i>Give your partner step-by-step building directions to create a tower.</i></p>
2 	PROMPT Meet the Light Matrix (Hub)	COMPUTING SYSTEMS CSTA 2-CS-02 Design projects that combine hardware and software components to collect and exchange data. SKILL PRACTICE: SEQUENCE OF EVENTS	<ul style="list-style-type: none"> Follow instructions to create a program. Explore programming the light matrix. Describe coding steps in sequence. 	<p>Introduce students to the light matrix using the hub in their set as they prepare to program it. Using the Light Matrix tutorial, have students start with the hub. Then prompt them to describe the coding steps in words to a partner.</p> <p>SAY <i>Turn on your hub. Follow the tutorial steps to make it work. Then tell your partner step by step what the code does. Say what happens in order.</i></p> <p>MORE DETAILS The Light Matrix tutorial in the START section of the LEGO® Education SPIKE™ App, available on the web or downloaded</p>
3 	PROMPT Meet the Motor	COMPUTING SYSTEMS CSTA 2-CS-02 Design projects that combine hardware and software components to collect and exchange data. SKILL PRACTICE: SEQUENCE OF EVENTS.	<ul style="list-style-type: none"> Follow instructions to create a program. Explore programming a motor. Describe coding steps in sequence. 	<p>Introduce students to the motor in their set as they prepare to program it. Using the Motor tutorial, have students start the motor. Then prompt them to describe the coding steps in words to a partner.</p> <p>SAY <i>Connect a 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.</i></p> <p>MORE DETAILS The Motor tutorial in the START section of the SPIKE App, available on the web or downloaded</p>

<p>4</p> <p>⌚</p>	<p>PROMPT Meet the Color Sensor</p>	<p>COMPUTING SYSTEMS CSTA 2-CS-02 Design projects that combine hardware and software components to collect and exchange data.</p> <p>SKILL PRACTICE: SEQUENCE OF EVENTS</p>	<ul style="list-style-type: none"> • Follow instructions to create a program. • Explore programming a sensor. • Describe coding steps in sequence. 	<p>Introduce students to the Color Sensor in their set as they prepare to program it. Using the Color Sensor tutorial, have students start with the sensor. Then prompt them to describe the coding steps in words to a partner.</p> <p>SAY <i>Connect the Color Sensor to your hub. Follow the tutorial steps to make it work. Then tell your partner step by step what the code does. Say what happens in order.</i></p> <p>MORE DETAILS The Color Sensor tutorial in the START section of the LEGO® Education SPIKE™ App, available on the web or downloaded</p>
<p>5</p> <p>⌚</p>	<p>PROMPT Meet the Distance Sensor</p>	<p>COMPUTING SYSTEMS CSTA 2-CS-02 Design projects that combine hardware and software components to collect and exchange data.</p> <p>SKILL PRACTICE: SEQUENCE OF EVENTS</p>	<ul style="list-style-type: none"> • Follow instructions to create a program. • Explore programming a sensor. Describe coding steps in sequence. 	<p>Introduce students to the Distance Sensor in their set as they prepare to program it. Using the Distance Sensor tutorial, have students start with the sensor. Then, prompt them to describe the coding steps in words to a partner.</p> <p>SAY <i>Connect the Distance Sensor to your hub. Follow the tutorial steps to make it work. Then tell your partner step by step what the code does. Say what happens in order.</i></p> <p>MORE DETAILS The Distance Sensor tutorial in the START section of the SPIKE App, available on the web or downloaded</p>
<p>6</p> <p>⌚</p>	<p>PROMPT Meet the Force Sensor</p>	<p>COMPUTING SYSTEMS CSTA 2-CS-02 Design projects that combine hardware and software components to collect and exchange data.</p> <p>SKILL PRACTICE: SEQUENCE OF EVENTS</p>	<ul style="list-style-type: none"> • Follow instructions to create a program. • Explore programming a sensor. Describe coding steps in sequence. 	<p>Introduce students to the Force Sensor in their set as they prepare to program it. Using the Force Sensor tutorial, have students start with the sensor. Then prompt them to describe the coding steps in words to a partner.</p> <p>SAY <i>Connect the Force Sensor to your hub. Follow the tutorial steps to make it work. Then tell your partner step by step what the code does. Say what happens in order.</i></p> <p>MORE DETAILS The Force Sensor tutorial in the START section of the SPIKE App, available on the web or downloaded</p>
<p>7</p> <p>⌚</p>	<p>PROMPT Meet the Gyro Sensor</p>	<p>COMPUTING SYSTEMS CSTA 2-CS-02 Design projects that combine hardware and software components to collect and exchange data.</p> <p>SKILL PRACTICE: SEQUENCE OF EVENTS</p>	<ul style="list-style-type: none"> • Follow instructions to create a program. • Explore programming a sensor. • Describe coding steps in sequence. 	<p>Introduce students to the Gyro Sensor in their set as they prepare to program it. Using the Gyro Sensor tutorial, have students start with the sensor. Then prompt them to describe the coding steps in words to a partner.</p> <p>SAY <i>Connect the Gyro Sensor to your hub. Follow the tutorial steps to make it work. Then tell your partner step by step what the code does. Say what happens in order.</i></p>

				MORE DETAILS <i>The Gyro Sensor</i> tutorial in the START section of the LEGO® Education SPIKE™ App, available on the web or downloaded
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Pass the Brick				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
8	LESSON	<p>COMPUTATIONAL THINKING CSTA 2-AP-10 Use flowcharts and/or pseudocode to address complex problems as algorithms.</p> <p>CSTA 2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.</p>	<ul style="list-style-type: none"> Demonstrate the ability to work effectively and respectfully with different types of people. 	<p>Have students work together to create a grabber model that will allow them to pass a brick between groups.</p> <p>SAY <i>Let's work together to pass a brick from group to group.</i></p> <p>MORE DETAILS Pass the Brick lesson or access in the SPIKE App</p>
9	PROMPT More with Math and ELA	<p>DESIGN ENGINEERING NGSS MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	<ul style="list-style-type: none"> Communicate and express ideas clearly. Collaborate with peers. 	<p>Have your students explore best practices for effective discussions such as construction feedback, reformulation, or building consensus.</p> <p>SAY/ASK <i>How can we best give feedback and build consistence? Let's discuss.</i></p>
10	PROMPT More with Math and ELA	<p>STATISTICS & PROBABILITY CCSS.MATH.Content.6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.</p> <p>SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.</p>	<ul style="list-style-type: none"> Answer questions with data Collect real world data 	<p>Have your students collect data about the number of brick passes, number of bricks dropped, and how long it took to finish the tasks. Have them use this data to generate statistics.</p> <p>SAY/ASK <i>Let's look at the data to know how well we are doing in our passes. Create a data table to share your findings.</i></p>

		Goal!		
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
11 Ⓛ Ⓛ	LESSON	<p>DESIGN ENGINEERING NGSS MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	<ul style="list-style-type: none"> • Collaborate to solve various challenges. • Collaborate to develop a new challenge. 	<p>Have student collaborate to build a fun tabletop challenge and score as many goals as possible.</p> <p>SAY <i>Create a tabletop game that includes a goal, a robot player and a hand player. Iterate on your program to improve your accuracy to score goals.</i></p> <p>MORE DETAILS Goal! lesson or access in the SPIKE App</p>
12 Ⓛ	PROMPT More with Math and ELA	<p>STATISTICS & PROBABILITY CCSS.MATH.Content.6.SP.B.5.A Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations. b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data was gathered. d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data was gathered.</p> <p>SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.4 Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.</p>	<ul style="list-style-type: none"> • Communicate and express ideas clearly. • Create written or media artifacts to enhance their game. 	<p>To incorporate language arts skills development, ask your students to write down the rules of their challenge. Have them use illustrations and graphics to explain the rules.</p> <p>SAY/ASK <i>When playing a game, it is important that everyone plays by the same rules. Create a rulebook for your game including illustrations as needed.</i></p>





		SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.5 Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.		
13 Ⓛ	PROMPT More with Math and ELA		<ul style="list-style-type: none"> Investigate the direct relationship between power and distance. Collect and record data. Analyze data to create statistics. 	<p>In this lesson, you'll already be exploring key math concepts, have your students graph the direct relationship between the power level of the programming block and the distance traveled by the disk. Ask your students to collect data about the number of shots, number of shots on goal, number of goals, and number of successful passes, then generate statistics out of this data.</p> <p>SAY/ASK <i>Let's collect data from our game so we can track the number of shots made, goals scored, passes, etc. We can then use that data to look at where you are successful in the game and where you need more practice.</i></p>

Ideas, the LEGO Way!				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
14 Ⓛ Ⓛ	LESSON	DESIGN ENGINEERING NGSS MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	<ul style="list-style-type: none"> Use an idea generation and creation tool. 	<p>Have students use LEGO bricks as a unique way to generate creative ideas. Students will create a countdown clock and use that time to build their ideas.</p> <p>SAY <i>Create a countdown clock using your hub. Use this time to brainstorm ideas for improving your morning.</i></p> <p>MORE DETAILS Ideas, the LEGO Way! lesson or access in the LEGO® Education SPIKE™ App</p>
15 Ⓛ	PROMPT More with Math and ELA	SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.	<ul style="list-style-type: none"> Use different media types to communicate and express ideas clearly. Make decisions about the best way to present an idea. 	<p>To incorporate language arts skills development, have your students use sketches, mock-ups, or other media to present the ideas they've produced during their brainstorming. Ask each student to hand in a creative document in which they describe their best idea.</p>

		<p>SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.5 Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.</p> <p>WRITING CCSS.ELA-Literacy.W.8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>		<p>SAY/ASK <i>Make a presentation of your ideas by sharing your sketches, mock-ups, or other media.</i></p>
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Help!				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
16	LESSON  	<p>DESIGN ENGINEERING NGSS MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	<ul style="list-style-type: none"> Define a problem. Begin to establish criteria that will eventually lead to a solution. 	<p>Define a problem by observing a scenario.</p> <p>MORE DETAILS Help! lesson or access in the LEGO® Education SPIKE™ App</p>
17		<p>PROMPT More with Math and ELA </p>	<p>COMPUTATIONAL THINKING CSTA 2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.</p> <p>SPEAKING & LISTENING CCSS.ELA-LITERACY.SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.</p>	<ul style="list-style-type: none"> Communicate and express ideas clearly. Collaborate with peers.

		Hopper Race		
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
18 Ⓛ Ⓛ	LESSON	DESIGN ENGINEERING NGSS MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	<ul style="list-style-type: none"> Explore the process of creating prototypes to solve a problem. 	Have students design multiple prototypes to find the most effective way to move a robot without using wheels. SAY See if you can create the fastest hopper. Build and test the prototype. Then come up with ideas to modify the prototype to make it move faster. MORE DETAILS Hopper Race lesson or access in the LEGO® Education SPIKE™ App
19 Ⓛ	PROMPTS More with Math and ELA	COMPUTATIONAL THINKING CSTA 2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.	<ul style="list-style-type: none"> Communicate and express ideas clearly. Create a presentation. 	Have students produce a presentation about biomimetics by showing how the hopper is biomimicking animal movement. SAY/ASK Describe how your hopper is biomimicking the movement of an animal. Create a presentation to share your ideas.
20 Ⓛ		SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.1.C Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion. EXPRESSIONS & EQUATIONS CCSS.MATH.Content.6.EE.B.7 Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p , q and x are all nonnegative rational numbers.	<ul style="list-style-type: none"> Solve real world problems. Investigate equations. Make predictions. 	Ask students to find the speed of their hopper in cm/sec (or in/sec). Have them predict the distance their hopper would travel after 8, 16, and 24 seconds. SAY/ASK Find the speed of your hopper using this equation: $\text{Distance traveled} = \text{Speed} * \text{Time}$ Now try to predict the distance traveled after 8, 16, and 24 seconds using the same equation.

		Super Cleanup		
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
21  	LESSON	<p>DESIGN ENGINEERING NGSS MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p> <p>COMPUTATIONAL THINKING CSTA 2-AP-13 Decompose problems & sub-problems into parts to facilitate the design, implementation, and review of programs.</p>	<ul style="list-style-type: none"> Define evaluation criteria for 2 designs. Test 2 designs using objects of different shapes and sizes. Make recommendations regarding the best design. 	<p>Have students test the efficiency of two different grabber designs and determine the best design based on specific test criteria.</p> <p>SAY <i>We need help creating a grabber to help with trash cleanup day. Test the two grabbers to see which works best for each object.</i></p> <p>MORE DETAILS Super Cleanup lesson or access in the LEGO® Education SPIKE™ App</p>
22 	PROMPTS	<p>SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.4 Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.</p>	<ul style="list-style-type: none"> Use different media types to communicate and express ideas clearly. Collaborate with peers. Understand how to provide feedback. 	<p>Have students create a presentation or a review video highlighting the pros and cons of each grabber. Ask your students to upload their videos to the appropriate channels, use comments as feedback.</p> <p>SAY/ASK <i>Create a presentation or video to explain the pros and cons of each grabber model. Share your work.</i></p>
23 	More with Math and ELA	<p>RATIOS & PROPORTIONAL RELATIONSHIPS CCSS.MATH.Content.6.RP.A.3.C Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. which p, q and x are all nonnegative rational numbers.</p>	<ul style="list-style-type: none"> Solve real world problems. Investigate ratios and finding parts of a whole. 	<p>Introduce the concept of a weight factor to evaluate objects. For example, effectiveness could be measured with weighted criteria of 25% aesthetics, 20% cost, 5% portability, and 50% weight. Explain that the sum of all weight factors should equal 100%. Ask students to score each grabber (-1 or +1 point) for each criterion, then apply the weight factors.</p> <p>SAY/ASK <i>Score each grabber based on aesthetics, cost, portability, and weight. Then calculate a weight factor for each grabber.</i></p>

Protect Our Produce				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
24 Ⓛ Ⓛ	LESSON	<p>PHYSICAL SCIENCE: FORCES & MOTION NGSS MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.</p> <p>DESIGN ENGINEERING NGSS MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.</p>	<ul style="list-style-type: none"> Apply Newton's third law to design a solution that harvests produce from a tree, without causing damage from collision. Systematically test, and iterate on their design. 	<p>Apply Newton's third law to design a solution that harvests produce from a tree, without causing damage from collision.</p> <p>SAY/ASK <i>How can we harvest fruit without causing damage to the trees? Create a tool that will minimize the damage when harvesting a fruit.</i></p> <p>MORE DETAILS Protect Our Produce lesson or access in the LEGO® Education SPIKE™ App</p>
25 Ⓛ	PROMPT More with Math and ELA	<p>COMPUTATIONAL THINKING CSTA 2-AP-17 6-8 Systematically test and refine programs using a range of test cases.</p>	<ul style="list-style-type: none"> Communicate and express ideas clearly. Create written or media artifacts to document learning. 	<p>Have your students create written artifacts or give oral presentations based on their creations. Have them present these artifacts to another class, family members, or members of the community for feedback. Have them display their written artifacts publicly (in or out of school) to encourage broader discussion around the central idea.</p> <p>SAY/ASK <i>How can we share our creations? Design a written artifact that can help you share your idea with others.</i></p>




Broken				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
26 Ⓛ Ⓛ	LESSON	<p>DESIGN ENGINEERING NGSS MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p>	<ul style="list-style-type: none"> Evaluate the performance of a design solution. Understand the simple function of a machine that's used in everyday life. Iterate to identify problems and think of solutions. 	<p>Designing and programming often leads to things not working. Students need to learn to troubleshoot. Challenge students to figure out why something isn't working and fix it.</p> <p>SAY <i>Something has gone wrong. The CNC machine is not working. Troubleshoot to find how to fix the CNC machine so it works properly.</i></p> <p>MORE DETAILS Broken lesson or access in the LEGO® Education SPIKE™ App</p>

		COMPUTATIONAL THINKING CSTA 2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.	<ul style="list-style-type: none"> Optimize a design solution. 	
27	PROMPTS More with Math and ELA	SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.2 Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.	<ul style="list-style-type: none"> Communicate and express ideas clearly. Collaborate with peers to role-play. 	Have your students work hands-off to role-play calling a customer support line. <ul style="list-style-type: none"> One student describes the problem. The other student explains how to fix it. <p>SAY/ASK <i>Create a presentation or video to explain the pros and cons of each grabber model. Share your presentations or videos appropriately.</i></p>
28		GEOMETRY CCSS.MATH.Content.6.G.A.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	<ul style="list-style-type: none"> Solve real world problems. Investigate area. 	Challenge your students to use the maximum available space on a piece of paper to draw a rectangle and see how big it is. <ul style="list-style-type: none"> Change the program parameters to increase the size of the rectangle. Have them calculate the size of the rectangle. Explain that every design solution has limitations, and that sometimes a solution must be upgraded to meet a need that exceeds its current limitations. <p>SAY/ASK <i>Let's practice maximizing our space. What are some ways that design solutions have limitations. Let's test that.</i></p>

Design for Someone				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
29	LESSON	DESIGN ENGINEERING NGSS MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	<ul style="list-style-type: none"> Define criteria and constraints in order to solve a design problem. Evaluate different design solutions. Analyze and communicate similarities and differences between design solutions. Identify possible improvements to the chosen solutions. 	Exercise creativity, explore the design engineering process, and invent a desktop helper. <p>SAY <i>Now it is time to design something for yourself. Create a desktop helper.</i></p> <p>MORE DETAILS Design for Someone lesson or access in the SPIKE App</p>
		COMPUTATIONAL THINKING CSTA 2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.		

<p>30</p> <p>Ⓛ</p>	<p>PROMPT</p> <p>More with Math and ELA</p>	<p>SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.4 Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.</p>	<ul style="list-style-type: none"> • Communicate and express ideas clearly. • Create written or media artifacts to document learning. 	<p>Have your students use text, images, videos, sketches, etc. to record their design process, creating an invention notebook to document their project. Have them present their project to a wider audience (e.g., during a science fair).</p> <p>SAY/ASK <i>Create a presentation or video to explain the process of creating your desktop helper. What design decisions did you make based on the problem you were trying to solve?</i></p>
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Design for You				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
<p>31</p> <p>Ⓛ</p> <p>Ⓛ</p>	<p>LESSON</p>	<p>DESIGN ENGINEERING NGSS MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>COMPUTATIONAL THINKING CSTA 2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.</p>	<ul style="list-style-type: none"> • Define criteria and constraints in order to solve a design problem. • Evaluate different design solutions. • Analyze and communicate similarities and differences between design solutions. • Identify possible improvements to the chosen solutions. 	<p>Exercise creativity, explore the design engineering process, and invent a desktop helper.</p> <p>SAY <i>Now it is time to design something for yourself. Create a desktop helper.</i></p> <p>MORE DETAILS Design for You lesson or access in the SPIKE App</p>
<p>32</p> <p>Ⓛ</p>	<p>PROMPT</p> <p>More with Math and ELA</p>	<p>SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.4 Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.</p>	<ul style="list-style-type: none"> • Communicate and express ideas clearly. • Create written or media artifacts to document learning. 	<p>Have your students use text, images, videos, sketches, etc. to record their design process, creating an invention notebook to document their project. Have them present their project to a wider audience (e.g., during a science fair).</p> <p>SAY/ASK <i>Create a presentation or video to explain the process of creating your desktop helper. What design decisions did you make based on the problem you were trying to solve?</i></p>

		What Is This?		
#	Activity Name	TOPIC(s) & Standards	Objectives Students will	Prompt
33  	LESSON	<p>DESIGN ENGINEERING NGSS MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	<ul style="list-style-type: none"> Develop communication skills and put them into practice. 	<p>Challenge students to define, customize, and communicate the use of a new "thing." Students will build and program a model and need to figure out what it is.</p> <p>SAY/ASK students <i>What is this? What does it do? Let's build and program a model to see what it does in order to figure out what it is.</i></p> <p>MORE DETAILS What Is This? lesson or access in the LEGO® Education SPIKE™ App</p>
34 	PROMPT More with Math and ELA	<p>DESIGN ENGINEERING NGSS MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.4 Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.</p> <p>SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.5 Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.</p>	<ul style="list-style-type: none"> Use different media types to communicate and express ideas clearly. Make decisions about the best way to present an idea. 	<p>To incorporate language arts skills development, have students organize a school-wide "thing fair" where each team has to effectively communicate their ideas in front of a diverse audience. Find the best "thing" in your school!</p> <p>Organize a "promote your idea" contest. Have some students play the role of entrepreneurs and others play the role of sponsors. Then switch roles.</p> <p>SAY/ASK <i>What is the best way to promote your ideas? Get ready to showcase your creation. Come up with a great way to promote your idea.</i></p>

Greetings, Earthling				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
35	LESSON	DESIGN ENGINEERING NGSS MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	<ul style="list-style-type: none"> Collaborate to solve various challenges. Use engineering design skills to design and build a mechanism to greet others. 	Have students collaborate to build a mechanism to greet people with a wave, a fist bump, a high five, or some other welcoming movement!
(L) (L)		DESIGN ENGINEERING NGSS MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.		Challenge students to incorporate the ultrasonic sensor to have their device move only when someone is in front of it. MORE DETAILS Share the Greetings, Earthling! placemat lesson with students for this challenge.

Going the Distance				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
36	LESSON	COMPUTATIONAL THINKING CSTA 2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.	<ul style="list-style-type: none"> Use estimation to evaluate distances. Use test findings and deductive reasoning to improve a program. 	Have students program their rhino model to stop before it hits something.
(L) (L)		STATISTICS & PROBABILITY CCSS.MATH.Content.6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.		<ul style="list-style-type: none"> Communicate ideas clearly. Collaborate with peers.
37	PROMPT More with Math and ELA			
(L)				

		SPEAKING & LISTENING CCSS.ELA-Literacy.SL.6.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.		SAY/ASK <i>Make a presentation to share the problems you have tried to solve and how the solutions met the need. Share your presentation for the class.</i>
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Silly Walks				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
38	LESSON	DESIGN ENGINEERING NGSS MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. DESIGN ENGINEERING NGSS MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	<ul style="list-style-type: none"> Collaborate to solve various challenges. 	<p>Have students collaborate to build a mechanism for their SPIKE Prime to move without using wheels. Considering having students draw their models before building and discuss with a partner how different variables might affect the movement of their design (e.g. length of the legs).</p> <p>Challenge students to iterate upon their builds to see if they can create a silly walk that only utilizes one motor.</p> <p>MORE DETAILS Share the Silly Walks placemat lesson with students for this challenge.</p>

Puppet Show				
#	Activity Name	TOPIC(S) & Standards	Objectives Students will	Prompt
39	LESSON	DESIGN ENGINEERING NGSS MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	<ul style="list-style-type: none"> Collaborate to solve various challenges. Use engineering design skills to design and build a puppet. 	<p>Have students collaborate to build a puppet. Encourage students to consider how to test and improve their initial puppet to make it better.</p> <p>Challenge students to have their puppet move in sync with music.</p> <p>MORE DETAILS Share the Puppet Show placemat lesson with students for this challenge.</p>

<p>40</p> <p>⌚</p>	<p>PROMPT</p> <p>More with Math and ELA</p>	<p>DESIGN ENGINEERING NGSS MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>WRITING CCSS.ELA-LITERACY.W.6.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.</p>	<ul style="list-style-type: none"> • Communicate and express ideas clearly. • Create a written narrative to illustrate real or imagined experiences. 	<p>In this lesson, you'll have students expand upon their Puppet Show placemat building experience. Students will develop and write a narrative that coincides with their puppet build. Have students add to their programs to have the puppet movement represent key details in their story. Encourage students to recognize the similarity in event-sequences in their narrative and in their code.</p> <p>SAY/ASK <i>Puppet shows tell a story in a fun and engaging way! Let's write a story for our puppet creations to illustrate through movement. Your story may be real or imagined. You may narrate the story, dialogue, and key event. The SPIKE Prime puppet should move to demonstrate or represent different events throughout the story.</i></p>
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