Pennsylvania Learning Progressions STEELS and CS Standards

Grade 1

LEGO® Education Brings STEAM Learning to Life

At LEGO® Education, our mission is to develop the builders of tomorrow. We believe STEAM Learning has become prime for preparing even the youngest students for their future and for in-demand careers. LEGO® Education offers hands-on learning systems that make abstract concepts more tangible for young minds, enabling them to experience joy as they master STEAM subjects. This playful approach helps spark curiosity and lifelong learning.

Learning Promise

This curriculum is designed to ensure that K-5 students will be able to engage in project-based, hands-on STEAM learning experiences with lessons facilitated by teachers who are confident they are delivering an outstanding learning experience.

This program is designed to:

- Provide all elementary students with access to high-quality, project-based STEAM learning experiences with a focus on science and engineering, as well as computational thinking
- Encourage students to be actively engaged in hands-on learning activities that foster their creativity, critical thinking, and problem-solving skills
- Enable teachers to confidently and effectively facilitate hands-on, project-based STEAM learning experiences that focus on the engineering design process and computational thinking
- Lead to expansion of STEAM learning experiences at the middle school

Organization of the Units

The units in this document and the lessons within each unit follow a learning progression that will enable you and your students to explore the power of learning through play in both unplugged and digital environments, but please don't feel that they must be followed lock step. Use your professional judgement to make adjustments to accommodate the learning styles and needs of your students.

Getting Started Lessons – Use these lessons the first time you use your LEGO® Education Learning Solutions. These lessons will help you and your students become familiar with the software and intelligent hardware in the LEGO® Education SPIKE™ Essential sets.

Unplugged Lessons – These lessons use the BricQ Motion Essential set, LEGO® Education's non-digital solution. You will not need devices to complete these lessons and the build instructions can be found in the booklets that come inside the set.

SPIKE™ Essential Lessons – These lessons follow a learning progression that increases in difficulty and complexity of both the model and the programming as you move through the unit. Follow the links to review a complete lesson plan, access video overviews, and review objectives and standards alignment.

Please leverage these plans when creating learning experiences for your students as they will provide the foundation you need to meet the needs of all your students

Organization of the Lesson

The lessons linked in this document follow the 5Es Inquiry Based Framework. This model progresses through 5 different stages of the learning process – Engage, Explore, Explain, Elaborate, Evaluate. Here are some suggestions for using this framework when delivering instruction and the corresponding ISTE standards.

- **Beginning of Class - Activate Prior Knowledge (Engage)** - Launch class by having students share/discuss their learning experience from the previous class session.
    - Where did you leave off? What obstacles did you encounter? In what ways did you overcome those challenges? What is the learning goal for today?
        - *ISTE 1.1a*: Empowered Learner: Students articulate and set personal learning goals, develop strategies, leveraging technology to achieve them, and reflect on the learning process itself to improve learning outcomes.
- **During Class – Collaboration and Communication (Explain)** - Ask students to share with one another their models and their programming for these models. Have them display their code to the class and then talk through the code, explaining what they expected to or observed happen and even demonstrating this using their model if possible.
    - What did you expect to happen with this program? Did your model perform as expected? What did you have to modify or change to improve the program or model?
        - *ISTE 1.6c:* Creative Communicator: Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.
- **End of Class** - **Reflection (Evaluate) -** Have students end the class each day by sharing with their partner/group/teachers the learning progress, accomplishments, and next steps.
    - What did you accomplish today? How did you collaborate with your partner? What could you do to improve your collaboration in the next class?
        - *ISTE 1.7c:* Global Collaborator: Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.

The Power of Iteration

Build, Rebuild, Iterate. There is more than one way to build any model. Students may experience these builds more than once during your program. When repeating a build, reflect on what was learned in previous building experiences and how learnings can be used to improve and possibly address new goals or questions that arise.

Cross-Curricular Integration

While the extension activities provide some cross-curricular integration ideas, the sky is the limit on using these materials in all areas of your classroom. Here are a few ideas to seed your brilliance:

Foster Collaboration and Integration – Plan with colleagues in other departments to integrate these learning experiences into a comprehensive Project Unit that explores multiple content areas through hands-on learning and computer science.

Engage Curiosity – Use an experience at the beginning of a unit of study to inspire curiosity about the subject.

Explore Content Concepts – Use an experience to help students get hands on to explore the real-world application of science, technology, engineering, art, and mathematics.

Elaborate Understanding – Use an experience as a unit capstone or a culminating project, allowing students to transfer learning from multiple different content areas to demonstrate understanding and progress with skills and concepts.

Grade 1

Units: Great Adventures | Science: See It! Hear It! Build It! | Train to Win

Time	Lesson Title and Summary	PA CS Standards	PA STEELS Standards
35-45 Min	Dog Obstacle Course *In Train to Win Unit*  Build an obstacle course for dogs! Describe the push and pull forces that are at work.	**NA**	**3.2.K.A:** Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. **3.2.K.B:** Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
35-45 Min	**Getting Started Tutorials:** SPIKE™ App Explore and learn to program the intelligent hardware.		
35-45 Min	Boat Trip *In Great Adventures Unit*  Maria and Sofie are going on a boat trip! How will they get their boat into the water?	**1A-AP-08** **1A-AP-12** **1A-AP-14** **1A-AP-15**	**3.2.2.C:** 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. **3.4.K-2.C:** Explain ways that places differ in their physical characteristics, their meaning, and their value and/or importance. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
35-45 Min	Arctic Ride *In Great Adventures Unit*  Leo is going on an Arctic adventure to see polar bears. How can he use his snowmobile to get there?	**1A-AP-08** **1A-AP-11** **1A-AP-12** **1A-AP-14** **1A-AP-15**	**3.2.2.B:** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. **3.4.K-2.C:** Explain ways that places differ in their physical characteristics, their meaning, and their value and/or importance. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
45-90 min	Illumination *In Science: See It! Hear It! Build It! Unit*  Sofie thinks something is under her bed. Can you help her see it?	**NA**	**3.2.1.B:** Make observations to construct an evidence-based account that objects can be seen only when illuminated. **3.2.1.C:** Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**

35-45 Min	Sail Car *In Train to Win Unit*  Ahoy! Build a sail car and explore an invisible push force. Which sail design will catch the most wind and make your sail car go the farthest?	**NA**	**3.2.K.A:** Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. **3.2.K.B:** Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
35-45 Min	Cave Car *In Great Adventures Unit*  Daniel wonders what lives inside a dark cave. What do you think is hiding in the dark?	**1A-AP-08** **1A-AP-12** **1A-AP-14** **1A-AP-15**	**3.2.1.B:** Make observations to construct an evidence-based account that objects can be seen only when illuminated. **3.2.2.B:** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. **3.4.K-2.C:** Explain ways that places differ in their physical characteristics, their meaning, and their value and/or importance. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
35-45 Min	Animal Alarm *In Great Adventures Unit*  Leo doesn't want to miss any of the animals walking by his campsite while he's asleep. How can his animal alarm help him?	**1A-AP-08** **1A-AP-10** **1A-AP-12** **1A-AP-14** **1A-AP-15**	**3.2.1.D:** Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. **3.2.2.B:** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. **3.4.K-2.C:** Explain ways that places differ in their physical characteristics, their meaning, and their value and/or importance. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
45-90 min	Musical Vibration *In Science: See It! Hear It! Build It! Unit*  Maria plays piano. She wants to make more music. Can you build her something to play on?	**1A-DA-07**	**3.2.1.A**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **3.2.1.D:** Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**

35-45 Min	Hockey Practice *In Train to Win Unit*  Build a hockey player and goalie! Explore how different push and pull forces help make and block penalty shots.	**NA**	**3.2.K.A:** Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. **3.2.K.B:** Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
35-45 Min	Underwater Quest *In Great Adventures Unit*  Maria is curious to explore life below the sea. How can she get the submarine in and out of the water?	**1A-AP-08** **1A-AP-10** **1A-AP-12** **1A-AP-14** **1A-AP-15**	**3.4.K-2.C:** Explain ways that places differ in their physical characteristics, their meaning, and their value and/or importance. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
35-45 Min	Treehouse Camp *In Great Adventures Unit*  Sofie is looking forward to seeing the moon from her treehouse! How can she open the treehouse roof for a great view of the sky?	**1A-AP-10** **1A-AP-11** **1A-AP-14** **1A-AP-15**	**3.2.2.B:** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. **3.4.K-2.C:** Explain ways that places differ in their physical characteristics, their meaning, and their value and/or importance. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
45-90 Min	Transparency *In Science: See It! Hear It! Build It! Unit*  Leo wants to make some shade on a sunny day. What materials should he use? Help him find out.	**1A-DA-07**	**3.2.1.C:** Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**

35-45 Min	Get Up and Dance *In Train to Win Unit*  Get up and dance! Explore how different gears push each other and change the dancers' spinning speed in a fun dance competition.	**NA**	**3.2.K.A:** Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. **3.2.K.B:** Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
45-90 Min	The Great Desert Adventure *In Great Adventures Unit*  It's time for another great adventure. Help the team reach the pyramids!	**1A-AP-08** **1A-AP-12** **1A-AP-14** **1A-AP-15**	**3.2.2.B:** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. **3.4.K-2.C:** Explain ways that places differ in their physical characteristics, their meaning, and their value and/or importance. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
45-90 min	Communicate with Light and Sound *In Science: See It! Hear It! Build It! Unit*  Daniel lives across the street from Sofie. What can he build to send messages to her?	**NA**	**3.2.1.D:** Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**
45-90 min	Using Ideas from Nature *In Science: See It! Hear It! Build It! Unit*  Daniel, Sofie, Leo, and Maria learned that some lightbulbs were made using ideas from how fireflies make light. Help them learn about other ideas we get from nature.	**NA**	**3.1.1.A:** Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. **3.5.K-2.M** **3.5.K-2.N** **3.5.K-2.O** **3.5.K-2.P** **3.5.K-2.Q** **3.5.K-2.S** **3.5.K-2.T** **3.5.K-2.U** **3.5.K-2.W** **3.5.K-2.AA** **3.5.K-2.DD**

Extension Activities (as time allows)

Tufts University Robotics Playground			
Tufts University has created a series of placemats to inspire engineering design and programming using the SPIKE Essential solution. Each placemat consists of 2 slides which present a challenge and suggestions on how to build and program a solution. The placemat also gives ideas on how students can iterate and elaborate on their solution. Use as time allows.			
	Activity	**Time**	**Objectives**
SPIKE Essential Placemats	Clean Up	45 min	Create a device to clear the floor of small LEGO pieces.
	Snow Plow	45 min	Create a device to clean up snow.
	Dance!	45 min	Create a robot that dances.
	Ball Launcher	45 min	Design a machine to throw a small plastic ball as accurately as possible.
	Build an Instrument	45 min	Create an instrument using SPIKE Essential.
	Silly Walks	45 min	Build a robot that moves forward – without using wheels!

The LEGO® Group Build the Change Curriculum Series			
Build the Change is all about giving children a voice and allowing them to express their hopes and ideas for a better future. Children use their creativity to solve real-world challenges with LEGO® bricks and other creative materials – and it is all achieved via Learning through Play. These materials are designed for use in classrooms, with lesson plans, presentations, and printables. To get started, click on the link below and download the resource packs for educators for the course you wish to explore.			
Build the Change			
	Think Outside the Bus (mini-lesson)	1 day	A learning through play lesson resource introducing young learners to the circular economy of electric school buses in the United States – created in partnership with WRI (World Resources Institute).
	Human Impact: Saving Today's Dinosaurs	1 day to 1+ month	A learning through play resource introducing young learners to the concept of our human impact on nature, through the lens of "today's dinosaurs," birds.
	A Future Without Waste	1 day to 1+ month	A learning through play resource introducing young learners to a FUTURE WITHOUT WASTE – where people and planet can thrive together.
	Biodiversity and Climate Change	1 day to 1+ month	A learning through play resource introducing young learners to the effects of climate change on animals and their habitats, and enlisting them to imagine solutions to these challenges.