Activating Computer Science Learning

With Mobile CS Labs

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LEGO education

Objectives

- Review of Implementation Timeline
- How we support Success
  - Content Alignment Menus
  - Community of Practice
  - Professional Development
  - Suggestions for measuring success
  - Discuss next steps

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Timeline

Phase 1: December

Distribution and Soft Launch
Provide Mobile Lab materials and resources to institution
Prepare and launch Community Website
Develop Content Menus

PD and Training
- Getting Started Webinars
- Self-Guided Point of Need Training

Curriculum Development
- Create Content Menus and distribute

Phase 2: January Full Launch

Promotion and Use
- Outline materials reservation process
- Promote content and resources
- Continue PD and training (in-person, self-guided)

Check-In
- Gather feedback on program
- Continue PD and training (In-person, self-guided)

March

April

Reflection and Evaluation
- Gather feedback on program
- Content Menu updates
- Integrating additional learning domains

Summer Program PD
Summer engagement and camp activities: Best Practices

Summer

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Supporting Success: Scaffolding Engagement

- Provide teachers with Content Menus
- Menus aligned to CS, provide integration guidance
- Shared through media centers and teacher portals
- Take the guess work out of planning and use of high-quality instruction with hands-on learning
- Provide point of need support for teachers to ensure confidence with hands-on learning
- Ensure all students have opportunity for fun, playful learning

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Content Menus

Content Overview

- Shows alignment to standards
- Materials and Resources Needed
- Recommended Allotted Time
- Pacing Guidance

Learning Materials

- 5e Lesson Plan
- Rubrics

- Timeline
  - CS Menus – 12/30
  - Additional Integration– 3/1/23

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1st Grade: CS

Computing Systems
CSTA 1A-CS-01

Great Adventures
Boat Trip, Animal Alarm
SPIKE™ Essential
1-2 hours

Networks and the Internet
CSTA 1A-NI-04

Unplugged: Cybersecurity
SPIKE™ Essential or Any Brick
1 hour

Data Analysis
CSTA 1A-DA-11

Amazing Amusement Park
Snack Stands
SPIKE™ Essential
1 hour

Algorithms and Programming
CSTA 1B-AP-11, 1B-AP-15

Happy Traveler
River Ferry, Taxi! Taxi!
SPIKE™ Essential
1-2 hours

Algorithms and Programming
CSTA 1B-AP-10, 1B-DA-12

Crazy Carnival Games
Bowling Fun, High Stick Hockey
SPIKE™ Essential
1-2 hours

Impacts of Computing
CSTA 1A-IC-16

Happy Traveler
Getting Around Town
SPIKE™ Essential
1-2 hours

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1st Grade: CS and Science

Physical Science
Information Transfer
1-PS4-1, 1-PS4-2

See it! Hear it! Build it!
Musical Vibrations, Sound and Light
SPIKE™ Essential
1-2 hours

Physical Science
Information Transfer
1-PS4-3, 1-PS4-4

See it! Hear it! Build it!
Illumination, Transparency
SPIKE™ Essential
1-2 hours

Life Science
Structures and Processes
1-LS1-1

See it! Hear it! Build it!
Using Ideas from Nature
SPIKE™ PRIME
1-2 hours

Engineering Design
Problems and Solutions
K-2-ETS1-1

Amazing Amusement Park
Classic Carousel, Snack Stand
SPIKE™ Essential
1-2 hours

Engineering Design
Shape and Function
K-2-ETS1-2

Amazing Amusement Park
The Fast Lane, The Perfect Swing
SPIKE™ Essential
1-2 hours

Engineering Design
Strengths and Weaknesses
K-2-ETS1-3

Amazing Amusement Park
Ferris Wheel, Twirling Teacups
SPIKE™ Essential
1-2 hours

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3Rd Grade: CS and Language Arts

Communicator
NGSS 4-ESS3-2, 3-5-ETSI-1, CSTA 1B-AP-15, ISTE 1.4c, CCSS.ELA.Literacy.SL.4.1

Science Connections
Preparing for Weather, Life Cycles
SPIKE™ Essential
1-2 hours

Problem Solver
CSTA 1B-AP-10, NGSS 3-5-ETS 1-2, ISTE 1.5.d, CCSS.ELA-Literacy.SL.3.4

Happy Traveler
Cable Car, River Ferry
SPIKE™ Essential
1-2 hours

Responsible Citizen
CSTA 1B-AP-o8, NGSS 3-5 ETS1-2, ISTE 1.4c, CCSS.ELA-Literacy.SL.5.1

Quirky Creations
Big Little Helper, Trash Monster
SPIKE™ Essential
1-2 hours

Comprehension and Collaboration
SL.2.3.b

Science Connections
Preparing for Weather, Life Cycles
SPIKE™ Essential
1-2 hours

Presentation of Knowledge and Ideas
SL.4.3

Science Connections
Animal Behavior, Solving Problems
SPIKE™ Essential
1-2 hours

Vocabulary Acquisition and Use
L.6.3

Animals and their Habitats
Musical Vibrations, Sound and Light
SPIKE™ Essential
1-2 hours

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6th Grade: Science

Contact Forces
6.MS-ETS2-1(MA), 6. MS-ETS2-2(MA), 7. MS-PS3-1, 7.MS-PS3-5, 7.MS-ETS1-2, 7.MS-ETS1-4, 7.MS-ETS1-7(MA), 8.MS-PS2-1, 8.MS-PS2-2, 8.MS-ETS2-4(MA)

The Science Of Sports: Pass the Ball, Gymnast, Ski Slop
BricQ Motion Prime
2-4 hours

Sound
6.MS-PS4-1, 6.MS-PS4-2

See it! Hear it! Build it!: Musical Vibrations; Communicate with Light and Sound
SPIKE™ Essential
2-4 hours

Forces at a Distance
6.MS-PS4-3, 7.MS-PS2-5, 7.MS-PS3-2

The Science Of Sports: Free Kick, Land Yacht, Propeller Car
BricQ Motion Prime
2-4 hours

Earth in Space
6.MS-ESS1-1a, 6.MS-ESS1-5(MA), 6.MS-PS2-4, 6.MS-PS4-2, 8.MS-ESS1-1b, 8.MS-ESS1-2

Tufts Placemat: Astronauts Tools
SPIKE™ PRIME
2-6 hours
2-6 week checkout

Genetics
8.MS-LS1-5, 8.MS-LS3-1, 8.MS-LS3-2, 8.MS-LS3-3(MA), 8.MS-LS3-4(MA), 8.MS-LS4-5

Tufts Placemat: Silly Walk (CCC)
SPIKE™ PRIME with Python
2-4 hours

Natural Selection & Ancestry
6.MS-LS4-1, 6.MS-LS4-2, 7.MS-LS1-4, 8.MS-LS4-4

Tufts Placemat: RoboChef (CCC)
SPIKE™ PRIME with Python
2-4 hours

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Learning Materials

Teacher Lesson Materials

Prepare Engage Explore Explain Elaborate Evaluate Tips Differentiation Extension

SPIKE™ Essential

Animal Alarm

Print Share

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?

30–45 min. Beginner Grades 1–2

Prepare

- Review the *Animal Alarm* lesson in the LEGO® Education SPIKE™ App.
- If necessary, pre-teach these related vocabulary words: *alarm, cause, Color Sensor, creature, effect,* and *react.*
- Consider the abilities and backgrounds of all your students. Differentiate the lesson to make it accessible to everyone. See the *Differentiation* section below for suggestions.
- If time allows, plan and facilitate the language arts extension. See the *Extension* section below for more information.

Engage

(Whole Class, 5 Minutes)

- Facilitate a quick discussion about cause and effect.
  - Talk with your students about what happens when an alarm (e.g., fire alarm, alarm clock, cell phone alert) goes off.
  - Ask questions, like: *What would happen if you heard an alarm going off? What would you think is happening?*
- Introduce your students to the story's main characters and the first challenge: turn on the animal alarm.
- Distribute a brick set and a device to each group.

Explore

(Small Groups, 30 Minutes)

- Have your students use the LEGO® Education SPIKE™ App to guide them through their first challenge:
  - Make and try the program that turns on the alarm when a blue creature

Teacher Support

Key objectives

Students will:

- Identify cause and effect
- Develop a program to solve a problem
- Practice helping a story character
- Participate in collaborative conversations

Things you will need

Additional resources

Building instructions
Meet the Team: Minifigure Bios
Assessment Rubric

Educational standards

- CSTA 1A-AP-10
- NGSS 1-PS4-4
- ISTE 1.5d
- CCSS.ELA-LITERACY.SL.1.1
- CCSS.MATH.CONTENT.1.MD.C.4

Language Arts Extension

- CCSS.ELA-LITERACY.W.1.2

Rubrics for Assessment

Great Adventures

Creating Interactive Stories

Name: _____

Student can	Needs additional support	Can work independently	Can teach others
Break down (decompose) the problem into smaller steps			
Describe a sequence of code			
Demonstrate a sequence of code			
Describe cause and effect in relation to their program.			
Demonstrate a repeated action			
Test and modify a program			
Describe cause and effect in a program			
Identify the main character in the story			
Participate in collaborative conversations			

Additional comments:

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Computer Science	LEGO® Education Lesson Resources	Lesson Description	Sequencing	Decomposition	Debugging
	Unplugged Back-to-Back Physical Coding	Communicate how to create a blind build. PK-2 students can use 3 bricks; older students should use 6 bricks.	**Grades PK-2** Develop programs with sequences and simple loops to express ideas or address a problem. **What do we want the train to do? In what order should the train do those actions? Can the minifigs take the same trip again?** **Grades 3-5** Create programs that include sequences, events, loops, and conditionals. **What kind of sound events can you add to your light sequences? Can you program different sounds for different experiences on a journey?** **Grades 6-8** Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. **Can you program a short song to accompany your digital sign? Or pair with other groups to create synchronized displays? How can you help friends with different needs see, hear, or experience the digital sign?**	**Grades PK-2** Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. **(With prompting) can you tell me the sequence of events?** **Grades 3-5** Use decomposition skills to break a complex problem down into smaller parts. **What questions need to be answered to create your code? Create a visual storyboard of each step to be completed to create your code.** **Grades 6-8** Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs. **Can you create a checklist of all the tasks necessary to create the digital sign? What patterns do you see in your pseudocode? How can you use this to develop your final code?**	**Grades PK-2** Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. **Why do you think X happened? What could we do to correct this?** **Grades 3-5** Test and debug a program or algorithm to ensure it runs as intended. **Can your group copy the sequence of lights, sounds from another group? How will you know the lights, sounds are exact? Do the codes need to be exact to have the same output?** **Grades 6-8** Systematically test and refine programs using a range of test cases. **Document programs to make them easier to follow, test, and debug. What important information should you highlight with comments in your code to help with updates and changes in the future?**
	Coding Express O-Shaped Track Looping Physical Coding	Create an O-shaped track with repeating sequences.			
	SPIKE™ Essential App Tutorial 2: The Light Icon Coding	Use icon blocks to create and test a program that first turns on a light, then matches light patterns.			
	SPIKE™ Essential Cave Car Icon or Block Coding	Replicate a program to activate a cave car's light. Modify and describe the program's sequence of events and its outcome.			
	SPIKE™ Prime App Tutorial 1: The Light Matrix Block Coding	Create a program that displays a smiley face. Then modify the code to replicate a given pattern.			
	SPIKE™ Prime Communicating with Light Intro to Python Coding Course All Courses	Write a program to control the light matrix to show images and write words.			
	SPIKE™ Prime Digital Sign Python Coding	Apply knowledge of using the light matrix and programming sounds to design, build, and program a digital sign for advertisement.			
The SPIKE Prime activities featured link to Legacy SPIKE App 2 lessons (December 2022). Consider using this sequence to showcase your school's computer science classes *IN LIGHTS*!					

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Phase 1: Getting Started

December 2022

- Getting Started: Setting up for Success
  - Unboxing
  - Storage and Maintenace
  - Inventory Control
  - Technical Questions
  - Updating hubs and firmware
  - Classroom materials management guidance

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Phase 1

- Share information about learning system resources and support including:
  - Success Programs
  - Community of Practice
  - Training and Point of Need PD
  - Lesson plans and learning resources
  - Standards information and resources
- Build engagement with National CS activities
  - National CS Week 12/5-12/11
  - National STEM/STEAM Day 12/8
  - Hour of Code 12/9
  - Games Day 12/20

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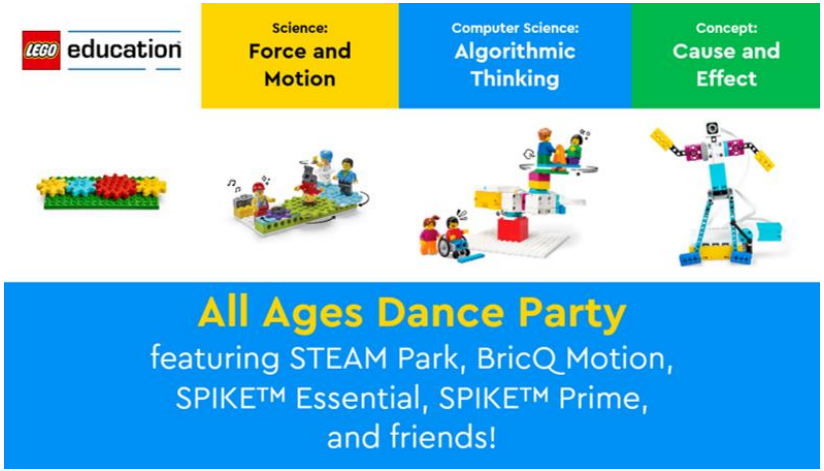
Example: National STEM - Day Dance Party



[National STEAM Day Dance Party - LEGO Education]

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LEGO® All-Ages DANCE PARTY	LEGO® Education Lesson Resources	Science: Force and Motion	Computer Science: Algorithmic Thinking	Concept: Cause and Effect
	STEAM Park Gears Include Minifigs in the build so they, too, can dance!	**Grades PK-2** —Investigate how pushing on an object can change the speed or direction of its motion, and start or stop its movement. ***How do gears of different sizes push each other? Which sizes move faster or slower?*** **Grades 3-5** —Demonstrate and explain that objects push on one another when they touch and that this can change their motion. ***What is the relationship between force and motion?*** **Grades 6-8** —Explain, using evidence from the model, that when two objects interact, each one exerts a force on the other, and these forces can transfer energy between them. ***Create a diagram from the model that shows the direction of forces.***	**Grades PK-2** —Create and follow algorithms (sets of step-by-step instructions) to complete tasks. ***Have students line up the gears in a row and place them so that when they move one of the gears, all the gears move.*** —Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. **Grades 3-5** —Compare and refine multiple algorithms for the same task and determine which is the most appropriate. ***How can you iterate on (change and improve) the build or the code?*** **Grades 6-8** —Compare and refine multiple algorithms for the same task and determine which is the most appropriate. ***How will you define or determine "most appropriate" or "best"?*** —Demonstrate ways a given algorithm applies to problems across disciplines. ***How can this build and code be applied to authentic products/processes?*** —Describe choices made during program development using code comments and demonstrations.	**Grades PK-2** —Design and perform tests to gather evidence to support or refute student ideas about causes. ***What happens when you interlock a large gear with a small gear? What happens when you interlock two gears of the same size?*** **Grades 3-5** —Identify and test causal relationships and use these relationships to explain change. ***Can you explain How and Why the build moves as it does?*** **Grades 6-8** —Classify relationships as causal or correlational. ***Use cause and effect relationships to predict phenomena in designed systems.***
	BricQ Motion Essential Get Up and Dance			
	SPIKE™ Essential Classic Carousel			
	BricQ Motion Essential Cheering Crowd			
	WeDo 2.0 Make a Dancing Robot			
	SPIKE™ Essential Twirling Teacups			
	SPIKE™ Prime Break Dance			

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Phase 2 – All

- Share Content Menus
- Ongoing Professional Development
- Point of Need Coaching
- Troubleshooting and On-going Support
- Check-in: April - May
- Summer Program Development

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LEGO® Education Additional Support

- Customer Success resources and support
- Community Portal for Mobile Labs
- Open Access Professional Development portal for self-guided training

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The LEGO Education Community!

The new online hub for all things LEGO Education allows educators to harness the power of their peers to:

- Share best practices and resources
- Discover and participate in upcoming events and programs
- Ask questions and answer them
- Connect directly with LEGO Education product experts

https://community.legoeducation.com/home

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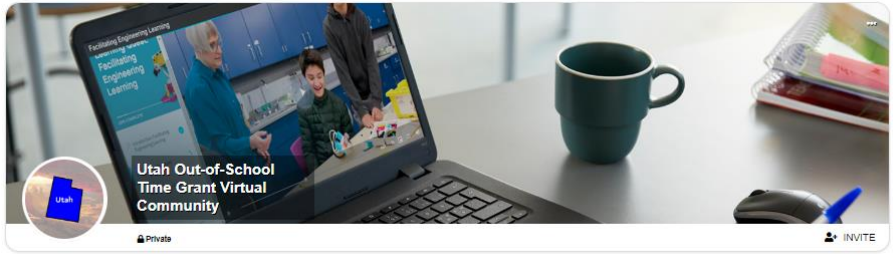
Customized Community Page



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About

Category:
Geographic Groups

Description:
This group is intended for Utah Out-of-School Time Grant participants. Facilitated by LEGO Education Academy trainers, this space is meant for educators to share documents, ideas and best practices that are relevant to the needs of the grant.

Welcome

Welcome to the group! Here are a few ways to get started:

1. Introduce yourself and get to know others in the discussion thread.
2. Register for an upcoming Q&A session with the LEGO Education Certified Academy Trainers.
3. Download the After School Activity Guide.

Ongoing Discussions

Search

FILTER

DATE CREATED

Introduce Yourself!

Hello all! Welcome to the Utah Out-of-School Time Grant Virtual Community. Use this thread to introduce yourself. ...

LEGO Education Community Team Category Utah Professional Learning Sep '22

Jennifer Flood 30d

Hi! I'm Jennifer Flood, LEGO Education Trainer, from Austin Texas! I look forward to connecting with y'all ...

STEPHEN MEEHAN 29d

@LEGO Education Community Team

Hello, my name is Stephen Meehan, I also am a LEGO Certified trainer and a retired ...

Upcoming Events

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Professional Development

Self-Guided Learning

Online, on-demand

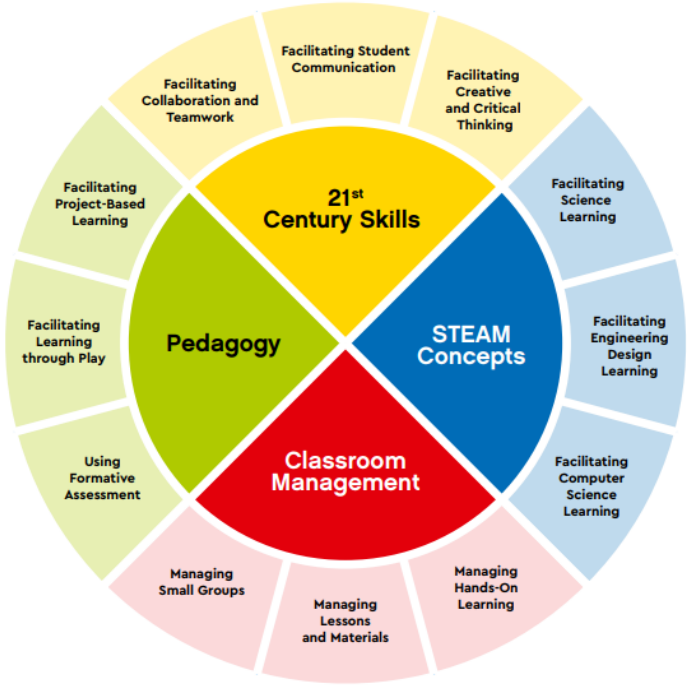
Product Training & Support Resources

Training videos

Competency-Based Modules

Learning Bursts – 10 min.

Learning Quests – 30-40 min.



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What does success look like?

Suggestions* for measuring success of your implementation

Uptake and use of materials by 25%

Metrics to Measure

Growth in reservations

- Compare check-out volume to volume 6 months and 1 year after implementing the program

Increase the number of hands-on learning hours by 25%

Metrics to Measure

Teacher reported number of hours of in-class time using hands-on materials

- Survey 6 months and 1 year after implementing the program

Increase teacher confidence in delivering high quality hands-on Coding and Hardware instruction by 25%

Metrics to Measure

Change in teacher confidence

- Pre-survey to gauge current teachers' perceptions and confidence in leading high-quality instructional experiences using hands-on Coding and Hardware Materials

- Interim and Post survey 6 months and 1 year after implementing the program

***LEGO® Education does capture, review, or analyze program data.**

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