

A-Maze-Ing

Try to beat Leo's current record for completing the maze!

🕒 30–45 min. 📦 Beginner 🎓 Grades 3–5



Teacher Support

Key objectives

Students will:

- Observe and explain how interactions between two objects can impact the energy of an object
- Compare and iterate to improve the design of the solution
- Engage effectively in a range of collaborative discussions

Things you will need

(one for every two students)

- LEGO® Education SPIKE™ Essential Set
- Device with the LEGO® Education SPIKE™ App installed

Additional resources

[Building instructions](#)

[Meet the Team: Minifigure Bios](#)

[Assessment Rubric](#)

Educational standards

- CSTA 1B-DA-07
- NGSS 4-PS3-2
- ISTE 1.3d
- CCSS.ELA-LITERACY.SL.4.1

Language Arts OR Math Extension

- CCSS.MATH.CONTENT.4.NF.C.7

Prepare

- Review the *A-Maze-Ing* lesson in the LEGO® Education SPIKE™ App.
 - If necessary, pre-teach these related vocabulary words: *capable*, *evidence*, *obstacles*, *record*, *tilt*, and *transfer*.
 - 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 math extension. See the *Extension* section below for more information.
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Lesson Plan

Engage

(Whole Class, 5 Minutes)

- Facilitate a quick discussion about how energy can be transferred from one object to another.
 - Talk with your students about what happens when two objects collide with one another.
 - Ask questions, like: *When two objects collide, what happens to their energy? How can you tell that energy is being transferred?*
 - Introduce your students to the story's main characters and the first challenge: counting the number of tilts that are needed to complete the maze.
 - Distribute a brick set and a device to each group.
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Explore

(Small Groups, 30 Minutes)

- Have your students use the LEGO® Education SPIKE™ App to guide them through their first challenge:
 - Create and test the program that counts the number of tilts it takes to complete the maze.
 - Have your students iterate and test their models to complete the next two challenges in the app:
 - Modify the program to make the maze do something different when it's tilted.
 - Upgrade the maze by adding different obstacles.
 - You can find coding and building support in the *Tips* section below.
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Explain

(Whole Class, 5 Minutes)

- Gather your students together to reflect on their completed challenges.

- Ask questions, like: *How many tilts did it take for the ball to reach the goal? How did the ball's energy change when it interacted with an obstacle or the wall of the maze? How was it visible in the ball's motion?*
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Elaborate

(Whole Class, 5 Minutes)

- Prompt your students to discuss and reflect on their observations of energy being transferred from place to place.
 - Ask questions, like: *Where did you see interactions that affected the energy of the ball in the maze? What else could you see or hear that would indicate that energy was being transferred?*
 - Have your students clean up their workstations.
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Evaluate

(Ongoing Throughout the Lesson)

- Ask guiding questions to encourage your students to "think aloud" and explain their thought processes and reasoning in the decisions they've made while building and programming.

Observation Checklist

- Measure your students' proficiency in explaining how motion can be a sign that energy is being transferred.
- Create a scale that matches your needs. For example:
 1. Needs additional support
 2. Can work independently
 3. Can teach others

Self-Assessment

- Have each student choose the brick that they feel best represents their performance.
 - Yellow: I think I can explain how motion can be a sign of energy being transferred.
 - Blue: I can explain how motion can be a sign of energy being transferred.
 - Green: I can explain how motion can be a sign of energy being transferred, and I can help a friend do it too.

Peer-Feedback

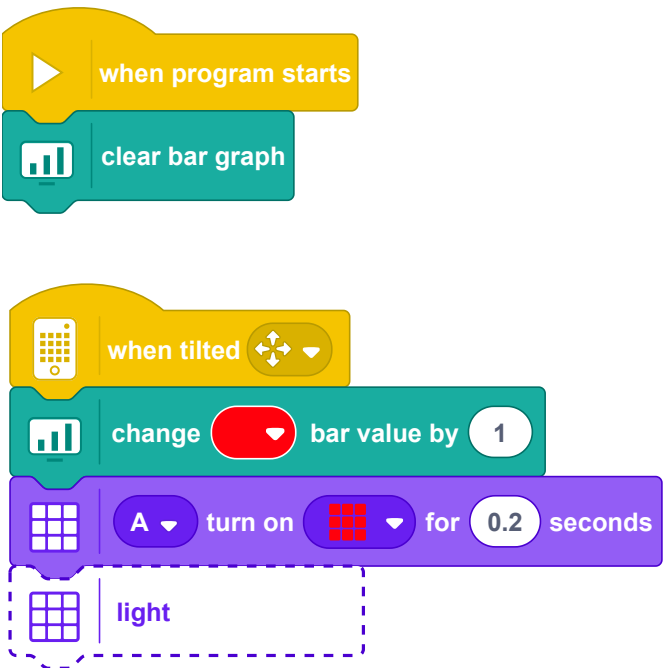
- In their small groups, have your students discuss their experiences working together.
- Encourage them to use statements like these:
 - I liked it when you...
 - I'd like to hear more about how you...

Tips

Coding Tip

- After your students complete their first challenge, they'll be provided with three Inspiration Coding Blocks to help them modify their programs.
- The Inspiration Coding Blocks are intended to spark their imaginations as they experiment to find their own solutions.

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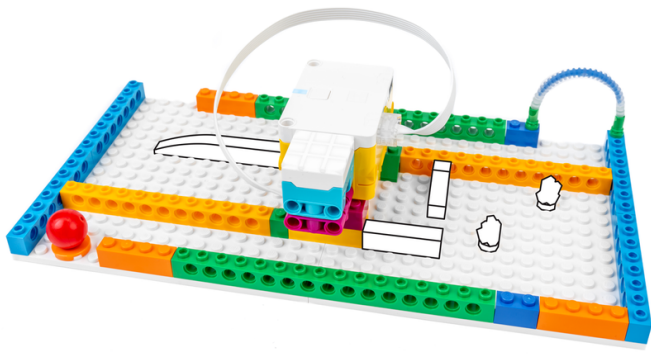
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Model Tip

- After your students complete their second challenge, they'll be provided with three Inspiration Images and an open-ended prompt for improving their models.
- The Inspiration Images are to help spark their imaginations as they experiment and change their models.

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There aren't any building instructions for this challenge.

Differentiation

Simplify this lesson by:

- Limiting the number of obstacles in the maze
- Selecting one Inspiration Image to help your students change their models
- Experimenting with either the coding or the building

Increase the difficulty by:

- Creating a different program that collects data when the maze is tilted differently (e.g., left, right, forward, backward)
- Exploring new and different coding blocks in the program

Extension

- Using the information gathered from the Bar Graph Block, ask your students to write a paragraph comparing their results to another group's results. Tell them to use more than, less than, and equal to statements.

If facilitated, this will extend beyond the 45-minute lesson.

Math: CCSS.MATH.CONTENT.4.NF.C.7

