

Bowling Fun

Have fun with Daniel's bowling game! Can you get a strike?

🕒 30–45 min.

📦 Beginner

🎓 Grades 3–5



Teacher Support

Key objectives

Students will:

- Predict outcomes of the changes in energy that occur when objects collide
- Observe and describe the relationship between energy and force
- 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-AP-12
- NGSS 4-PS3-3
- ISTE 1.3d
- CCSS.ELA-LITERACY.SL.4.1
- CCSS.MATH.CONTENT.4.MD.C.5

Language Arts Extension

- CCSS.ELA-LITERACY.W.4.7

Prepare

- Review the *Bowling Fun* lesson in the LEGO® Education SPIKE™ App.
- If necessary, pre-teach these related vocabulary words: *force*, *modify*, *potential energy*, and *ramp*.
- 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 the outcomes of the changes in energy that occur when objects collide.
 - Talk with your students about what happens when two or more objects collide (e.g., in bowling, baseball, golf).
 - Ask questions, like: *What will you see when two objects collide? What do you think happens to the energy of the objects when they collide?*
 - Introduce your students to the story's main characters and the first challenge: bowling a strike.
 - 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 to get a strike.
 - Have your students iterate and test their models to complete the next two challenges in the app:
 - Modify the program to improve the bowling game.
 - Upgrade the bowling game to knock down different types of pins.
 - 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 did you bowl a strike? How did the ball's energy impact the bowling pins?*
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Elaborate

(Whole Class, 5 Minutes)

- Prompt your students to discuss and reflect on the changes in energy that occur when objects collide.
 - Ask questions, like: *How do you know that two objects have collided? Why does the speed of an object affect what happens when two objects collide?*
 - 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 predicting the outcomes of changes in energy that occur when objects collide.
- 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 describe how energy changes when objects collide.
 - Blue: I can describe how energy changes when objects collide.
 - Green: I can describe how energy changes when objects collide, and I can help a friend do it too.

Peer-Feedback

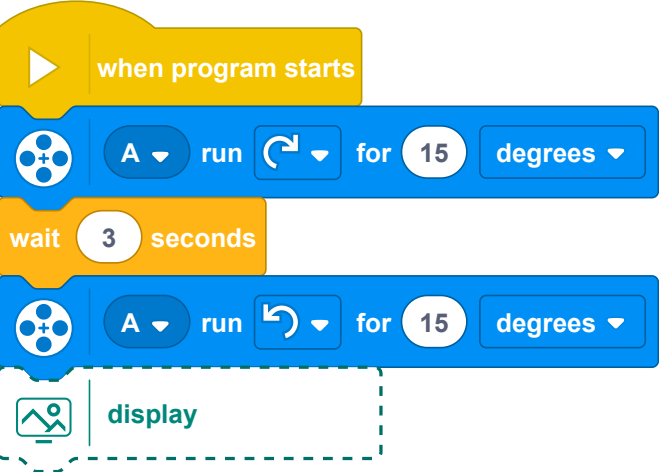
- In their small groups, have your students discuss their experiences working together.
- Encourage them to use statements like these:
 - I liked it when you...
 - I'd like to hear more about how you...

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.

1



when program starts

A run for 15 degrees

wait 3 seconds

A run for 15 degrees

display

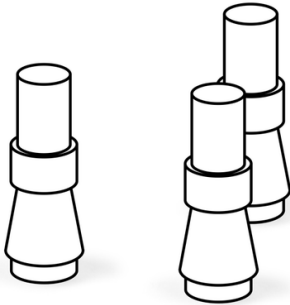
3

2

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.

1



3

2

There aren't any building instructions for this challenge.

Differentiation

Simplify this lesson by:

- Selecting one Inspiration Image to help your students change their models
- Experimenting with either the coding or the building

Increase the difficulty by:

- Using the Color Sensor to start the program for the bowling ramp
 - Adding additional obstacles that could impact the ball's energy before it reaches the pins
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Extension

- Have your students conduct a short research project about accessibility in public spaces, and how objects can be modified to make the space accessible to everyone.

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

Language Arts: CCSS.ELA-LITERACY.W.4.7