

Help!

Define a problem by observing a scenario.

🕒 30–45 min. 📦 Beginner 🎓 Grades 6–8



Teacher Support

Key objectives

Students will:

- Define a problem
- Begin to establish criteria that will eventually lead to a solution

Things you will need

[LEGO® Education SPIKE™ Prime Set](#)

Additional resources

[Building instructions \(Kiki, the dog\)](#)

[Python Programs](#)

Educational standards

NGSS

MS-ETS1-1 Engineering Design

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.

Common Core

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.

Lesson plan

1. Prepare

- Read through the student material in the LEGO® Education SPIKE™ App.
- If you feel it's needed, plan a lesson using the getting started material in the app. This will help familiarize your students with LEGO® Education SPIKE™ Prime.

2. Engage (5 Min.)

- Use the ideas in the *Ignite a Discussion* section below to engage your students in a discussion related to this lesson.

- a discussion related to this lesson.
- Use the video to explain the lesson.

3. Explore (20 Min.)

- Have your students work in pairs to build the Kiki the dog model.
- Ask them to play the first programming stack and describe what they think is happening.
- Have them play the second programming stack.
- Give them one minute to make a list of all the possible problems Kiki could have with the new sounds.

4. Explain (5 Min.)

- Have each team pair up with another team to compare and discuss their lists. Steer the discussion toward defining a problem.

5. Elaborate (10 Min.)

- Ask the teams to create a new "story" and to define new problems by choosing their own sounds and updating their programs accordingly.
- Don't forget to leave some time for cleanup.

6. Evaluate

- Give feedback on each student's performance.
 - You can use the assessment rubrics provided to simplify the process.
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Ignite a Discussion

Start a discussion about pets by asking if any of your students have a pet at home. Briefly talk about some of their animals' behavior, focusing the discussion on how they can identify problems their pet may be having, for example:

- Has their cat ever made an odd sound?
- Does their dog bark or growl?

Have your students watch this video to see what they're about to do.

Building Tips

How does it work?

This model uses a Color Sensor to detect and react to the color of objects. The Color

This model uses a Color Sensor to detect and react to the color of objects. The Color Sensor can detect various color tones. Find out more about the Color Sensor in the help section of the SPIKE App.

Make It Your Own

Allow students to personalize their models by adding bricks and other elements from around the classroom.

Coding Tips

Main Program

Other Programs

Differentiation

Simplify this lesson by:

- Narrowing the options of where these stories are taking place (e.g., in a house, park, or city street)

Take this lesson to the next level by:

- Eliminating easy and obvious options (e.g., Kiki is barking because the doorbell rang), challenging your students to come up with some highly creative problem descriptions
- Having the teams give "story sounds" to each other, then comparing how different teams define problems

‣ Note: a "story" is a series of 3 sounds, one for each color block

- Having your students go through the full design process after defining the problem, in order to find a solution to the problem
- Incorporating the language arts extension

Assessment Opportunities

Teacher Observation Checklist

Create a scale that matches your needs, for example:

1. Partially accomplished
2. Fully accomplished
3. Overachieved

Use the following success criteria to evaluate your students' progress:

- Students can define problems based on various observations.
- Students can communicate the details of the problem they observed.
- Students can see the difference between defining a problem and defining a solution.

Self-Assessment

Have each student choose the brick that they feel best represents their performance.

- Blue: I've identified one problem in each of Kiki's stories.
- Yellow: I've identified multiple problems in each of Kiki's stories.
- Violet: I've identified multiple problems in each of Kiki's stories and described all of them in detail.

Peer-Assessment

Encourage your students to provide feedback to others by:

- Having one student score the performance of another using the colored brick scale above.
- Asking them to present constructive feedback to each other so that they can improve their group's performance during the next lesson.

Language Arts Extension

To incorporate language arts skills development:

- Have your students share their lists in various ways:
 - ▷ As a presentation to the class
 - ▷ As part of a class discussion
 - ▷ In small groups of 8-10 students

- Ask the students to give positive and constructive feedback to the other teams.

Note: This will make for a longer lesson.

Career Links

Students who enjoyed this lesson might be interested in exploring these career pathways:

- Construction and Architecture (Architecture)
- Business and Finance (Entrepreneurship)
- Manufacturing and Engineering (Pre-Engineering)