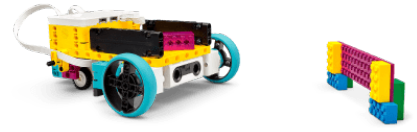


Out of Order

Find and fix mistakes in a program to make a Delivery Cart work as intended.

🕒 30–45 min. 📦 Beginner 🎓 Grades 6–8



Teacher Support

Key objectives

Students will:

- Identify and fix programming problems

Things you will need

[LEGO® Education SPIKE™ Prime Set](#)

Additional resources

[Building instructions](#)

Educational standards

CSTA

2-CS-03

Systematically identify and fix problems with computing devices and their components.

Common Core

CCSS.ELA-LITERACY.W.7.2

Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

CCSS.MATH.CONTENT.7.NS.A.3

Solve real-world and mathematical problems involving the four operations with rational numbers.1

Lesson Plan

1. Prepare

- Read through the student material in the LEGO® Education SPIKE™ App.

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.
- Use the video to explain the lesson.

3. Explore (15 Min.)

- Have your students work in pairs to build the cart.
- Ask them to play the program, keeping in mind that it has some bugs that need to be fixed.

4. Explain (5 Min.)

- Ask your students to share their methods for finding bugs.

5. Elaborate (15 Min.)

- Have your students play with the second programming stack.
- Ask them to make a list of all the bugs they think they've found.
- Give them a few minutes to correct the program.
- Have each team write their own program to make their cart follow a second path as shown in the video.
- To avoid introducing bugs into their programs, make sure they document their key actions.
- 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 prototyping by asking relevant questions, like:

- How do you fix something that goes wrong on your bike?
- What to do when your phone or tablet update fails?
- When solving a math problem, how do you check your work?

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

Building Tips

A Funny Little Cart

This delivery cart has a unique way of moving around. The two Medium Motors in front are for driving forward and backward, and the Large Motor at the back is for steering.

This model is intentionally designed to be a little unpredictable.

Coding Tips

Main Program

Possible Solution

Other Programs

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Differentiation

Simplify this lesson by:

- Conducting the lesson in larger groups, guiding your students toward the bugs they have to correct

Take this lesson to the next level by:

- Creating a "problem cards" pdf and seeing how many problems each team can solve during a lesson
 - Arranging these problems in increasing order of complexity
-

Assessment Opportunities

Teacher Observation Checklist

Create a scale that matches your needs, for example:

1. Partially understood

1. Partially accomplished
2. Fully accomplished
3. Overachieved

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

- Students can find bugs in a program.
- Students can fix bugs after finding them.
- Students can correctly document modifications and improvements to a program.

Self-Assessment

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

- Blue: I've found some bugs in the program.
- Yellow: I've found and fixed all the bugs in the program.
- Violet: I've found and fixed all the bugs in the program and recorded the fixes so other people can modify their programs based on my notes.

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 create a detailed checklist of elements to verify when they're coding.
- Introduce them to adding comments to their programs, focusing on the importance of making their comments precise and easily understood by anyone.

Note: This will make for a longer lesson.

Math Extension

To incorporate math skills development:

- Give a math problem and demonstrate how to debug it, focusing on key concepts, for example:
 - ▷ Correctly isolating the problem to be solved
 - ▷ Reviewing each step of the process

Note: This will make for a longer lesson.

Career Links

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

- Manufacturing and Engineering (Pre-Engineering)
- Media and Communication Arts (Digital Media)
- Transportation (Automotive Technology)