

Automate it!

Create and program an automated helper that can identify and ship the correct package based on color.

🕒 120+ min. 📦 Intermed. 🎓 Grades 6–8



Teacher Support

Key objectives

Students will:

- Use computational thinking skills to produce a complete solution to a problem

Things you will need

[LEGO® Education SPIKE™ Prime Set](#)

Additional resources

[Building instructions \(Solution Example\)](#)

[Building instructions \(Solution Example\)](#)

[Building instructions \(Solution Example\)](#)

[Inventor Notebook PDF](#)

[Python Programs](#)

Educational standards

NGSS

MS-ETS1-4

Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

CSTA

2-CS-02 6-8

Design projects that combine hardware and software components to collect and exchange data.

Common Core

CCSS.ELA-LITERACY.SL.7.5

Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

Lesson plan

1. Prepare

- Read through the student material in the LEGO® Education SPIKE™ App.
- Create a space for storing models between lessons.
- Prepare an Inventor Notebook with documenting questions to help your students keep track of their work. Look for inspiration in the Inventor Notebook provided.

Part A

2. ENGAGE (10 Min.)

- Use the ideas in the *Ignite a Discussion* section below to engage your students in a discussion related to this lesson.
- Explain the lesson, noting that this project will run for the next 2-3 class sessions.

3. Explore (35-55 Min.)

- Explain the problem your students are trying to solve.
- Give them some time brainstorm solutions.
- Ask them to create pseudocode for the actions they plan to program.
- Have them work in pairs to build their automated helper.

4. Explain (10 Min.)

- Ensure that your students are identifying and documenting any problems they're facing as they develop their solutions.

Part B

5. Elaborate (60 Min.)

- Have your students finalize their programs. Make sure to encourage collaboration between teams.
- Ask each team to present their solution to the class.
- 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 robots by asking relevant questions, like:

- How do factory robots work?
- What do they detect? Colors? Shapes? Sizes?
- What kind of motorized mechanism does a factory robot use?
- How does the robot know where it is?
- What design features will guarantee that the robot's movements are accurate and repeatable?

You can refer back to the *Ideas, the LEGO Way* lesson to refresh your students' memories on idea generation.

Building Tips

Open-Ended Solutions

This project is designed so that every student or team can have a unique solution.

Example Solution

Here's an idea you can use to inspire your students' design process.

Combining Models

Bring your classroom together by combining everyone's creation.

Coding Tips

Main Program

Differentiation

Simplify this lesson by:

- Having your students build the example solution to start, and then improve it

Take this lesson to the next level by:

- Having your students' program as many different functions as they can come up with
- Asking some teams to build delivery carts to connect the factory robots, creating the biggest automated factory ever!

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 identify the key elements of a problem.
- Students are autonomous in developing a working and creative solution.
- Students can clearly communicate their ideas.

Self-Assessment

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

- Blue: I've successfully created an automated helper.
- Yellow: I've successfully created an automated helper that creatively solves the problem.
- Violet: I've successfully created an automated helper that creatively solves the problem and I've presented my ideas clearly.

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:

- Ask your students to use text, images, sketches, etc. to record their design process, creating an invention notebook to document their work.
- Have them present their projects to a wider audience (e.g., a school-wide assembly or by publishing online videos).
- Ask your students to create a website presenting their factory or business.

Career Links

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

- Business And Finance(Entrepreneurship)
- Information Technology (IT Applications)
- Manufacturing And Engineering (Pre-Engineering)