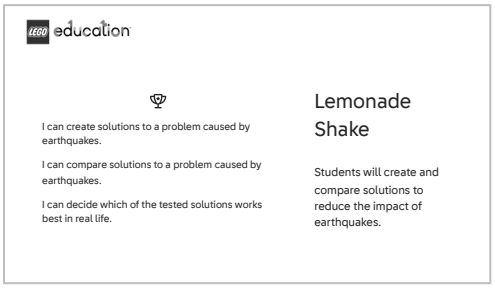
Facilitation Notes

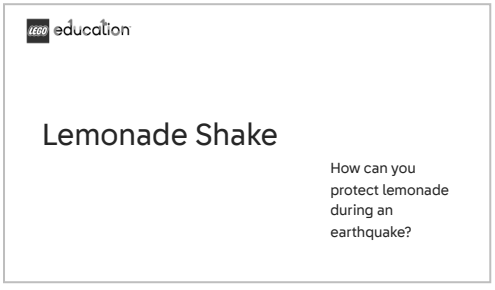
Engage 5 min.

Engage students by asking them what happens during an earthquake. Share the story of the lemonade stand and ask what effect an earthquake would have on it and the lemonade cups.



0 | Goals and Objectives

You can introduce the students to the objective and learning targets of this lesson.

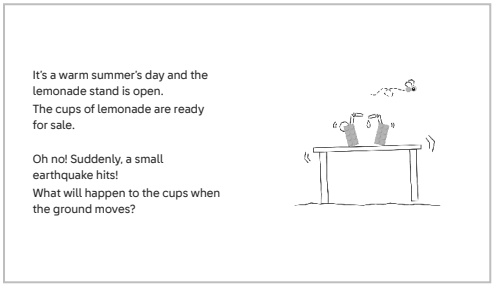


1 | Introduction

You can use these questions to start the lesson:

- *What happens during an earthquake?*
- *What happens to things sitting on the ground during an earthquake?*

Students may know that the ground shakes, causing many things on the ground to also shake.



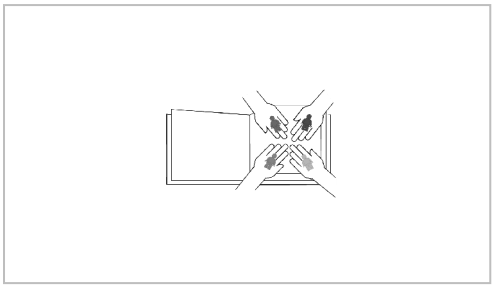
2 | Context

You can spark students' curiosity further by asking questions about the story of the lemonade stand.

- *What do you think will happen to the cups?*
- *What can the lemonade seller do to prevent it?*

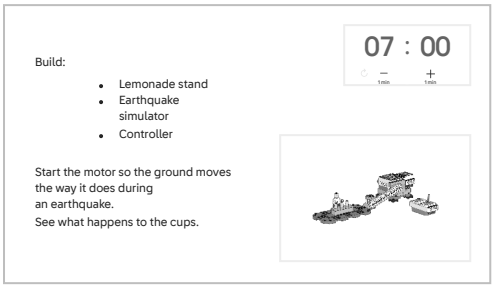
Explore 10 min.

In groups of 4, students will build the lemonade stand and the earthquake simulator. They will then start the motor on the simulator to observe what happens to the cups.



3 | Groups and Roles

Divide the students into groups of 4. Use the blue, red, green and yellow LEGO® minifigures to assign student roles and help each student find which part of the collaborative model they will build. They can find the corresponding blue, red, green and yellow LEGO minifigure icons in the building instructions.



4 | Build and Explore

If desired, you can connect all the motors to one controller using a single connection card and then count down to starting the earthquake for all groups at once. If time allows, repeat the test at least two times.

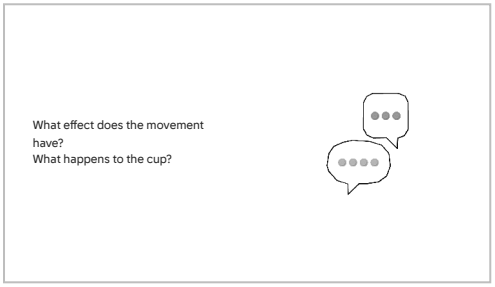
Ask students to identify what problem they need to solve for the lemonade seller.

To check student understanding, you can look for the following:

- *Students can describe what they see and define the problem.*
- *Students repeat the test to verify their observations.*

Explain 5 min.

Students will share their discoveries about the effect of the ground's movement on the cups.



5 | Share

Ask students to elaborate on the causes and effects they discovered. You might suggest that they describe these in order.

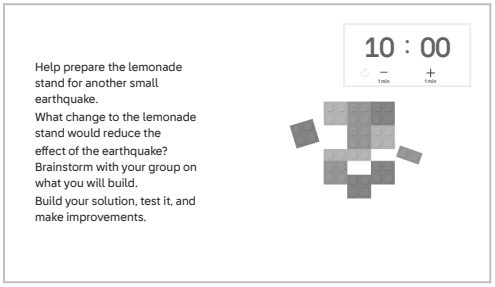
- *What causes did you notice?*
- *What effects did you notice?*

If your students need support, you can draw a cause-and-effect diagram and use it to explain:

- *The earthquake makes the ground move. Because the lemonade stand is connected to the ground, it moves when the ground moves. Because the cups are on the stand, this makes the cups move.*
- *The first cause is the ground moving. The first effect is that the table moves.*
- *The second cause is the table moving, and the second effect is that the cups fall over/off.*
- *Some effects become causes.*

Elaborate 15 min.

Students will rebuild the lemonade stand to reduce the effect of the earthquake and will then test their solution. They will share and compare their solutions. Afterwards, students will relate their design to real-life solutions that help keep things in place.



6 | Build

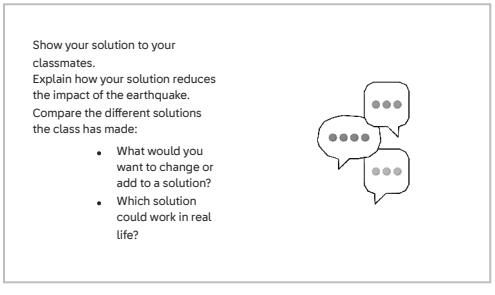
Encourage students to plan in their groups prior to building. If extending lesson time is an option, students can use project planners or graphic organisers to record their ideas.

To vary the difficulty of the problem, you can ask the students to

- only use smooth elements so the cups cannot be snapped onto the lemonade stand
- use as few elements as possible
- only make changes to the cups themselves
- create a barrier around the cups to keep them in
- hang the cups loosely instead of standing them on a desk.

To check student understanding, you can look for the following:

- *Students can use their findings from the first test to redesign.*
- *Students can use different ideas before starting to build.*

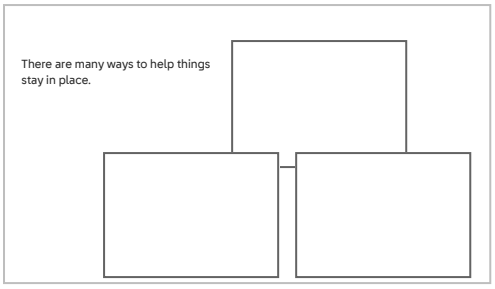


7 | Share Your Build

As students share, ask them to notice that there are different solutions to the same problem.

You can support students in comparing with questions that develop criteria for comparison. What do you think is a good outcome for the lemonade seller?

- *All the cups stay standing up.*
- *The cups are still easy to give to customers (not attached to the table).*
- *The cups are easy for customers to see.*



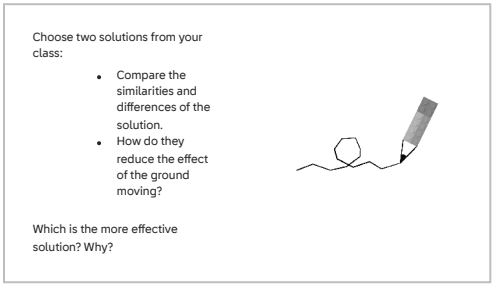
8 | In Real Life

Talk with your students about the different solutions shown. Where applicable, compare the pictured solutions to students' designs:

- A cupholder in a car may work like solutions that build a border around the lemonade stand to prevent the cups from falling down.
- Screwing benches to the ground may be similar to attaching the cups using studs.
- Tying down a truck's load may work like a solution in which students build something to restrain the cups.

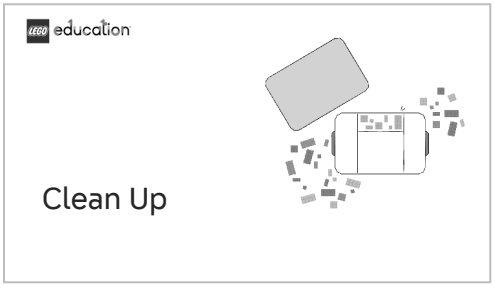
Evaluate 5 min.

An optional prompt asks students to extend their comparison from Elaborate by choosing and comparing two solutions from the class.



9 | Show What You Know

Depending on your students' abilities, you can ask them to write short notes in their notebook, draw pictures or use a combination of both.



10 | Clean Up