

Craft and Build “Drop Test” - 1 hour

Sturdy Building with Craft Materials (Engineering connection)

Overview: The students will become engineers, learning the steps of the Engineering Design Process. They will create models out of craft and recycled materials, then they will test the sturdiness of their models by dropping them from ankle height. If the models don't survive, the students can follow the engineering design process to revise their designs. Finally, they can attach their sturdy constructions to KIBO robots to make them move.

Learning Goals: Students will:

- Define an **engineer** as someone who invents and improves things.
- Understand the steps of the **engineering design process**.
- Build a sturdy construction with craft supplies, LEGO® bricks, or other familiar building materials.
- Revise their designs to achieve a goal.

Materials/Resources:

- A variety of craft and recycled materials for building and decorating.
- Pictures of a variety of natural and human-made objects.
- Engineering Design Process poster (included on page 3).
- **Optional:** one KIBO 10 kit or higher per group of 2 – 4 students.



New to KIBO? Watch the Videos!

If this is your first time using KIBO, we encourage you to check out our short tutorial videos at kinderlabrobotics.com/getting-started.

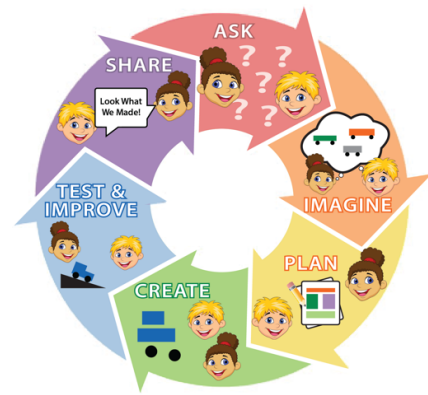
Lesson Plan



Inspire: “Today we will all become **engineers**. We will build and improve our own creations. An engineer is anyone who invents or improves things.”

Introduce the engineering design process using the poster included at the end of this lesson plan. “In their projects, engineers follow a series of steps called the “**Engineering Design Process**.” It has just 6 steps: ASK, IMAGINE, PLAN, CREATE, TEST & IMPROVE, and SHARE. The Engineering Design Process is a cycle – there’s no official starting or ending point. We can keep going around and around as we imagine and invent our creations.”

Ask the students to share examples of times they've imagined something new and then created it. Did what they created always work the first time? Engineers don't expect things to work the first time. Engineers **test** their creations to find ways to **improve** them.



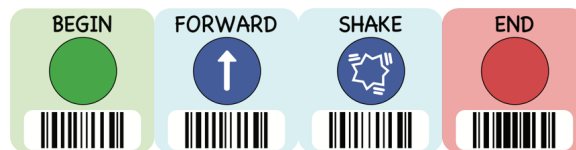
Connect: Engineered or Not? Show a variety of different pictures of naturally occurring and human-made objects, such as trees, clouds, animals, buildings, roads, and tools. Ask students to stand if they think the object is human-made and to sit down if they think it is natural. Explain to students that any human-made object is influenced in some way by engineering. Ask students to share their own examples of things that engineers have created.



Small-Group Work: Sturdy building and the ankle-drop test. Have students think about the different things they have learned that engineers can create (i.e. rockets, cars, ladders, etc.). Each group will choose one thing and create a simple sketch to serve as their **plan**.

Based on their plan, the group should then create a model using crafts and recycled materials or LEGO bricks. These models need to be sturdy! Groups should test their models by dropping them from ankle height to see if they fall apart. If models do not survive the ankle-drop test, remind students of the **test and improve** step of the Engineering Design Process. Encourage them to modify their designs. Are there loose parts that need to be better connected? Do they need a softer material to cushion the fall?

Finally, each group can attach their model to the top surface or art stage of their KIBO robot. Assist the group in scanning and running a simple movement program, such as:



Does the group's structure stay put on top of KIBO? If not, how might they improve it?



Reflect: What Did You Change? After finishing the task, groups **share** their creations. They may explain the features of their projects, describe the features of their final design that make it sturdy, talk about what they found easy and difficult, and share anything they changed from their original plan as a result of their testing.

Standards Addressed

CSTA K-12 Computer Science Standards: 1A-AP-15

NGSS Science Standards: K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3

The Engineering Design Process



When making projects, engineers follow a series of steps called the Engineering Design Process. It has just 6 steps: ASK, IMAGINE, PLAN, CREATE, TEST & IMPROVE, and SHARE. The Engineering Design Process is a cycle – there’s no official starting or ending point. You can begin at any step, move back and forth between steps, or repeat the cycle over and over!

