



# LESSON PLAN: HIGH FIVE MACHINE

**GRADE LEVEL(S):** 6-8

**LENGTH OF TIME:** 50 MINUTES

**MAKER SKILL(S):** CARDBOARD CONSTRUCTION

**TOPIC(S):** ARTS & CULTURE

## OVERVIEW

Create a high five machine using chipboard and other materials. Learn to create moving joints and to design around specific criteria and constraints.

## MATERIALS, TOOLS, AND RESOURCES

### Students

*each student*

- 2 sheets of chipboard
- 2 pipe cleaners
- 4 skewers
- 2 straws
- 4-6 brass fasteners

*(to share in small groups)*

- scissors
- masking tape
- markers or colored pencils
- colored paper
- glue dots (optional)

### Teachers

- **Skill Building Resources**  
[#HistoryMakers](#)
- student materials



## VOCABULARY

- **Hinge:** A hinge is a type of connection between two pieces of materials, where they are able to move in one direction while still staying connected to each other.
- **Joint:** A joint is another type of connection between materials where they are able to move while staying connected. The most common use of the word joint is to refer to the place where your bones connect, but are still able to move, like a knee joint. The word joint refers to the shape of that connection. A hinge is a type of joint.

## LESSON PLAN: HIGH FIVE MACHINE CONT.

### PREPARATION

- Gather student materials, and determine how students will access them during the lesson.
- Create a sample creation to share with students.
- Create a slide or share photos of a hinge and a joint, to use during the mini challenge.

### LESSON OUTLINE

<b>PROJECT FRAMING</b>	3 minutes	Students are introduced to the idea of moveable parts and the project for the day.
<b>EXPLORATION</b>	12 minutes	Students explore how to create a hinge and a joint.
<b>MAKER PROJECT</b>	27 minutes	Students make their inventions that include one moveable part.
<b>CLEANUP, SHARING &amp; REFLECTION</b>	8 minutes	Students use their inventions and reflect on the challenge.

### REAL WORLD INSPIRATION

You can tie the work from this lesson into a variety of makers and inventors. For example, Dr. Cori Lathan's inventions focus on helping people to do things better, and Dr. Arlyne Simon invented a blood test to help cancer patients (and is a children's book author).

#### Explore our #HistoryMakers:

[Dr. Cori Lathan](#)



[Dr. Arlyne Simon](#)



## LESSON PLAN: HIGH FIVE MACHINE CONT.

### PROJECT FRAMING

#### Introduction (3 minutes)

This lesson is all about making moveable parts with materials, and using those to create an invention - a high five machine. Depending on the class, students can adapt the prompt to create a different invention that contains moveable parts.

Have the class discuss why we give people high fives (to say hello, to celebrate, to make people happy, etc). Today, they are going to create an object or structure that meets one of those goals.

### EXPLORATION

#### Exploration (12 minutes)

Lead a quick brainstorm discussion asking students to name objects that move or have moving parts, but do not have any electricity. Students may share things like doors, wheels on a toy car, fingers, etc. Explain that today, we will learn about two kinds of moving parts: hinges and joints.

Ask students to think about and identify where they see these kinds of moving parts. Encourage them to look around the room, think about vehicles, or think about another place such as a grocery store to come up with ideas. Read/listen to a few student responses and synthesize, making sure cover the following points or similar:

- Scissors have a joint in the center to allow them to open and close.
- Doors use a hinge to open and close.

Transition into an open-ended mini challenge for students. As you introduce the challenge, show photos of a joint and a hinge, and leave them displayed as they work.

*Prompt:* You have three minutes to use your materials to try to build one of these two moving parts: joint or hinge.

After three minutes of building, ask students to stop. Remind them not to worry if they were not able to complete the challenge, and that they will be learning a few ways to do so in a moment.

Start with one mechanism and invite 1-2 students who chose that mechanism to share by showing their work and explaining what they did. Repeat for the other mechanism.

*Note:* See the *Maker Skill* sections of this plan for information about how to create a hinge and a joint.

## LESSON PLAN: HIGH FIVE MACHINE CONT.



### MAKER PROJECT

#### Project Prompt

Create a high-five machine. Ask students why people give high fives (to say hello, to celebrate, to make people happy, etc). Each student should select one of these goals and create a moving object or structure. They can use any of the mechanisms discussed in class, or think creatively about how to create other motions.

#### Procedure (25 minutes)

1. Students should start by briefly sketching out their idea for their invention, indicating which moving parts they will use and what materials they will use.
2. Build the body of the invention, adding moving parts as you go. Have students add one moving part first, then additional or other decorations as time allows.

### EXAMPLE PROJECT :



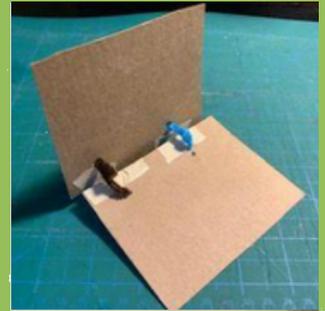
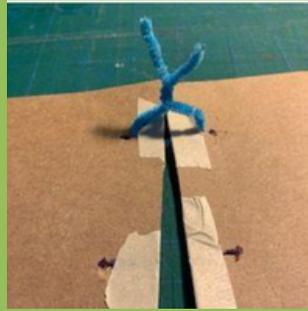
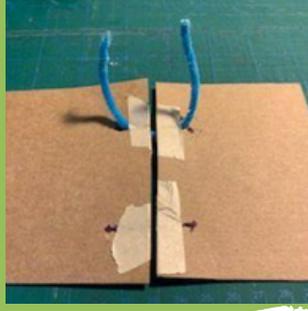
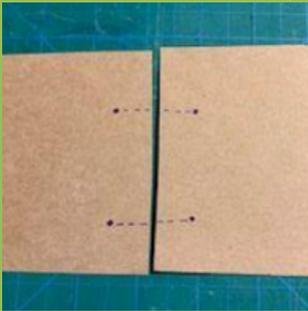
## LESSON PLAN: HIGH FIVE MACHINE CONT.

### MAKER SKILL

#### Cardboard Hinge - [Video Resource](#)

A cardboard hinge is used to connect two pieces of cardboard, chipboard, or cardstock so that one piece can swing relative to the other, like a door, box lid, or flapping wings.

1. Cut out the two pieces of cardboard that you want to connect using a hinge.
2. Align the two edges of cardboard that you would like to connect and make two small marks along each edge, making sure that the marks are lined up along both pieces.
3. Make a hole on each mark using a hole punch.
4. Cut a small piece of pipe cleaner, about four inches long. Slide one end of the pipe cleaner through the aligned holes on the two pieces of cardboard, until the two pieces of cardboard are about halfway through the pipe cleaner. Then lie the two pieces of material flat. Make sure you leave enough space between the two pieces of material to lay flat and not overlap each other. *Note: instead of pipe cleaner, you can also use twist ties or string.*
5. Cross the end of the pipe cleaner to form an X, and then use the other hand to twist the ends together. Fold the twist down on one side.
6. Repeat the same process with the second hole on both pieces. Continue the process for any additional holes.
7. Open and close the hinge until it moves smoothly.



## LESSON PLAN: HIGH FIVE MACHINE CONT.

### MAKER SKILL

#### Cardboard Moving Joints- [Video Resource](#)

This technique can be used with any stiff material such as cardboard, cardstock or chipboard. In place of brass brads, pipe cleaners, twist ties, or bent paper clips can be used.

1. Cut out the two shapes of chipboard that will be connected by the joint: the fixed piece and the moving piece. Align the pieces where they will connect and make a mark on each piece at the connection point.
2. Use a hole punch to make a hole on the mark on the moving piece.
3. Repeat Step 2 with the fixed piece, creating a hole on the mark where the two pieces will connect.
4. Insert a brass fastener through the hole in the moving piece, then through the hole in the fixed piece. Open the legs of the fastener so they are flat against the back side of the fixed piece. Tape the legs of the fastener to the back of the fixed piece of chipboard.
5. Rotate the moving piece until the hole widens enough for the piece to rotate smoothly. If necessary, remove the brass fastener to widen the hole with a pencil.



## LESSON PLAN: HIGH FIVE MACHINE CONT.

### CLEANUP, SHARING, AND REFLECTION

#### Cleanup (3 minutes)

Students should keep their projects. They should return materials that can be reused and throw away trash materials.

#### Reflection (5 minutes)

Have students gather together with their inventions.. Give them a few minutes to test out each other's work, sharing what the goal of the invention was (say hello, celebrate, etc). Ask the class to reflect on what the most challenging part of the activity was, and what they are the most proud of.



### EXTENSIONS AND ADAPTATIONS

- Students who finish early can decorate their inventions
- Students who struggle should focus on creating a single moving part, then adding it to a larger stationary piece of cardboard.
- Groups can work together to combine their mechanisms and create a larger machine.

