

## CARDBOARD FURNITURE

This session introduces participants to the three phases of the design process—investigating, planning, and building.

### CATEGORY

- Exploring – Engineering
- US DOE - STEM

### OBJECTIVES

By the end of this session, participants will be able to:

- Investigate and plan the design of a piece of furniture.
- Build a piece of functional furniture out of scrap cardboard.

### ADVISOR NOTE

Before conducting this activity, you will need to obtain lots of cardboard. Check out your local big-box stores, hardware stores, appliance stores, bicycle or furniture shops, and grocery stores to see if they're willing to donate extra materials. You may want to consider organizing a simple cardboard drive and ask the Explorers, their parents and neighbors, and community members to accumulate and drop off spare cardboard at a designated location. The more the better!

### SUPPLIES

- Cardboard of all sizes and shapes, whether scraps, corrugated, cartons, toilet paper rolls, box dividers, paper towel tubes, etc. Gather as much cardboard as possible.
- Duct tape in different colors to use as decoration; about 10-12 feet per piece of furniture. (You may want to prep the duct tape in advance by cutting 1-foot strips. If desired, you can limit the amount of tape used by each group, i.e., 10 1-foot strips.)
- Pens and pencils
- Scissors (one pair per participant)
- Rulers, tape measures, or yardsticks (one per two to four participants)
- Butcher paper or recycled printer paper for brainstorming and sketching
- Box cutters or X-Acto® knives (optional)
- Work gloves (required to help protect hands if using box cutters or X-Acto® knives)
- Decorative items or craft supplies, such as fabric, markers, paper cups, foam pipe insulation, hot glue (optional; these could also be supplied by the participants); these can provide extra inspiration and add creativity to designs

### ADVISOR NOTE

Encourage working in groups of two to four. This is a great collaboration opportunity.

Make sure everyone has a chance to participate and build.

**ADVISOR NOTE:** Text in italics should be read aloud to participants. As you engage your post in activities each week, please include comments, discussions, and feedback to the group relating to

**Character, Leadership, and Ethics.** These are important attributes that make a difference in the success of youth in the workplace and in life.

## **ACTIVITIES**

### **Activity 1**

#### **Observation and Investigation**

Start by asking participants to do some investigation. Have them take a look at existing furniture from all different angles (sideways, upside-down).

Suggest that they make note of the different shapes integrated into furniture pieces. Have them point out squares, circles, and triangles that table and chair legs make; how the pieces connect with one another; and what holds the furniture together. Then ask participants to share their findings with one another.

Initiate a discussion by asking these or similar questions:

- What are common shapes in chairs, stools, desks, tables, and shelves (e.g., triangles, squares, rectangles, circles)?
- Are there strange-looking pieces of furniture that still serve their purpose?
- What allows the furniture pieces to hold weight and be sturdy?
- What's important to you in a comfortable chair? Desk? Table? (For example, height of seat or angle of desk.)

### **Activity 2**

#### **Creating Your Design**

Give participants 15 to 20 minutes to brainstorm and come up with ideas for their cardboard furniture. Encourage them to sketch and jot down their designs. Allow time and space for them to explore and design. Let them tinker with the materials available. Playing with the materials will help their ideas and designs. During this process, have participants share their ideas with one another.

Give these hints to participants about strength:

- Creating thickness in materials—whether through folding multiple layers or taping materials together—provides additional strength and stability.
- Closed forms, like a fully enclosed box, are stronger than open forms.
- Triangular forms can add strength, too.

Have each participant make notes of the different shapes integrated into furniture pieces.

Have them point out squares, circles, and triangles that table and chair legs make; how the pieces connect with one another; and what holds the furniture together. After the initial investigation, have the youth share their findings with one another.

Initiate a discussion by asking these or similar questions:

- What type of furniture do you want to make? Chairs, stools, desks, tables, couches, shelves, or something else entirely?
- Can you make something that is both functional and stylish?
- How does a tall, skinny stool hold a person's weight equally as well as a big, fluffy lounge chair?
- What do you think is the most important part of the furniture piece?

Have the small groups share their ideas with the group as a whole.

**ADVISOR NOTE:** The group sharing, both in small groups and among the entire group, may inspire Explorers to modify their design based on comments or questions from others. This sharing provides a testing ground for the designer to adjust the design as needed before and during the build activity.

### **Activity 3**

#### **Building Your Design**

Once participants have finished their designs, have them start making their furniture. Be sure to let them know how much time they have to work on their furniture (about 20 to 60 minutes). As they draw, cut, assemble, and make furniture, guide them throughout the process and encourage them by using some of the suggestions and guidelines below.

- Remind participants to measure twice and cut once!
- Expect and celebrate mistakes, as well as multiple versions.
- Gauge the participants' progress and mood. If they want more advanced challenges, think about adding a limit. For instance, you might suggest that each group limit the amount of duct tape used by giving them only 10 1-foot strips for their entire piece of furniture.
- Encourage them to add fun and advanced elements to their furniture creations, such as footrests and cup holders.
- Keep track of time, and provide updates for the amount of time left in the activity.
- Participants may need guidance or supervision when cutting cardboard or working with box cutters (optional).
- To get a clean fold in cardboard, tell participants to score it first using a straight edge and pen or the blunt side of a scissors blade.
- When using box cutters or X-Acto® knives, tell participants the following: Always cut away from the body; keep an arm's length away from anyone else before using a sharp blade; and do not walk around with an open box cutter.

### **Activity 4**

#### **Wrap-Up**

Leave at least 10 minutes at the end of the session for participants to show off, share, and test one another's furniture creations. Try putting items on shelves, sitting in chairs, and using desks. Have Explorers share their successes and challenges.

#### **ADVISOR NOTE**

Some sample questions are below. They are designed to help the participants apply what they have learned to their own interests. You are welcome to use these questions or develop your own questions that relate to your post or specific focus area.

#### **REFLECTION**

- *What did the first version or prototype look like compared with the final product?*
- *How many different prototypes and tweaks did you make?*

- *What did the original design sketch look like? Is it the same as the final product? If not, what changed and why?*
- *What decisions did you have to make during the making process?*
- *How did your group work together? What roles and tasks did each of you take on?*

#### **ADVISOR AND OFFICER REVIEW**

After the meeting, address the following:

- Identify what was successful about the meeting.
- Identify what needed improvement.
- Schedule an officer and Advisor planning meeting to prepare for the next post meeting or activity.

Or use the Roses, Buds, and Thorns evaluation tool described in the Leaders Guide.

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