



Grape Crusher

Amount of time Demo takes: 3 minutes

Try this at home!

Lesson's Big Ideas

- All items need to be designed to stand up to the forces that they endure during use. This is especially important for the designs of things like homes and automobiles.
- While successful designs can vary, a tried and true design is to build a column using the paper around the grape. Columns support the weight of what is above (in this case the force of the arm of the grape crusher) and transfers it through compression to structural elements below it.

Materials

- Grape crusher (2)
- Paper, post-it note sized squares (1/participant)
- Toothpicks (1/2 box/hr) (round toothpicks are preferable to flat)
- Grapes (1/2 bag/hr)
- Paper towels or regular towels to wipe up crushed grapes (1/4 roll/hr)
- Trash bag (1/2/hr)

SAFETY!

- Make sure students get their hands/fingers out of the way before allowing the grape crusher to swing down.

Setup Instructions

1. Set up grape crushing contraption on table.
2. Set out paper squares, toothpicks, and grapes.
3. Make sure to have a plastic tablecloth down. This should be changed daily because it will get sticky.
4. Have cleaning supplies set out.

Instructional Procedure

1. Set out Grape Crusher in an area big enough to safely let the arm swing.
2. Challenge for public: Can you build something from a small piece of

paper and a toothpick that will protect a grape from our Grape Crusher?

3. Hand out the grape, paper, and toothpick to participant. They can do whatever they want with the three items they think will protect the grape. When they are ready, set their contraption under the grape crusher. Make sure fingers are clear!
4. Check to see how your participant did. If their grape got crushed, ask if they want to try one more time. Before you have them start, ask them what went wrong? What are they going to change? How will their new one be better?
5. This is a problem solving activity. If the participant has tried a few times and they still can't get it, guide them in the correct direction or ask leading questions to help them arrive at a better design. Some good examples include rolling the paper into cylinders (columns) or breaking the toothpick into 2-4 pieces (to skewer the grape in several places and protect it).
6. Clean up after each crushed grape. Throw out participants' failed designs. Wipe off table.

Tips & Tricks

- If a student comes up with a design that they know will not work, encourage them to change it before you crush it. Most of the time they just want to destroy the grape but they should be learning!
- Don't let the students eat the crushed grapes. Some will try.
- Depending on the age of the students and the quality of the materials provided, use your best judgement as to if they should get more materials to build their structure. Ex: try giving them a second piece of paper.

Assessment Questions

1. How did your design work?
2. If your design did not work, what could you do to make it better?
 - a. Prompt the participant to think about what went wrong and correct the issues.
3. What are some shapes/design elements to consider?
 - a. Columns are a very structurally strong design!

Careers & Real-World Applications

- All of the products we use need to be quality tested.

- Automobiles go through extensive crash testing before being deemed safe to sell to the public.
- Careers:
 - Mechanical Engineer
 - Structural Engineer
 - Architect
 - Quality Control Engineer
 - Packaging Engineer

Clean Up

- Clean up between demos if needed. When completely finished gather all materials listed for this demo and make sure everything is accounted for. If something was used up, broken, or damaged, let someone know so it can get replaced or fixed.
- Clean up after each crushed grape. Use towels and trash bags to keep the area clean.

Related Next Generation Science Standards

- K-5
 - K-PS2 Motion and Stability: Forces and Interactions
 - 1-LS1 From Molecules to Organisms: Structures and Processes
 - 2-PS1 Matter and Its Interactions
 - K-2-ETS1 Engineering Design
 - 3-PS2 Motion and Stability: Forces and Interactions
 - 3-5-ETS1 Engineering Design
- 6-8
 - MS-PS2 Motion and Stability: Forces and Interactions
 - MS-ETS1 Engineering Design