

Precious Produce

Grade 6

► **Next Generation Science Standard: MS-ETS1-1**

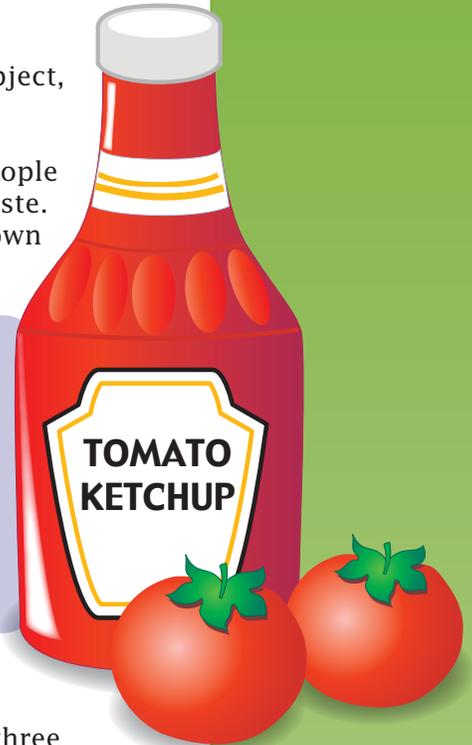
Define a design problem that can be solved through development of an object, tool, process or system.

Application: Because of advancements in processing and packaging, people can store foods for longer periods of time, therefore decreasing food waste. This experiment challenges students to think creatively to invent their own packaging.

Materials for the class:

1 medium onion, chopped, or
2 teaspoons onion powder
 $\frac{2}{3}$ cup dark brown sugar
 $\frac{1}{2}$ teaspoon salt
 $\frac{1}{2}$ cup cider vinegar
2 tablespoons olive oil
28-oz can whole tomatoes in purée

1 tablespoon tomato paste
blender
cooking surface
4 quart saucepan
resealable containers such
as resealable bags, glass
jars, plastic containers, etc.



Introducing the lesson:

Farmers around the world grow the food we enjoy every day. There are three basic steps to get food from the farm to the dinner table:

- *Production* involves growing the food on a farm.
- *Processing* is what happens to the food once it is ready to be picked. This could involve packaging, canning, freezing, or drying it. Airtight containers and the addition of preservatives contribute to keeping foods safe and fresh for a long time.
- *Transportation* involves taking the food to the store.

Did you know?

Christopher Columbus was trying to sail to the East Indies in search of spices. Instead, he discovered North America!

Lesson:

1. Even with refrigeration, foods don't stay fresh indefinitely. Discuss this idea with your class. **Ask students:**
 - How do you know that food has gone bad? *Mold, food dries out, taste or appearance changes, etc.*
 - What are some ways people store food to keep it fresh longer? *Resealable plastic bags, resealable plastic containers, plastic wrap, etc.*
 - Why does sealing food before storing help keep food fresh longer? *Resealable containers and bags limit the amount of oxygen that can reach stored food. This inhibits the growth of bacteria and the loss of moisture from the food.*
2. Explain that around 1825, a preservation technique called *canning* was invented as a way for people to store food for longer periods of time. During the canning process, food is boiled to kill all of the bacteria; then it is sealed in a sterile container to prevent any new bacteria from getting in. Generally when people think of canning they're referring to food being put in metal cans, but any sealable container would work. **Ask students:**
 - Have they or any of their family members ever canned food? If so, what food did they can and why?

Did you know?

Since there was no refrigeration in the Middle Ages, meat and fish were buried in salt or soaked in a salt solution to preserve them for later consumption. Not surprisingly, the meat tasted salty! To alter the taste, spices like pepper, saffron, garlic, mustard, and cinnamon were added when the food was prepared.



3. Explain to students that not all scientists, inventors, and engineers are adults. Share the story of 15-year-old Carolyn Jons. In 2013 she developed a new type of plastic bag that uses chemicals to suck oxygen out of the bag and therefore keep food fresh longer. She shared her bag design at the Intel International Science and Engineering Fair.

Ask students:

- What are some items that you use to store foods? How could these items be improved to work better or be easier to use?
4. One of the most recognizable preserved foods is ketchup. Students probably know that ketchup is created from tomatoes but may not know the process a tomato goes through to become ketchup.
5. Explain to the class they are going to make homemade ketchup. The ketchup will be created using the “canning” method, but students will apply their engineering smarts to decide how best to package and store it. Provide various items for students to choose from, including resealable plastic containers, resealable plastic bags, plastic wrap, foil, waxed paper, etc. Student groups combine the items to create their own containers. Test the containers by placing the ketchup inside and refrigerating for a set time period. Check each week for signs of mold or other changes in the ketchup. (Note: Be sure the containers are sterile or else the ketchup may break down because of bacteria inside the container.)
6. After making the ketchup, discuss with students how their ketchup is similar to or different than the ketchup they might have at home. Which do they think will last the longest? Why? *Bottled ketchup has the benefit of preservatives to keep it fresh, in addition to airtight packaging.*

Think about it. What makes ketchup, well ketchup? It’s the tomatoes, right? Sort of. But without the added flavors of onion, vinegar, sugar, salt, and olive oil, ketchup wouldn’t have the savory flavor we love. What other spices might be good in ketchup? Head back to the kitchen, gather some spices, and try some taste tests!

Making Homemade Ketchup

Materials:

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|---|--|
| 1 chopped medium onion | 1 tablespoon tomato paste |
| $\frac{2}{3}$ cup packed dark brown sugar | blender |
| $\frac{1}{2}$ teaspoon salt | cooking surface |
| $\frac{1}{2}$ cup cider vinegar | 4 quart saucepan |
| 2 tablespoons olive oil | airtight package (students decide upon |
| 28-oz canned whole tomatoes in purée | the design of the package in step 6 of |
| | the lesson) |

Directions:

1. Purée tomatoes in a blender until smooth.
2. Cook the onion in oil in a 4-quart saucepan over medium heat. Stir the onion until it softens.
3. Add the pureed tomatoes, tomato paste, brown sugar, vinegar, and salt. Simmer uncovered until it is very thick. (About 1 hour)
4. Puree the ketchup in the blender until it is smooth.
5. Divide the batch among the containers students created. Refrigerate for at least two hours. If refrigerated, the ketchup can be enjoyed for several weeks.

Note: Only an adult should cook or use the blender.

