# Lesson Title: Twisted Starch

*Brief: Students will learn how to identify foods that are high in starch. They will also be learning how to read and follow a recipe.*

***Grade: 4-6***

***Duration of Lesson: 45 minutes***

***Materials:***
Iodine
Flour-whole wheat, all purpose or cake
Small dishes or pans
Starchy foods-potato, sugar, apple, cornstarch
Non-starchy foods-salt
Active dry yeast
Sugar
Salt
Vegetable Oil
Bowls
Spoons
Greased Baking Sheets
Eggs

***Key Terms*** chaff, combine, thresh, stem, kernel, roots, starch, iodine

## Standards / Objectives

**Math Common Core: 5. Measurement and Data**
**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. 3.** Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

**Mathematical Practices: 4-6.**
1. Make sense of problems and persevere in solving them.
5. Use appropriately tools strategically.

**NGSS 5. Matter and Energy in Organisms and Ecosystems**
**Disciplinary Core Ideas, LS1.C: Organization for Matter and Energy Flow in Organisms**
Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (Secondary to 5-PS3-1)

**NGSS MS. Matter and Energy in Organisms and Ecosystems**
**Disciplinary Core Ideas, LS1.C: Organization for Matter and Energy Flow in Organisms**
Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

| Understanding(s) /Big Ideas: | Essential Question(s): |
|---|---|
| Foods have different nutritional values—such as different amounts of starch. Some foods do not have any starch. People should know how identify what foods have starch in them. | What is starch? What foods have starch in them? How do you identify if foods have starch in them? |
| Students will know: | Students will be able to: |
| How to identify starch in foods. How to read a recipe. | Work together to identify starches. Make pretzels from scratch. |
| **Performance / Observations** | |
| Performance Task(s): | Other Evidence: |
| Students will have a discussion with peers and work in groups to predict and determine which foods have starches. | Students will make pretzels by following a recipe. |
| **Learning / Inquiry Activities** | |

**Introduction:** Wheat is a crop that is planted by a drill pulled by a tractor. The drill digs a tiny furrow that is just deep enough to plant the wheat seed. It drops the seed into the ground and then covers it up with soil. Once the seed is planted it begins to absorb moisture and swell. The stem begins to grow toward the surface of the soil and then the primary roots begin growing. Within a couple of weeks the stem starts growing above ground. The stem will get longer and heads will appear. When the wheat flower is pollinated, it will develop into wheat kernels. About 30 to 60 days after flowering is when the kernels will be ripe. The kernel will continue to grow in size and harden over time. The entire plant will become dry and turn a golden brown.

Farmers will harvest the wheat once it is ripe and when the moisture content (level) is no more than 14% of the kernels weight. The farmer has a testing device to check the moisture content. They may also take a sample of wheat to the local elevator to have the moisture levels tested.

Wheat can be placed into two groups, winter wheat and spring wheat. Winter wheat grows in milder climates and produces higher yields than spring wheat. Spring wheat, which is grown in cold areas, is planted in the spring and ripens that summer. Winter wheat is planted in the fall and harvested the next summer. The winter wheat plant reaches the stage when tillers form and then as the cold weather arrives, the plant stops growing. When warm weather returns in the spring, the plant will begin growing again.

Wheat is divided into seven classes based on qualities such as color and texture of the kernels. The seven classes are (1) hard red winter wheat, (2) soft red winter wheat, (3) hard red spring wheat, (4) durum wheat, (5) red durum wheat, (6) white wheat, and (7) mixed wheat.

Millers grind wheat kernels into fine powder to make wheat flour, which contains a protein substance called gluten. Wheat flour is great for baking because the gluten makes the dough elastic. Wheat germ and wheat germ oil are derived from the wheat kernel and used to improve the flavor and nutritional value of foods. Wheat is also used as livestock feed, cosmetics, food thickener, paper, laundry soap, sweetener, insulation, and much more.

Starch is a powdery, white substance found in the living cells of green plants. The seeds of wheat, corn, rice beans, and the stems, roots, and tubers of the potato all contain starch. Starch is a carbohydrate, and carbohydrates are very important because they are a source of energy for us. When plants make food through photosynthesis, the plant uses sunlight to change carbon dioxide and water into glucose and oxygen. The glucose can then be converted into starch. To test the presence of starch in food, chemists use iodine. When starch is present, the iodine will turn a blue-black color.

**Learning / Inquiry Activities:**

1. Have a discussion with your students about wheat and starch. Use the information from above to guide that discussion.

2. Put students in small groups. Place small amounts of flour in small pans.

3. Ask the students to predict what they think will happen when iodine is dropped into the flour.

4. Put a few drops of iodine on the flour samples and observe what happens. Does this substance contain starch?

5. Perform the same test on the potato, apple, sugar, and salt. Discuss the results. Be sure to throw away the samples after the testing is complete. Iodine is toxic if it is ingested in this form!!

6. Make pretzels, using flour as the main ingredient.

7. Measure a ½ cup of warm water into a large bowl. Sprinkle in yeast and stir until dissolved.

8. Add1/4 cup of sugar, 1/2 teaspoon of salt 1/2-cup oil, and 3 cups flour. Beat until smooth.

9. Gradually add the remaining 1½ cups flour. To make a soft dough.

10. Knead dough by hand for 10 minutes.

11. Cover the bowl and let the dough rest for 30 minutes.

12. Divide dough into 24 pieces. Cover bowl and let rest for 5 minutes.

13. Roll each piece into a uniform 18" rope. Shape each rope into a pretzel by making a circle, overlapping the two ends, twisting them once, and then pressing them onto the bottom curve of the circle.

*14.* Place on greased baking sheets.

*15.* Beat and egg white and 1 tablespoons of water together. Use the mixture to brush pretzels. Sprinkle the pretzels with sesame seeds or salt.

*16.* Bake in preheated, 425º F oven for 12-15 minutes or until golden brown. Remove pretzels from the baking sheets and cool on wire racks.

17. Complete the Food Detective activity sheet as directed.

We invite you to send photos or information on your experience teaching the lesson to the Montana Department of Agriculture's Ag in the Classroom lbrenneman@mt.gov

*This lesson was adapted from Agriculture in Montana Schools, aginmontanaschools.com.*

# Food Detective

Directions: Take a prepared food product and find out what the food is made from. Find the source of the ingredients, and how those ingredients were grown. Look at the label for clues to discover where in the world the food ingredient came from. Fill in the Food Detective Ingredient Chart with your clues. Use reference sources from the library or the Internet to assist in finding more information about how and where the food is grown.

| **Food Detective Ingredient Chart** | | |
|---|---|---|
| **Name of Food _____** | | |
| **Ingredients (list each ingredient below)** | **Ingredient Source (What the ingredient comes from and how it is grown or produced)** | **Ingredient Place (Where the ingredient might have been grown or produced)** |
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