

# Grain Science

## Lesson 8: Baking Sourdough



<b>Unit:</b>	Grain Science
<b>Estimated Time:</b>	50 Minutes
<b>Age of Learners:</b>	9th-12th Grade
<b>Equipment, Supplies, References, and Other Resources:</b>	
<ul style="list-style-type: none"> <li>• Baking Prep: Measuring cups, sourdough starter, bread flour, salt, water, yeast, large bowl, baking pan, spray bottle, oven, cooking spray</li> <li>• Baking: oven, parchment paper or cooking spray, knife, clean water spray bottle, cooling rack</li> </ul>	
<b>Instructor Directions &amp; Estimated Time</b>	<b>Content Outline and/or Procedures</b>
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. Explain the process and significance of sourdough breadmaking, including creating and maintaining a sourdough starter, to appreciate the role of fermentation in bread production.</li> <li>2. Develop practical skills in dough preparation and baking techniques, such as kneading, performing the gluten windowpane test, scoring, and monitoring baking temperature, to produce high-quality sourdough bread.</li> <li>3. Discuss issues related to sourdough breadmaking, fostering critical thinking and teamwork skills while ensuring cleanliness and safety in the kitchen workspace.</li> </ol>

Instructor Directions & Estimated Time	Content Outline and/or Procedures
<p><b>Baking Prep</b></p> <p>~20 minutes</p> <p><i>Baking instructions are listed at the end of this lesson – you may need to arrange time outside of class to bake the bread as it will exceed the length of this lesson.</i></p>	<p><b>Day 8   Bake the Bread</b></p> <p><b>Ingredients and Materials</b></p> <ul style="list-style-type: none"> <li>• Bread Flour (5 cups) — flour made from last week.</li> <li>• Sourdough starter (1 cup)</li> <li>• Salt (2 ¼ teaspoons)</li> <li>• Water (1 ½ cup)</li> <li>• Yeast (1 teaspoon) (optional)</li> </ul> <p><b>Instructions</b></p> <ul style="list-style-type: none"> <li>• Add dry ingredients into bowl.</li> <li>• Add water on top of dry ingredients.</li> <li>• Start kneading by hand or start mixing on low.</li> <li>• Dough should be one piece and should not be sticky.</li> <li>• If hand-kneading use the palm of your hand to drive into the workstation.</li> <li>• On a floured surface, form the dough into a ball. Using your palms, fold the dough into itself until it has a smooth surface.</li> </ul>
<p><b>Windowpane Test</b></p> <p>~ 10 minutes</p>	<p>Dough mixing is normally judged by using the gluten film/windowpane test.</p> <ul style="list-style-type: none"> <li>• A piece of dough is stretched between the hands into a thin, smooth, translucent film. This simple test is an excellent indication that the ideal balance of extensibility and elasticity has been reached. If too elastic, it will not stretch into a film. If too extensible the dough will have too much flow. Although different products will have slightly different endpoints, they all need the proper balance to retain gas and make quality product.</li> </ul> <p>Students will demonstrate the windowpane test for the teacher before proceeding to the final step of preparing the dough for baking.</p>
<p><b>Baking Prep</b></p> <p>~ 5 minutes</p>	<ul style="list-style-type: none"> <li>• Place the dough in a greased bowl and cover with plastic wrap.</li> <li>• Leave at room temperature for 1-2 hours.</li> <li>• When the dough is proofed it will double in size.</li> </ul>
<p><b>Clean Up</b></p> <p>~ 5 minutes</p> <p><i>Allow time for students to clean workstations.</i></p>	<p>Students, please clean your workstations.</p>

Instructor Directions & Estimated Time	Content Outline and/or Procedures
<p><b>Discussion</b></p> <p>~ 10 minutes</p> <p><i>Students can answer the following discussion questions on a Learning Management System site, as a class, or with a partner.</i></p>	<p>Reflect on your experiences with sourdough in this course and answer the following discussion questions:</p> <ol style="list-style-type: none"> <li>1. What is the process of creating a sourdough starter, and why is it an essential step in making sourdough bread?</li> <li>2. What are the key ingredients required for making a sourdough starter?</li> <li>3. What factors can affect the success of creating a sourdough starter? How can you troubleshoot common issues such as a sluggish or overly active starter?</li> <li>4. Describe the role of feeding and maintaining a sourdough starter. Why is it necessary to regularly “feed” the starter, and what happens if it is neglected?</li> </ol>
<p><b>Baking</b></p> <p><i>To be completed after class. You may need to work with school kitchen staff or Family and Consumer Science teacher to find the best time to bake.</i></p>	<p><b>Baking</b></p> <ul style="list-style-type: none"> <li>• Place parchment paper or cooking spray on a baking sheet.</li> <li>• Invert the bowl with the dough onto the baking sheet.</li> <li>• Score the dough with a knife using a design of your choosing.</li> <li>• Bake at 450 degrees Fahrenheit.</li> <li>• Spray water into the oven to create steam to prevent drying.</li> <li>• Cook for 30 minutes.</li> <li>• To check that the sourdough is completed cooking, tap on the bottom, and listen for a hollow sound or check that the internal temperature of the bread is 200 degrees Fahrenheit.</li> <li>• Remove from pan to cooling rack.</li> </ul>

	State Standards
<p><b>Language Arts</b></p>	<ul style="list-style-type: none"> <li>• <b>W.9-10.3.e.</b> Provide a conclusion that follows from and reflects on what is experienced, observed or resolved over the course of the narrative.</li> <li>• <b>W.11-12.12.</b> Write routinely over extended time frames (time for research, reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes.</li> <li>• <b>SL.9-10.1.</b> Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups and teacher-led) with diverse partners on grades 9-10 topics, texts and issues, building on others’ ideas and expressing their own clearly and persuasively.</li> </ul>
<p><b>Science</b></p>	<ul style="list-style-type: none"> <li>• <b>HS-LS1-2.</b> Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.</li> <li>• <b>HS-PS1-5.</b> Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.</li> <li>• <b>HS-PS2-6.</b> Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.</li> </ul>

	<b>State Standards</b>
<b>Math</b>	<ul style="list-style-type: none"><li>• <b>N.Q.1.</b> Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.</li><li>• <b>N.Q.2.</b> (Define appropriate quantities for the purpose of descriptive modeling.</li><li>• <b>N.Q.3.</b> Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</li></ul>

## Lesson 8: Baking Sourdough Bread Worksheet

Today you will put on your chef, or in this case baker's, hat as you will whip up a Sourdough Bread Starter. Sourdough bread is different from other bread – you must feed it!

Sourdough bread starts in a warm environment with the growth of natural yeast that's both airborne and found in grain and flour. The yeast buds as it ferments. As the carbon dioxide gas escapes, bubbles are created to leaven the dough.



### Day 1 | Sourdough Starter

#### Ingredients and Materials

- 1 cup (115 grams) bread flour (for each day)
- ½ cup (115 grams) water (for each day)
- Large Bowl
- Container (1 quart or larger)
- Wax paper, cheese cloth or plastic wrap to cover container
- Plastic glove

#### Instructions

- Place ingredients in bowl.
- Wear gloves to mix ingredients by hand.
- Store starter in a plastic container (with not very tight lid) or glass jar covered with wax paper or cheese cloth.

### Day 2 – Day 7 | Feeding the Starter

- Start feeding by removing the starter from the container.
- In a bowl, mix 1 cup (115 grams) flour and 1/2 cup (115 grams) water with the starter, mixing by hand until smooth.
- Clean original container before replacing the starter. Cover and store.

## Day 8 | Bake the Bread

### Ingredients and Materials

- Bread Flour (5 cups)
- Sourdough starter (1 cup)
- Salt (2¼ teaspoons)
- Water (1½ cup)
- Yeast (1 teaspoon) (optional)

### Instructions

- Add dry ingredients into bowl.
- Add water on top of dry ingredients.
- Start kneading by hand or start mixing on low.
- Dough should be one piece and should not be sticky.
- If hand-kneading use the palm of your hand to drive into the workstation.
- On a floured surface, form the dough into a ball. Using your palms, fold the dough into itself until it has a smooth surface.
- Place the dough in a greased bowl and cover with plastic wrap.
- Leave at room temperature for 1 to 2 hours.
- When the dough is proofed it will double in size.

### Baking

- Place parchment paper or cooking spray on a baking sheet.
- Invert the bowl with the dough onto the baking sheet.
- Score the dough with a knife using a design of your choosing.
- Bake at 450° Fahrenheit.
- Spray water into the oven to create steam to prevent drying.
- Cook for 30 minutes.
- To check that the sourdough is completed cooking, tap on the bottom, and listen for a hollow sound or check that the internal temperature of the bread is 200° Fahrenheit.
- Remove from pan to cooling rack.



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Grain Science lessons are posted at:

<https://www.grains.k-state.edu/educator-resources/untitled.html>

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