Nasco Education™ LESSON PLAN

FCS

Sourdough science: From starter to slice

Volume 83 | Gr. 9–12

Time: 5–13 Days

Standards

2.1.1 Apply time management, organizational, and process skills to prioritize tasks and achieve goals.

8.5.1 Demonstrate techniques in food product preparation, safety, and sanitation.

8.5.3 Apply scientific and mathematical principles to food preparation and meal management.

8.5.10 Prepare breads, baked goods and desserts using safe handling and professional preparation techniques.

8.5.13 Integrate sustainability in food production and services including menu planning; acquisition, preparation, and serving of food; storage; and recycling and waste management

9.3.3 Apply principles of food production to maximize nutrient retention in menus.

9.7 ADemonstrate principles of food biology and chemistry.

Materials

For starter creation:

- Flour (unbleached all-purpose, bread flour, whole wheat or rye)
- Water (non-chlorinated or filtered, room temp)
- Measuring cup
- Spurtle or non-metallic spatula
- Clear glass jar or container with lid
- Labels and markers (**WA34953**)
- Handout: "How to feed a starter", p. 5
- Starter journals (notebooks)

For bread making:

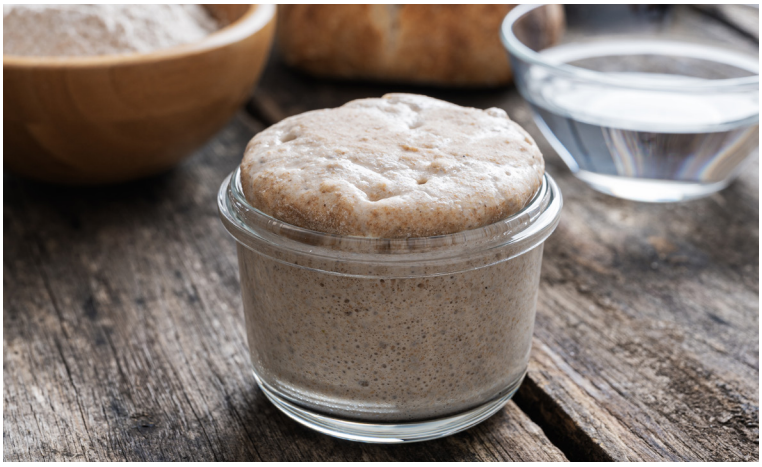
- Sourdough starter (active and bubbly)
- Bread flour (preferred) or all-purpose flour
- Salt
- Water
- Optional: Digital scale (**WA33623**)
- Mixing bowl (**WA28266**)
- Dough/Danish whisk or spoon
- Dutch oven or loaf pans (if baking in class)
- Pastry scraper (**NE40253**)
- Parchment or baking paper (**WA32553**)
- Banneton proofing basket (**NE40045**, and/or **NE40046**)
- Lame or sharp knife
- Optional mix-ins: shredded cheese, garlic, fresh herbs, raisins, cinnamon, nuts, olives, chocolate chips, etc.
- Handout: "Sourdough bread recipe + inclusion ideas", p. 6
- Visual aids: fermentation diagram, yeast/bacteria life cycle
- Tasting plates and napkins
- Worksheet: "The science of fermentation", p. 7

Objectives

Students will...

- Understand what a sourdough starter is and why it's used
- Learn how wild yeast and bacteria develop through fermentation
- Begin and maintain their own starter with daily observations
- Follow step-by-step sourdough bread instructions
- Understand the role of gluten, hydration, and time in bread structure and flavor
- Experiment with flavor variations through add-ins

Part 1: Creating the starter



Background: Fermentation basics

1. Show a short video of sourdough being made, such as "*Easy sour dough starter guide* (***qrco.de/starterguide***)." Then ask students: Have you tasted sourdough? What makes it different?
2. Then define and discuss fermentation.
   a. **Fermentation** = the breakdown of carbs by yeast and bacteria, producing gas, acid, and flavor.
   b. **Wild yeast vs. commercial yeast**
      - **Wild yeast** is naturally found in the air, on flour, and on surfaces all around us. It's what we use in sourdough starter — when you mix flour and water and leave it out, the wild yeast finds its way in and starts growing.
      - **Commercial yeast** is the kind you buy in packets at the store. It's been grown and packaged so it works quickly and predictably for baking.
      - Think of wild yeast like a team of local musicians forming a band from scratch — it takes time, and every band sounds a little different. Commercial yeast is like hiring a professional band — ready to perform fast, and always sounds the same.
   c. **Difference between alcoholic and lactic acid fermentation**
      - Both are types of fermentation — the process where microorganisms break down sugars.
      - **Alcoholic fermentation** happens when yeast breaks down sugars and turns them into alcohol and carbon dioxide. This is used in things like beer, wine, and bread (including sourdough). The carbon dioxide is what makes bread rise.
      - **Lactic acid fermentation** is when certain bacteria (like lactobacillus) break down sugars into lactic acid. This happens in foods like yogurt, kimchi, and sourdough, and it gives them a tangy flavor.
      - In sourdough, both types happen at the same time: Yeast makes bubbles to help the bread rise (alcoholic fermentation), and bacteria create that sour flavor (lactic acid fermentation).

Day 1

1. Introduce the starter by explaining the components: flour, water, time, temperature. Show a mature starter (pre-prepared) and describe its smell, bubbles, and consistency.
2. Explain that each group will create their own starter by combining ½ cup unbleached flour with ½ cup room temperature, filtered water in a clean jar or container. Mix well with a non-metallic spurtle, spatula, or spoon. It should be a thick pancake batter consistency. Cover loosely.
3. The starter is a living thing; have each group give it a name and label the jar with the name and date. Store at moderately warm location (ideally 68°–80° F).

Day 2

1. Provide the handout on p. 5 to each group.
2. Have groups feed their starter daily using a 1:2:2 ratio (one part starter, two parts flour, two parts water) or about ¼ starter, ½ cup flour, and ½ cup water. Ideally, they should feed it at the same time each day by following these steps.
3. Discard half the starter so you are left with approximately ¼ cup. You have several options of what to do with your discard:
   - Throw away (do not pour into sink, instead put in trash).
   - Let students take home and continue to feed and have their own starter.
   - Bake with it. Search sourdough discard recipes online for ideas.
4. Add ½ cup all-purpose flour + ¼ cup filtered, room temp water.
5. Stir and cover.

Day 3

1. Today the starter may have bubbles! Have students observe and record smell, texture, and activity. There may also be a layer of liquid on top (hootch). This is normal, just stir it in.
2. If the starter jar looks messy or dirty, discard half and pour starter into a new jar. Changing out the jar every few days will help prevent mold.
3. Feed your starter (see day 2 directions).

Days 4-10 (Depends on fermentation and rise times)

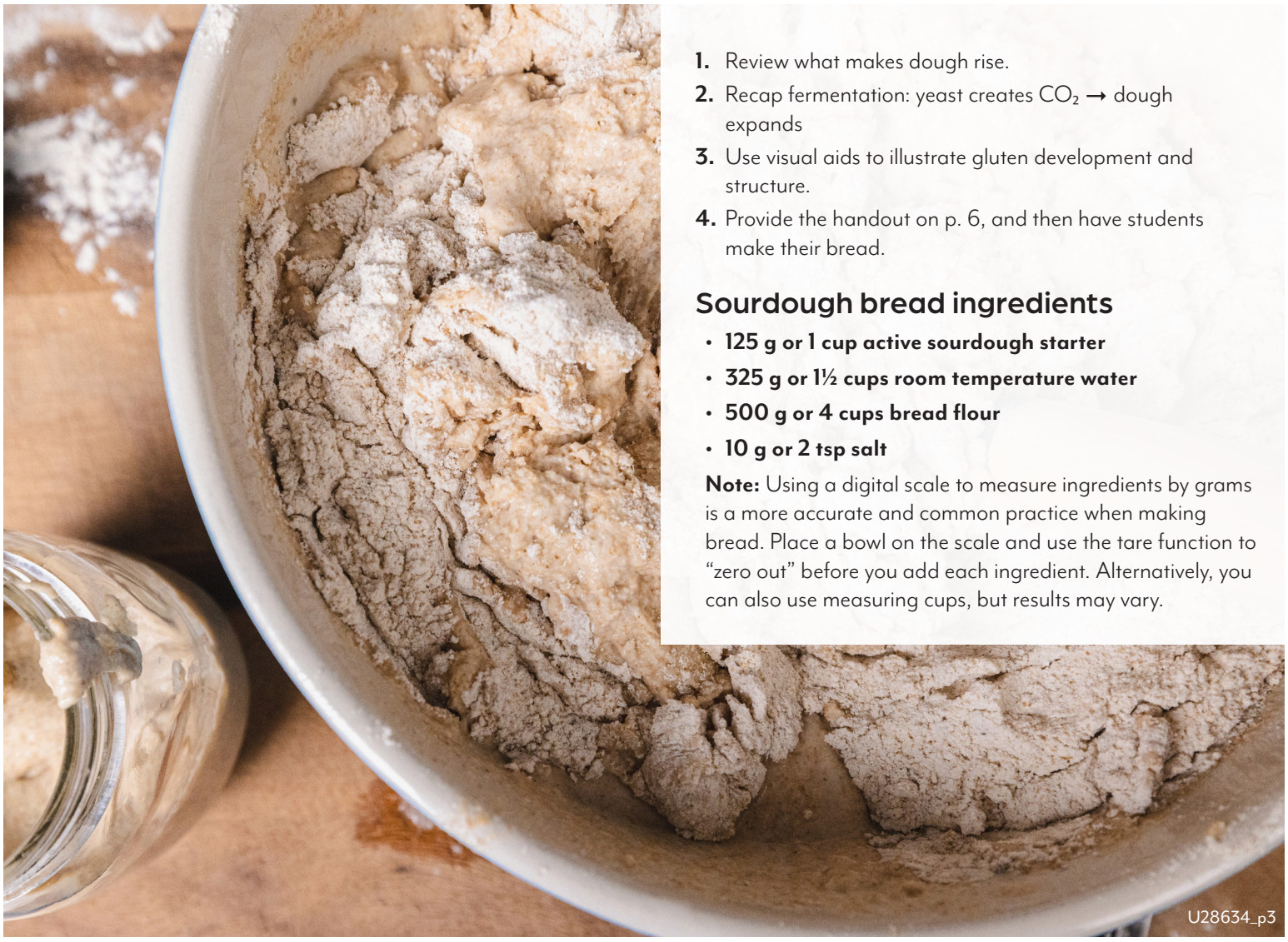
1. Repeat the steps from day 2.
2. By day 7 the starter may be ready to use! After it's fed, place a rubber band around jar, or mark it with a dry-erase marker at the level of the starter. If after 4–8 hours it doubles in size, it is active and ready.
3. If it hasn't doubled in size on day 7, repeat a few more days until it does.

Starter maintenance: Once the starter is established, it can be stored on the counter and fed daily. Or, it can be fed and placed in the refrigerator for up to 6 weeks. A grayish liquid layer, called hootch, may form on top; this is normal, just pour it off or stir it in. To use, take it out of the refrigerator the day before, feed it, and let it get active.

Optional extension

Compare starters made with different flours — whole wheat, rye, white — and track which becomes most active.

Part 2: Making the bread



1. Review what makes dough rise.
2. Recap fermentation: yeast creates CO_2 → dough expands
3. Use visual aids to illustrate gluten development and structure.
4. Provide the handout on p. 6, and then have students make their bread.

Sourdough bread ingredients

- **125 g or 1 cup active sourdough starter**
- **325 g or 1½ cups room temperature water**
- **500 g or 4 cups bread flour**
- **10 g or 2 tsp salt**

Note: Using a digital scale to measure ingredients by grams is a more accurate and common practice when making bread. Place a bowl on the scale and use the tare function to "zero out" before you add each ingredient. Alternatively, you can also use measuring cups, but results may vary.

Day 1: Mix and rest

Directions:

1. Combine the active starter and water and mix using a Danish dough whisk or spoon.
2. Add bread flour and salt.
3. Mix until shaggy dough forms.
4. Cover the bowl with plastic wrap or a tea towel and let it rest (autolyse) for 60 mins.
5. After an hour, it is time to do a series of stretch and folds. Dip your fingers in a bowl of clean water and grab a section of dough between your thumb and forefingers and pull gently upwards. Stretch and fold it over to the opposite side of the bowl. Then turn the bowl slightly and pick up another section of dough and repeat the stretching and folding technique 4 times.
6. Continue the stretch and fold series every 30 minutes for a total of 4 times.
7. Let the dough bulk ferment for an additional 2–4 hours. NOTE: Bulk fermentation starts when you combine the ingredients and it ranges between 6–8 hours, depending on the environment temperature.
8. Bulk fermentation is complete when the dough has doubled in size and the dough is tacky, but not sticky to the touch.
9. Prepare your banneton or proofing basket by lightly dusting with flour.
10. Transfer the dough from the bowl to a lightly floured countertop to laminate. Use a bench scraper if needed to cut the dough.
11. To laminate: Stretch out the dough into a rectangle shape. Fold one long side in towards the middle, then the other side, like you would a letter. This is when you would add your optional mix ins or inclusions (see ideas below) by adding on top before folding. Starting at one end, roll the dough up into a ball.

12. Shape your ball and create surface tension by gently pushing and pulling the ball on the counter without tearing the gluten strands. This helps create a firm, smooth surface that will hold its shape during the final rise and baking.
13. Place dough seam side up in the proofing basket. Cover and refrigerate overnight. This is called cold proofing and will help develop the sourdough flavor. Do not cold proof more than 48 hours.

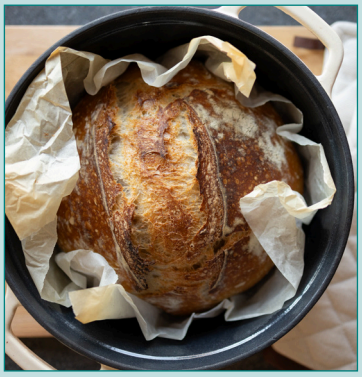
Day 2: Score and bake

1. Preheat your oven to 450° F with the Dutch oven inside.
2. Remove the dough from the fridge.
3. Turn the dough out onto a piece of parchment paper.
4. Using a lame or sharp knife, score the top for decoration and steam release.

5. With the parchment paper under the loaf, lift and place it into a Dutch oven, loaf pan, or put it on a baking sheet (open bake).
6. Cover the Dutch oven and place it into the oven. If you are using a loaf pan or doing an open bake, place it in the oven along with a pan with ice cubes to create a steam environment.
7. Bake at 450° F for 30 minutes. Remove Dutch oven lid or add more ice and bake an additional 20 minutes until golden and hollow-sounding.

Inclusion or mix-in ideas for custom loaves

- **Savory:** cheddar + jalapeño, garlic + herb, parmesan + black pepper, olives
- **Sweet:** cinnamon + raisin, chocolate chips, dried cranberries + walnuts
- **Nutritional:** sunflower seeds, flaxseed, oats



Wrap up and assessment

Taste test

Slice and sample each bread, discussing flavor, texture, and aroma.

What differences did you notice between groups?

How did the dough change over time?

What challenges did you experience?

Evaluate understanding

- **Participation:** Hands-on involvement and collaboration
- **Worksheet:** Complete the "Science of fermentation" questions
- **Observation logs:** Starter development journal
- **Group discussion:** Insightful contributions during reflection

How to feed your sourdough

Supplies needed:

- Sourdough starter (in a jar or container with lid)
- All-purpose flour
- Room temperature water (non-chlorinated or filtered)
- Spurtle, spoon, or spatula
- Measuring cups
- Rubber band or dry-erase marker

Daily feeding instructions:

1. **Discard half of the starter** (leave about ¼ cup remaining). This keeps the starter manageable and prevents it from overflowing. Do not put down drain; discard in trash or bake with it (search for sourdough discard recipes online).
2. **Add ½ cup all-purpose flour and ½ cup room temperature water** to the remaining starter.
3. **Stir well.** Should be a thick pancake batter consistency. Scrape down the sides.
4. **Cover loosely** with a lid or towel to keep from drying out. You want the lid to be able to move if your starter grows more than expected.
5. Place a rubber band around jar or mark with a dry-erase marker at the level of the starter to help measure when it has peaked (doubled in size).

6. The sourdough has peaked when it becomes bubbly and has doubled in size, usually 2–4 hrs after feeding, depending on feeding ratios and temperature. The larger the ratio, the longer it will take to peak. Once it has peaked or active, it is ready to bake with.
7. The starter will gradualy start to fall after it has peaked, usually 1–2 hours after. It will have less bubbles and become a thinner consistancy.
8. Store at room temperature and feed every 24 hours.

Notes:

- A thin, watery layer on top means your starter is hungry and needs to be stirred and fed.
- Clean or swap out your starter jar for a new one every other day to avoid mold.
- The “float test” is another method to use to see if your starter is active. Drop a small amount of starter into water. If it floats, its ready to bake with.
- If you are unable to feed your starter daily, cover it and place it in the refrigerator for up to 6 weeks. When you are ready to use, take out, let come to room temperature, and feed. Sometimes it may take 2–3 feedings for the starter to wake up and become active again.

Sourdough bread recipe + inclusions ideas

Sourdough bread ingredients:

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The science of fermentation

Name: _____ Date: _____

1. What is fermentation?

2. Name two microorganisms that help sourdough rise.

3. What gas does yeast produce that helps the dough rise?

4. What does lactic acid bacteria contribute to the bread?

5. What are some signs that your starter is healthy and active?

6. What changes did you observe during the fermentation process?

7. Which bread variation did your group make? What did you add?

8. How did your bread look, smell, and taste after baking?

9. What did you enjoy most about this project?

10. What would you try differently next time?