What a Waste of Food!
The Food Waste Issue and Ways to Reduce It

LESSON PLAN

Food waste is a major issue in developed countries. This unit is designed to teach students about food waste and ways they can help reduce it.

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ESTIMATED TIME
Two 30-minute lessons and one 60-minute lesson

VOCABULARY
- Producer
- Consumer
- Food Waste
- Super Tasters
- “Ugly” Foods
- Manufacturer
- Expiration Date
- Perishable Food

UNIT OBJECTIVES
Students will be able to:
- Identify how, where, and why food is wasted
- Describe how their eating habits can affect the food waste problem
- Accurately interpret expiration and “best-by” dates
- Describe proper storage methods for various foods
- Propose various techniques for using older foods and food byproducts

Lesson 1
English / Language Arts
CCSS.ELA-LITERACY.L.2.1
CCSS.ELA-LITERACY.L.2.2
CCSS.ELA-LITERACY.L.2.3
CCSS.ELA-LITERACY.L.2.4
CCSS.ELA-LITERACY.L.2.5

Lesson 2
English / Language Arts
CCSS.ELA-LITERACY.L.2.1
CCSS.ELA-LITERACY.L.2.2
CCSS.ELA-LITERACY.L.2.3
CCSS.ELA-LITERACY.L.2.4
CCSS.ELA-LITERACY.L.2.5

Lesson 3
English/Language Arts
CCSS.ELA-LITERACY.L.2.1
CCSS.ELA-LITERACY.L.2.2
CCSS.ELA-LITERACY.L.2.3
CCSS.ELA-LITERACY.L.2.4

Lesson 2
Math
CCSS.MATH.CONTENT.2.NBT.B.5
CCSS.MATH.CONTENT.3.OA.C.7
CCSS.MATH.CONTENT.3.OA.D.8
OVERVIEW

What a Waste of Food!

LESSON PLAN

ACTIVITY MATERIALS

- 5 station signs
- 1 writing utensil per student
- 1 Best if Used Chart per student
- 1 Best if Used Worksheet per student
- 1 Food Storage Worksheet per student
- A Final Ap-‘peel’ PowerPoint

MATERIALS

- String (long enough for the entire class to line up single file and hold)
- 1 food journal per student
- Small pieces of interesting or exotic fruits and veggies for every student
- 3 to 4 small pieces of “ugly” foods
- 3 to 4 small pieces of “pretty” foods; same kinds as the “ugly” foods
- 1 PTC taste paper strip per student
  https://amzn.to/2FbqDdN
- 1 pair of latex-free gloves
- 1 blindfold
Lesson 1: The Apple Falls Far from the Tree

This lesson teaches students how, where, and why food is wasted from producer to consumer.

VOCABULARY

- **Producer**: A person or company that makes, grows, or supplies food.
- **Consumer**: A person who purchases food.
- **Food Waste**: Edible food that is thrown away, lost, or uneaten.

**Activity** / THE APPLE FALLS FAR FROM THE TREE

This activity guides students through the life of an apple from the orchard to consumers’ homes. It teaches them how many apples are wasted at each step of distribution. Instructors will act as the apple truck driver, guiding the students acting as apples between each of the five stations set up around the classroom. At each station, a certain number of students will sit down, representing the wasted apples.

**Before beginning the activity**

Calculate how many students will sit down at each station:

Values for all the stations (assuming a class size of 24 students):

- **Production**
  24 students*(20/100)=4.8 ≈ 5 students sit down

- **Postharvest**
  24 students*(3/100)=0.72 ≈ 1 student sits down

- **Processing and Packaging**
  24 students*(1/100)=0.24 ≈ 0 students sit down

- **Transport and Retail**
  24 students*(12/100)=2.88 ≈ 3 students sit down

- **Consumer**
  24 students*(28/100)=6.72 ≈ 7 students sit down

These values were calculated using the fractions provided on station signs.

Each apple wasted is represented by a slice of apple pie. Instructors will draw an apple pie on the board and erase a slice for every student that sits down at each station. The erased slices represent food waste.

**Example of “apple” pie charts and slice deduction**

**Full “Apple” Pie Chart – No Food Waste**

**During production, 5 “apples” were lost, so 5 slices of the pie could not be made**

**Calculations for the 4th-5th Grade Activity**

**Total fraction of wasted apples from orchard to home:**

\[
\frac{20}{100} + \frac{3}{100} + \frac{1}{100} + \frac{12}{100} + \frac{28}{100} = \frac{64}{100}
\]

**Apples wasted**

**Total fraction of apples remaining after food waste:**

\[
1 - \frac{64}{100} = \frac{36}{100}
\]

**Apples remaining**

**Resulting “apple” pie chart:**

\[\frac{64}{100} \text{ wasted} \quad \frac{36}{100} \text{ used}\]
Lesson 2: Pick on ME
This lesson shows students how their eating habits can affect the food waste problem.

VOCABULARY
• Super taster: A person who experiences the sense of taste with far greater intensity than average.
• “Ugly” food: Food that is not perfect in shape, size, or color.

SUPER Tasters
Our tongues have small bumps called taste buds, each made up of 50 to 150 taste receptors. These receptors detect specific molecules related to flavor that allow us to sense sweet, salty, bitter, sour, or umami (a savory taste); the combination of these flavors is what we taste.

Each person has a different number of taste buds. The more taste buds one has, the more sensitive their sense of taste. People with more taste buds, and thus a more heightened sense of taste, are known as super tasters. They often have very strong dislikes or likes for food … AKA picky eaters. At the opposite end of the spectrum are non-tasters; these people often think all foods are bland. People in the middle are average tasters; they often feel most foods are enjoyable but might not have strong likes or dislikes.

Every five to seven years, our taste buds change. As a result, people might find they have acquired a taste for foods they previously did not like and vice versa. Because our sense of taste changes with time, people should try new foods to see what novel things they might like and retry foods that they previously disliked.

PTC STRIPS
During the super-taster activity, students will be given a PTC taste paper strip that will test their tasting intensity — to determine whether they are a super taster. The students need to place half the strip on the tip of their tongue. If they do not taste anything, they have an average sense of taste. If they claim the paper tastes bitter, however, they are a super taster and have a heightened sense of taste. Neither one is better than the other. Super tasters may be more likely to be picky eaters because they taste things at a heightened level, such as the bitterness of Brussels sprouts or the tanginess of a grapefruit.

Lesson 3: Waste Not, Want Not:
This lesson teaches students how to accurately interpret expiration and “best-by” dates, how to properly store food, and how to use older foods and food byproducts.

VOCABULARY
• Manufacturer: A person or company that produces packaged food to sell.
• Expiration dates: The date after which a food should not be sold or consumed.
• Perishable food: Food that needs to be cooked or frozen within a certain amount of time to prevent spoiling.

ELABORATION ON EXPIRATION DATES
Dates include “sell-by”, “best-by”, and “best-if-used-by” dates. These dates are usually chosen by the manufacturer and tell consumers when they think the product will be the freshest; they are not safety dates. If a food is past its expiration date, that does not mean you need to throw it away. There is no universal way to choose these dates for food, nor is it required in all states to put expiration dates on food. Use the Tips for Food Safety to check if food is still edible whether it has reached its expiration date or not.

TIPS FOR FOOD SAFETY
Go through this list with students to learn how to determine whether food is still edible.
• Use the look-sniff-taste test to see if the food has any signs of spoilage.
  • Look: See if the food has changed color, texture, or has mold.
  • Sniff: Sense if the food has a foul odor.
  • Taste: Sense if the food has changed taste.

If the food does not pass the look-sniff-taste test, it should not be eaten.

• Food can still become unsafe even before its expiration date. For example, if you leave meat sitting on the counter for hours after purchasing it, putting it in the refrigerator will not get rid of bacteria that already started growing on it.

• If your eggs float when put in a bowl of water, that indicates they are old and likely past their best usage date. However, before throwing it away, you can crack the egg in a small bowl and smell it to see if there is any odor.
• Canned goods are safe indefinitely, as long as the can is not dented, swollen, or rusted. All are signs of improper canning or disturbance, and the food is no longer safe.

• Frozen goods — even those that fall into the perishable foods category — are safe indefinitely as long as they are frozen. Once thawed, they should be used for best quality. It is safe to re-freeze frozen food once it has been thawed out, but its quality may be reduced. You should only re-freeze uncooked food if its temperature never went above 40° Fahrenheit. Cook any meat before re-freezing it.

HOW TO STORE
Go through this list with students to learn proper food storage to extend food’s shelf life.

• Some food should be refrigerated to keep freshest longest, like eggs, dairy, and most fresh fruit and vegetables.

• Keep tomatoes, honey, and avocados on the counter, and keep potatoes and onions in separate cabinets because they can cause each other to spoil early. The refrigerator is too cold or wet for them to stay fresh. Fruits and vegetables should be put in the refrigerator once cut. Bread can be frozen until use and then thawed or toasted. Bread can also be stored on the counter, or in the refrigerator if you do not plan to use it soon.

• Wash carrots and herbs immediately before storing them in the refrigerator to keep fresher longer.

• Only wash other vegetables and fruits when you are ready to eat them to prevent mold and sogginess.

• Store perishable foods like meats and fish in the freezer to keep safe for several months. Thaw in the refrigerator 1-2 days before cooking.

• Never thaw food at room temperature for more than 2 hours.

• Keep packaging on perishable foods until you are ready to use them. Store in airtight containers once opened.

• The best practice is to only buy what you need, when you need it. If you are not planning on making a salad within the next few days, do not buy salad greens. Perishable food items should only be purchased if they are going to be used in the near future.

Resources


Eat By Date. 2012. EatByDate LLC. (http://www.eatbydate.com/).

EPA. 2011. Basic information about food waste. EPA. Washington, DC, USA.


LESSON 1  THE APPLE FALLS FAR FROM THE TREE

This lesson teaches students how, where, and why food is wasted from producer to consumer.

ESTIMATED TIME
30 minutes

REQUIRED MATERIALS
- String (long enough for the entire class to line up single file and hold)
- 5 station signs
- 1 writing utensil per student
- 1 food journal per student

PROCEDURE
1. Introduce the words producer, consumer, and food waste (see Teachers’ Notes).
2. Guide students through The Apple Falls Far from the Tree activity (see beside / page 8).
   a) If students are in 2nd-3rd grade, use the 2nd-3rd grade instructions.
   b) If in 4th-5th grade, use the 2nd-3rd grade instructions and then the 4th-5th grade extension.
3. Review what the students learned. Ask questions such as:
   - What were some reasons that apples were wasted at each step?
   - Where did the most waste occur? Was this surprising?
   - Do you ever waste fruits and vegetables? Why?
   - What are some ways we can reduce waste from the orchard to home?

ACTIVITY  THE APPLE FALLS FAR FROM THE TREE

Before beginning the activity
1. Calculate the number of students sitting at each station (see Teachers’ Notes).
2. Post the 5 station signs around the room in this order: 1) Production 2) Postharvest 3) Processing and Packaging 4) Transport and Retail 5) Consumer

2ND-3RD GRADE ACTIVITY
1. Explain to the students that they are apples from an orchard going on an adventure to become an apple pie. Like most adventures, there are dangers, and along the way some apples will be lost through food waste.
2. Draw a complete “apple” pie chart on the board and explain that this is what it looks like when no apples are wasted and 100% of apples make it into the pie.
3. Then divide the chart into as many slices as you have students. Explain how the apple each student represents makes up one slice, or a fraction, of the whole pie.
4. Have the students bring their food journal (e.g., notebooks, bound construction paper, folders or binders with loose-leaf paper) and a writing utensil, line them up and have them hold onto the string, with the teacher at the head of the line. You can play the role of the truck moving the apples along each step of their journey.
5. As you reach a station, have the students guess how many apples will be lost. After a few guesses, tell them how many “apples” were actually lost at that station. Have the wasted “apples” sit down at the station and have students write how many “apples” were lost in their food journals. Have students read reasons for food waste on the back of station signs and write reasons in the food journals.
6. Next, explain that for each “apple” lost, that is one less slice of pie you can make. At each station, erase the same number of slices from the big “apple” pie chart on the board as there are “apples” wasted at that station. The students can see how the pie gets smaller as more “apples” are wasted along the journey. Repeat steps 5 and 6 for each station.

7. Have students look at the “apple” pie chart to see how little is left after food waste from orchard to home. (See example “apple” pie charts in Teachers’ Notes.)

8. Guide students through making bar graphs in their food journals of how many apples were lost at each station to visualize at which step the most food waste occurred.

4TH-5TH EXTENSION

1. Perform steps 1-8 from the 2nd-3rd Grade Activity above.

2. Have students calculate the total fraction of wasted apples from orchard to home. (See Teachers’ Notes.)

3. Have students calculate the total fraction of apples remaining after food waste. (See Teachers’ Notes.)
1 Production
20/100 of all apples are lost here.

REASONS FOR FOOD WASTE

• It is hard for farmers to grow just the right amount of food needed; sometimes they grow too much and no one wants it.

• Sometimes there are not enough people to harvest all the food in the fields, so it spoils before it can be harvested.
3/100 of all apples are lost here.

Postharvest and handling is where the good apples are separated from the bad apples.

REASONS FOR FOOD WASTE

- Some apples may be the wrong size, color, shape, or weight.
- Some apples have too many bruises or nicks.
3 Processing and Packaging
1/100 of all apples are lost here.

REASONS FOR FOOD WASTE

• Skins, stems, cores, and other parts of the apple are removed to make fruit trays or new foods like applesauce or cider.

• Blemishes are cut off “ugly” apples while the rest of the fruit is processed as applesauce or cider, or packaged into fruit trays.
4 Transport and Retail
12/100 of all apples are lost here.

REASONS FOR FOOD WASTE

• “Ugly” apples are thrown out.
• Retailers order more apples than can be sold.
5 Consumer
28/100 of all food is lost in the home of consumers. It’s not just an apple problem.

REASONS FOR FOOD WASTE

• Consumers are sometimes confused about expiration dates (“sell-by” dates or “best-by” dates) so perfectly good food gets thrown away.
• Food might spoil due to improper storage.
• Too much food is purchased or prepared, so the excess goes bad and is thrown away.
This lesson shows students how their eating habits can affect the food waste problem.

**ESTIMATED TIME**

30 minutes

**REQUIRED MATERIALS**

- Small pieces of interesting or exotic fruits and veggies for every student
- 3-4 small pieces of “ugly” foods
- 3-4 small pieces of “pretty” foods; same kinds as the “ugly” foods
- 1 food journal per student
- 1 writing utensil per student
- 1 PTC taste paper strip per student
- 1 pair of latex-free gloves
- 1 blindfold

**PROCEDURE**

1. Tell the students your favorite foods, and then ask them to name a few of their favorite foods. Ask them why they like these foods and not others, and ask them to explain why. Ask them when the last time was that they tasted the food they do not like, or if they have ever tasted it at all.

2. Introduce the term *super tasters* (see Teachers’ Notes). Tell them how taste can be affected by how strongly their taste buds detect different flavors. Have each student test their tasting level using a PTC taste paper strip (see Teachers’ Notes). Record on the board how many super tasters are in your class.

3. Explain to students how some people will not eat food because they are picky. Pickiness can range from not eating a food because you thought it was gross at one point in your life or because it smells different than food you are used to, because you can taste certain flavors (e.g., bitter or sweet) more strongly than others, or because food looks ugly.

4. Tell the students that today they are going on a Taste Test where they get to PICK on the food that they try and then to PICK the food they would eat again. Guide students through the activity *Pick on ME* (see beside).

5. Review what students learned. Discuss if they will be more willing to try new foods in the future. Ask if they will be less likely to throw away foods that do not look picture-perfect or to help their parents pick out “ugly” food at the grocery store. Remind your students that it is important to pick these “ugly” foods, as they are often overlooked by other shoppers and are eventually thrown away.

**ACTIVITY / PICK ON ME**

*Before beginning this activity*

Prepare “pretty” and “ugly” foods, and exotic fruits and veggies, by cutting them into small pieces and storing them in airtight containers.

This activity allows students to try new foods in an open-minded environment. Students must be willing to:

- Try new foods and reserve judgment on their taste until after trying them, and
- Not judge their peers for what foods they end up liking or not liking.

1. Give each student a food journal — which can be anything from notebooks or bound construction paper to folders or binders with loose-leaf paper in them.

2. Pull out examples of “pretty” and “ugly” foods. Have 3-4 students come forward and blindfold them one at a time. Have each student try one “pretty” and “ugly” version of each food. Have the class remain quiet so as not to give away which is the ugly food. Ask the blindfolded student if they can tell which is the ugly food and keep a tally on the board of how often they were correct or not. Have them record in their journal what they experienced when tasting the food or watching others taste the food.

3. The instructor will pass around samples of interesting or exotic foods that are safe for all students to try. Make sure all students try the food at the same time and then have them write down their reactions in their food journals (e.g., Did they like it or not? Would they try it again?). Encourage students to use four senses when trying and describing the food; what did the food look, smell, feel, and taste like?
This lesson teaches students how to accurately interpret expiration and “best-by” dates, how to properly store food, and how to use older foods and food byproducts.

**ESTIMATED TIME**
60 minutes

**REQUIRED MATERIALS**
- 1 food journal per student
- 1 writing utensil per student
- 1 Best if Used Chart per student
- 1 Best If Used Worksheet per student
- 1 Food Storage Worksheet per student
- A Final Ap-’peel’ PowerPoint

**PROCEDURE**
1. Ask the students if they know when a food item has gone bad. Introduce the terms manufacturer, expiration dates, and perishable food as defined in the Teachers’ Notes.

2. Teach students the Tips for Food Safety found in your Teachers’ Notes. Have them write these tips in their food journals (e.g., notebooks, bound construction paper, folders or binders with loose-leaf paper).

3. Give each student a Best If Used Worksheet and a Best if Used Chart. Have them fill out the worksheet based on the chart.

4. Explain to students that we can reduce our food waste and keep food fresher for longer using proper storage techniques. Teach students How to Store Food (see Teachers’ Notes), then have students complete the Food Storage Worksheet.

5. Ask the students how much money they think the average family wastes on spoiled food or food that was thrown away because of its expiration date. Tell them the actual statistic: An average family wastes $589.76 in food each year. Have them write this in their food journals.

6. Additionally, for 3rd-5th grade: Guide students through the Food Waste Adds Up activity (see below). After completing the activity, ask the students follow-up questions such as:
   a. Would you want to give up your allowance for five whole years? What else would you rather do with that money?
   b. Does this help you see one reason why we do not want to waste food?

7. Explain to your students that we can use a lot of foods that are getting older and parts of food that we would often throw away using the A Final Ap-’peel’ PowerPoint.

8. Ask students for other examples of ways that they could reuse food waste. Have them write their ideas in their food journals.

9. Review with the students what they learned today about how to interpret expiration dates, how and why to store food, and how to use older foods or food byproducts.

**ACTIVITY / FOOD WASTE ADDS UP**

a. Tell the students, “Pretend you get $10 per month for allowance. If you needed to pay for all the food wasted by the average family each year, how long would it take you to save up enough money?”

b. Have the students multiply 12 months by $10/month equalling $120 to determine how much money the student could save in a year.

c. To see how many years it would take to pay for all the food waste, have them subtract $120 from the grand total, $589.76. Then, take the remaining balance ($469.76) and subtract $120 from that figure to get the remaining balance after two years of repayment ($349.76). Continue until all $589.76 are repaid (~4 years and 11 months, can have them round up to 5 years).
Most food can be used past the store's Expiration Dates. Below are some foods that can be used past their dates and how long you can store them.

<table>
<thead>
<tr>
<th>FOOD</th>
<th>SAFE STORAGE TIME PAST SELL-BY DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>1 week</td>
</tr>
<tr>
<td>Eggs</td>
<td>3-5 weeks</td>
</tr>
<tr>
<td>Hot Dogs (unopened)</td>
<td>2 weeks in refrigerator, indefinitely in freezer</td>
</tr>
<tr>
<td>Ground beef</td>
<td>1-2 days in refrigerator, indefinitely in freezer</td>
</tr>
<tr>
<td>Pizza</td>
<td>5 days in refrigerator, indefinitely in freezer</td>
</tr>
<tr>
<td>Dried fruits (raisins)</td>
<td>3-6 months in cabinet, 6-12 months in refrigerator</td>
</tr>
<tr>
<td>Frozen vegetables</td>
<td>Indefinitely</td>
</tr>
<tr>
<td>Canned goods</td>
<td>Indefinitely</td>
</tr>
</tbody>
</table>
For the foods below, decide what date the food is actually good until based on the Best if Used Chart.

- **Raisins in a cabinet**
  - You purchase: 1/21/18
  - Safe until: ____________

- **Canned goods**
  - You purchase: 12/11/16
  - Safe until: ____________

- **Milk**
  - You purchase: 7/8/18
  - Safe until: ____________

- **Pizza in the refrigerator**
  - You purchase: 4/5/18
  - Safe until: ____________

- **Eggs**
  - You purchase: 2/1/18
  - Safe until: ____________

- **Frozen vegetables**
  - You purchase: 12/31/16
  - Safe until: ____________
For the foods below, decide what date the food is actually good until based on the Best if Used Chart.

**Raisins in a cabinet**  
You purchase: 1/21/18  
Safe until: 4/21/18 to 7/21/18

**Canned goods**  
You purchase: 12/11/16  
Safe until: Indefinitely

**Milk**  
You purchase: 7/8/18  
Safe until: 7/15/18

**Pizza in the refrigerator**  
You purchase: 4/5/18  
Safe until: 4/10/18

**Eggs**  
You purchase: 2/1/18  
Safe until: 2/22/18 to 3/8/18

**Frozen vegetables**  
You purchase: 12/31/16  
Safe until: Indefinitely
For the foods below, choose the **best** way to store them using the words in the Word Bank. Some foods may have more than one way to be stored.

<table>
<thead>
<tr>
<th>WORD BANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counter</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>FOOD</th>
<th>BEST WAY TO STORE IT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canned goods</td>
<td></td>
</tr>
<tr>
<td>Frozen vegetables</td>
<td></td>
</tr>
<tr>
<td>Fresh celery</td>
<td></td>
</tr>
<tr>
<td>Fresh tomatoes</td>
<td></td>
</tr>
<tr>
<td>Bread</td>
<td></td>
</tr>
<tr>
<td>Honey</td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
</tr>
<tr>
<td>Fresh uncut onions</td>
<td></td>
</tr>
</tbody>
</table>
For the foods below, choose the best way to store them using the words in the Word Bank. Some foods may have more than one way to be stored.

<table>
<thead>
<tr>
<th>FOOD</th>
<th>BEST WAY TO STORE IT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canned goods</td>
<td>Cabinet</td>
</tr>
<tr>
<td>Frozen vegetables</td>
<td>Freezer</td>
</tr>
<tr>
<td>Fresh celery</td>
<td>Fridge</td>
</tr>
<tr>
<td>Fresh tomatoes</td>
<td>Counter</td>
</tr>
<tr>
<td>Bread</td>
<td>Counter / Fridge / Freezer</td>
</tr>
<tr>
<td>Honey</td>
<td>Counter / Cabinet</td>
</tr>
<tr>
<td>Eggs</td>
<td>Fridge</td>
</tr>
<tr>
<td>Fresh uncut onions</td>
<td>Cabinet</td>
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</tbody>
</table>