Chapter 8
Fats and Oils

Fat is a nutrient found in foods. The body uses fat for energy, growth and nerve and brain functions. Everyone needs some fat in their diet. However, many Americans eat too much fat. Fats are high in calories and the wrong kinds of fat can be unhealthy. For this reason, it is important to learn which fats are healthier and which are less healthy.

Enjoy investigating freaky fats and oils!

Hands-On Lessons:

Answer Keys:

Virtual Lessons:

(See Virtual FoodMASTER CD)

Sad Solids
Butter or Margarine
Happy Fats
Fats and Oils

Dress it Up

Summary

Students will read three salad dressing Nutrition Facts labels, complete a nutrition facts table and apply real world multiplication to answer questions regarding fat content. In addition, students will perform a taste test to further compare the salad dressings.

Objectives

1. Students will be able to locate serving sizes, calories, grams of total fat, grams of saturated fat and grams of trans fat on food labels.
2. Students will use correct unit labels.
3. Students will be able to record data in a table.
4. Students will practice multiplication skills by calculating the number of calories from fat in each type of salad dressing.
5. Students will be able to explain why one salad dressing is healthier than another.

Academic Content Standards

MATH

Number and Operations Standard
Compute fluently and make reasonable estimates.

Expectation:
- Develop fluency in adding, subtracting, multiplying, and dividing whole numbers.

Measurement Standard
Understanding measurable attributes of objects and the units, systems, and processes of measurement.

Expectation:
- Understand the need for measuring and standard units and become familiar with standard units in the customary and metric systems.

Data Analysis and Probability Standard
Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

Expectation:
- Collect data using observations, surveys, and experiments.
- Represent data using tables and graphs such as line plots, bar graphs, and line graphs.

Problem Solving Standard

Expectation:
- Solve problems that arise in mathematics and other contexts.

Connections Standard

Expectation:
- Recognize and apply mathematics in contexts outside of mathematics.

SCIENCE

Science and Technology: Content Standard E
Abilities of technological design.

Expectation:
- Evaluate a product or design.

Science in Personal and Social Perspectives: Content Standard F
Personal health.

Expectation:
- Nutrition is essential to health. Students should understand how the body uses food and how various foods contribute to health. Recommendations for good nutrition include eating a variety of foods, eating less sugar, and eating less fat.

SCIENTIFIC INQUIRY:
Reading Labels

Materials

For the teacher: 3 tablespoons, 16-fluid ounce bottle of ranch salad dressing, 16-fluid ounce bottle of light ranch salad dressing, 16-fluid ounce bottle of fat-free ranch salad dressing.

For each student: 1 plate, food labels for each salad dressing, several raw vegetable pieces (carrots, celery, broccoli), 1 tablespoon ranch dressing, 1 tablespoon light ranch dressing, 1 tablespoon fat-free ranch dressing.

Procedure

1. Read *Dress it Up* and complete the Doodle Bugs.
2. Review label reading. Explain that the Nutrition Facts on food labels tell you how many calories, grams of total fat, grams of saturated fat and grams of trans fat are in foods. Sometimes grams of monounsaturated and polyunsaturated fats are listed too. Show the class where to find serving sizes, total calories, total fat, saturated fat and trans fat on the Nutrition Facts label. Point out the different units of measurement such as tablespoons, calories and grams.
3. Give each student or pair of students a set of food labels. Instruct your students to complete the *Salad Dressing Nutrition Facts* table. Remind students to record units of measurement.
4. Students may work independently, in pairs or as a class to complete questions one to six.
5. Place several vegetables and one tablespoon of each salad dressing on each student's plate.
6. Students will dip vegetables into the salad dressing to complete a taste test. Instruct students to answer the remaining questions.

Teacher Tips:

- If possible, buy the same brand of the ranch, light ranch and fat-free ranch salad dressings. If you have more than 30 students participating in this activity, you will need two bottles of each salad dressing.
- Make copies of the actual Nutrition Facts labels or copies of the labels provided in this manual for each student or pair of students.
- Any raw vegetable that can be dipped may be used. For example, you could use carrots, celery, broccoli, cauliflower, cucumbers, green pepper or cherry tomatoes. Look for vegetables that are in season or on sale.
- Students may keep track of the different kinds of dressings by labeling the edge of their plates or another piece of paper. For good food safety, be sure the dressings and veggies will not touch the labels.
- To keep this lab running smoothly, wash and cut vegetables ahead of time or ask another adult to help with vegetable preparation and passing out supplies.
- To simplify the math problems, students may round numbers to the nearest whole number.
- Extension: Use the food labels to explore more multiplication fats. Such as calories from saturated fat, carbohydrates and protein.

SCIENTIFIC INQUIRY:
Reading Labels (continued)

Ranch

Nutrition Facts

Serving Size:
2 tablespoons (14g)
Servings Per Container: 16

Amount Per Servings
Calories 110
Calories from Fat 100

		% Daily Value
Total Fat	11 g	17%
Saturated Fat	1.5 g	8%
Trans Fat	0 g	0%
Cholesterol	<5 mg	0%
Sodium	310 mg	13%
Total Carbohydrate	2 g	1%
Dietary Fiber	0 g	0%
Sugars	1 g	
Protein	0 g	

*Percent Daily Values are based on a 2,000 calorie diet
*Not a significant source of Vitamin A, Calcium, Vitamin C or iron

Light Ranch

Nutrition Facts

Serving Size:
2 tablespoons (14g)
Servings Per Container: 16

Amount Per Servings
Calories 70
Calories from Fat 40

		% Daily Value
Total Fat	4.5 g	7%
Saturated Fat	0.5 g	3%
Trans Fat	0 g	0%
Polyunsaturated	2.5 g	
Monounsaturated	1 g	
Cholesterol	10 mg	3%
Sodium	370 mg	15%
Total Carbohydrate	7 g	2%
Dietary Fiber	0 g	0%
Sugars	1 g	
Protein	0 g	

*Percent Daily Values are based on a 2,000 calorie diet
*Not a significant source of Vitamin A, Calcium, Vitamin C or iron

Fat-Free Ranch

Nutrition Facts

Serving Size:
2 tablespoons (14g)
Servings Per Container: 16

Amount Per Servings
Calories 50
Calories from Fat 0

		% Daily Value
Total Fat	0 g	0%
Saturated Fat	0 g	0%
Trans Fat	0 g	0%
Polyunsaturated	0 g	
Monounsaturated	0 g	
Cholesterol	<5 mg	0%
Sodium	330 mg	14%
Total Carbohydrate	11 g	4%
Dietary Fiber	0 g	0%
Sugars	3 g	
Protein	0 g	

*Percent Daily Values are based on a 2,000 calorie diet.
*Not a significant source of Vitamin A, Calcium, Vitamin C or iron

Emulsify This

Summary

Students will make two oil and vinegar mixtures, one with an emulsifier and one without an emulsifier.

Objectives

1. Students will be able to use new vocabulary such as immiscible and emulsify.
2. Students will practice their measurement skills.
3. Students will perform an experiment and make reasonable conclusions.

Academic Content Standards

MATH

Measurement Standard

Apply appropriate techniques, tools, and formulas to determine measurements.

Expectation:

- Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles.

SCIENCE

Science as Inquiry: Content Standard A

Develop abilities necessary to do scientific inquiry.

Expectation:

- Plan and conduct a simple investigation.
- Use data to construct reasonable explanations.

Physical Science: Content Standard B

Properties of objects and materials.

Expectation:

- Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools, such as rulers, balances, and thermometers.

SCIENTIFIC INQUIRY:
Immiscible

Materials

For the teacher: Masking tape, permanent marker.

For each group: 1 liquid measuring cup, 2 glass jars with lids*, set measuring spoons, colored pencils, 1/2 cup vinegar, 1/2 cup cooking oil, 1 teaspoon dry mustard, 1 teaspoon paprika.

*Jars may be 1/2 pint size or larger.

Procedure

1. Prior to beginning the activity, label the jars using small strips of masking tape and a permanent marker. Each group will need a jar labeled “A” and a jar labeled “B”.
2. Read *Emulsify* This and complete Doodle Bugs.
3. Separate the class into groups of four to eight students.
4. Review the new vocabulary words: immiscible (liquids that normally don’t mix), emulsify (to blend), emulsifier (a substance that keeps two immiscible liquids from separating), interface (the line between two layers of liquids that don’t mix).
5. Students will follow the *Scientific Inquiry: Immiscible* instructions to complete the lab.
6. Students will take turns measuring the ingredients and shaking the jars.
7. While observing the separation of the vinegar and oil, the class may discuss other kitchen emulsions such as mayonnaise, salad dressing, peanut butter and milk.
8. After several minutes of observation, instruct students to complete the questions.

Teacher Tips:

- Students may be tempted to shake the jars instead of letting them settle. You may choose to set the jars in a special spot to help students resist the temptation to shake the jars.
- Since the oil and vinegar mixture separates rapidly, students may shake this mixture up a second or third time.
- Extension: Let the jars sit out over night without being shaken. Let the students observe the separation of the vinegar, oil, mustard and paprika again the next day. Then review the vocabulary terms once more.

Mmmm Creamy

Summary

Students will read ice cream Nutrition Facts labels, complete a nutrition facts table and use data from the table to complete a bar graph. Students will then perform a taste test comparing regular ice cream, reduced-fat ice cream and fat-free ice cream.

Objectives

1. Students will be able to locate serving sizes, calories and grams of total fat on food labels.
2. Students will be able to record data in a table.
3. Students will use correct unit labels.
4. Students will complete a bar graph.
5. Students will be able to discuss mouth feel.

Academic Content Standards

MATH

Measurement Standard

Apply appropriate techniques, tools, and formulas to determine measurements.

Expectation:

- Understand the need for measuring with standard units and become familiar with standard units in the customary and metric systems.

Data Analysis and Probability Standard

Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

Expectation:

- Collect data using observations, surveys, and experiments.
- Represent data using tables and graphs such as line plots, bar graphs, and line graphs.

Connections Standard

Expectation:

- Recognize and apply mathematics in contexts outside of mathematics.

SCIENCE

Physical Science: Content Standard B

Properties of objects and materials.

Expectation:

- Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools, such as rulers, balances, and thermometers.

Science and Technology: Content Standard E

Abilities of technological design.

Expectation:

- Evaluate a product or design.

Understanding about science and technology.

Expectation:

- People have always had problems and invented tools and techniques (ways of doing something) to solve problems. Trying to determine the effects of solutions helps people avoid some new problems.

Science in Personal and Social Perspectives: Content Standard F

Personal health.

Expectation:

- Nutrition is essential to health. Students should understand how the body uses food and how various foods contribute to health. Recommendations for good nutrition include eating a variety of foods, eating less sugar, and eating less fat.

SCIENTIFIC INQUIRY:

We All Scream for Ice Cream

Materials

For the teacher: : Ice cream scoop, 1/2 gallon regular ice cream, 1/2 gallon reduced-fat ice cream, 1/2 gallon fat-free ice cream.

*Be sure all three ice creams are the same flavor.

For each student: 3 small cups, 1 spoon, food labels for each ice cream, pen or marker.

Procedure

1. Read *Mmmm Creamy* and complete the Doodle Bugs.
2. Pass out the Nutrition Facts labels for each ice cream to each student or pair of students.
3. Review where to find serving sizes, calories and total fat on the Nutrition Facts labels.
4. Then instruct students to complete the *Ice Cream Nutrition Facts* table. Remind students to record the units of measurement.
5. Once students have completed the table, they will use the data to complete the bar graph.
6. Finally, serve each student a small sample of each type of ice cream in his or her small cups. Ask students to label their cups "R" for regular, "RF" for reduced fat and "FF" for fat-free.
7. Students will taste the ice cream and complete the *Ice Cream Taste Test Facts* table. Encourage students to use descriptive words when completing the chart.
8. Students will finish the lab by answer questions one to three.

Teacher Tips:

- To keep this lab running smoothly, invite another adult to help serve the ice cream.
- If possible, buy the same flavor and brand of regular ice cream, reduced-fat ice cream and fat-free ice cream.
- Make copies of the actual Nutrition Facts labels or copies of the labels provided in this manual for each student or pair of students.
- Note: Reduced-fat slow churned or double churned ice creams often have a better mouth feel than regular reduced-fat ice creams.
- To save class time, you may label cups for students ahead of time: "R" for regular, "RF" for reduced-fat and "FF" for fat-free.
- Extension: Ask students to think of a new flavor of ice cream. If they could create a new flavor of ice cream, what would they call it? Would it be regular, reduced-fat or fat-free? What would the main ingredient be?
- Extension: Make ice cream using the Take Home: Chocolate Coffee Can Ice Cream recipe or try making ice cream in lock and seal baggies.

Regular Chocolate Ice Cream

Nutrition Facts

Serving Size: 1/2 cup
Servings Per Container: 14

Amount Per Servings
Calories 140
Calories from Fat 60

		% Daily Value
Total Fat	7 g	11%
Saturated Fat	4.5 g	23%
Trans Fat	0 g	0%
Cholesterol	20 mg	6%
Sodium	50 mg	2%
Total Carbohydrate	17 g	6%
Dietary Fiber	1 g	3%
Sugars	16 g	
Protein	2 g	
Vitamin A		4%
Calcium		6%
Vitamin C		0%
Iron		4%

*Percent Daily Values are based on a 2,000 calorie diet

Reduced Fat Chocolate Ice Cream

Nutrition Facts

Serving Size: 1/2 cup
Servings Per Container: 14

Amount Per Servings
Calories 100
Calories from Fat 30

		% Daily Value
Total Fat	3.5 g	5%
Saturated Fat	2 g	10%
Trans Fat	0 g	0%
Cholesterol	10 mg	3%
Sodium	55 mg	2%
Total Carbohydrate	17 g	6%
Dietary Fiber	1 g	3%
Sugars	13 g	
Protein	2 g	
Vitamin A		6%
Calcium		8%
Vitamin C		0%
Iron		4%

*Percent Daily Values are based on a 2,000 calorie diet

Fat-Free Chocolate Ice Cream

Nutrition Facts

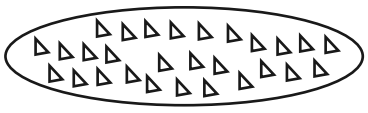
Serving Size: 1/2 cup
Servings Per Container: 14

Amount Per Servings
Calories 90
Calories from Fat 0

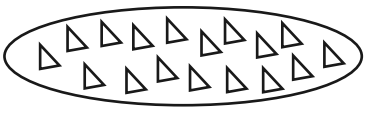
		% Daily Value
Total Fat	0 g	0%
Saturated Fat	0 g	0%
Trans Fat	0 g	0%
Cholesterol	0 mg	0%
Sodium	55 mg	2%
Total Carbohydrate	20 g	7%
Dietary Fiber	4 g	16%
Sugars	13 g	
Protein	3 g	
Vitamin A		4%
Calcium		10%
Vitamin C		0%
Iron		4%

*Percent Daily Values are based on a 2,000 calorie diet

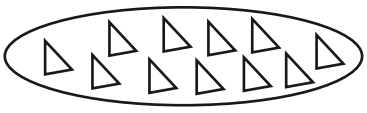
Ice Cream high in fat has small ice crystals.



Ice Cream low in fat has medium ice crystals.



Ice Cream with no fat has large ice crystals.



Answer Keys

Dress it Up

Doodle Bugs

Circle: **Saturated and trans fats**
Box: **9 calories**
Fill-in the blank: **There are five more calories in one gram of fat than there are in one gram of protein.**

SCIENTIFIC INQUIRY:

Reading Labels

Note: Answers based on Nutrition Facts labels will vary depending upon the brands.

Ranch: **2 tablespoons; 110 calories; 11 grams total fat; 1.5 grams saturated fat; 0 grams trans fat**
Light ranch: **2 tablespoons; 70 calories; 4.5 grams total fat; 0.5 gram saturated fat; 0 grams trans fat**
Fat-Free ranch: **2 tablespoons; 50 calories; 0 grams total fat; 0 gram saturated fat; 0 grams trans fat**

1. **Ranch**
2. **Ranch**
3. **9 calories/gram x 11 grams = 99 calories**
4. **9 calories/gram x 4.5 grams = 40.5 calories**
5. **9 calories/gram x 0 grams = 0 calories**
6. **110 calories – 70 calories = 40 calories**
7. **Answers will vary.**
8. **The fat-free ranch is healthiest because it has less fat and calories.**
9. **Yes. Salad dressings with healthy fats still have a lot of calories. Eating too much salad dressing can give you too many calories.**

Emulsify This

Doodle Bugs

Circle: **Immiscible**
Drawing: **Before – the jar has two separate layers (oil and vinegar). After – the jar has just one layer (a mixture of oil and vinegar).**

SCIENTIFIC INQUIRY:

Immiscible

1. **The mixture in Jar A separated faster because it did not have an emulsifier.**
2. **The mustard and paprika are emulsifiers. They changed the mixture by allowing the vinegar and oil to say mixed longer.**
3. **Jar B is an emulsion. It is a temporary emulsion.**
4. **Students should label the oil, interface and vinegar. Color should be used to represent the oil, paprika, and mustard.**

Mmmm Creamy

Doodle Bugs

Underline: **Mouth feel is simply how a food feels in your mouth.**
Circle: **Fat**
Fill-in the blank: **Companies want to make ice cream with less fat so that the ice cream will be healthier.**

SCIENTIFIC INQUIRY:

We All Scream for Ice Cream

Note: Answers based on Nutrition Facts labels will vary depending upon the brands.

Regular ice cream: **1/2 cup; 140 calories; 7 grams**
Reduced-Fat ice cream: **1/2 cup; 100 calories; 3.5 grams**
Fat-Free ice cream: **1/2 cup; 90 calories; 0 grams**

Star: **Fat-free ice cream**
Bar graph: **Regular = 7 grams; Reduced-fat = 3.5 grams; Fat-Free = 0 grams**

Regular ice cream: **Creamy and smooth; chocolaty and rich; tiny crystals**
Reduced-Fat ice cream: **Shiny and fairly smooth; chocolaty and a little watery as it melts; small crystals**
Fat-Free ice cream: **Shiny with small crystals; chocolaty but watery as it melts; bigger crystals**

Which ice cream had the best mouth feel? Why? **The regular ice cream had the best mouth feel because it has the most fat and the smallest ice crystals.**
Which ice cream had the biggest ice crystals? Why does it have bigger ice crystals? **The fat-free ice cream had the biggest ice crystals. The fat-free ice cream has less fat to separate the ice crystals so they grew bigger.**
Do you think you could eat reduced-fat or fat-free ice cream? **Answers will vary.**

Proficiency Questions (Workbook)

1. **c** 2. **a** 3. **c** 4. **a** 5. **a** 6. **b**

Proficiency Questions (Virtual CD)

1. **a** 2. **c** 3. **d** 4. **d**