

Body Story: Metabolism: Teacher's Guide

Grade Level: 6-8

Curriculum Focus: Life Science

Lesson Duration: Two+ class periods

Program Description

Is starving yourself the best way to lose that extra weight? Although it may seem like a quick fix, it's actually better to alter your metabolic rate by balancing your fuel intake and caloric burning. In other words, eat right and exercise!

Onscreen Questions

Before watching the video

- What do you know about the relationship between metabolism, fat, and weight?
- As you watch the program, think about how people try to lose weight or speed up their metabolism.
- Consider both healthy and dangerous ways to lose weight.

After watching the video

- Describe how the character in the program tried to lose weight. How does his diet compare to the food pyramid's guide to healthy eating?
 - Discuss the eating and exercise habits that are beneficial for maintaining a healthy weight.
-

Lesson Plan

Student Objectives

- Learn what a healthful diet is.
- Assess their eating habits to determine if they are getting the right foods to stay healthy.
- Learn about the relationships among metabolism, calories, and diet.

Materials

- Print resources, such as reference books and encyclopedias
- Internet access
- Food labels (optional but very helpful)

Procedures

1. Explain that puberty is a time of fast growth, second only to infancy. For this reason, it is important to eat a healthful diet and exercise regularly.
2. Discuss with students that they should begin taking responsibility for their eating habits. During this lesson, they will compare what they eat with the daily nutrition requirements recommended by the U.S. Department of Agriculture. First, they must understand the basics of nutrition. Provide students with this background information, and discuss the following key terms with them.
 - **diet:** Everything that someone consumes. A balanced diet is based on the scientific principles that healthful foods and appropriate nutrients must be consumed each day.
 - **calorie/Calorie:** One calorie is the amount of energy needed to raise the temperature of 1 gram of water 1 degree Celsius. One Calorie, or kcal, is equal to 1,000 calories, the amount of energy required to raise 1 kilogram of water (about 2.2 pounds) 1 degree Celsius. Nutrition is measured in Calories.
 - **metabolism:** The number of calories burned at any given moment. An individual's basal metabolic rate (BMR) is a measure of the number of calories burned to keep the person's heart, lungs, and muscles working while the body is at rest. An individual's actual metabolism is higher when the person is active than it is when the person is at rest.
 - **nutrients:** Substances found in foods that people need to stay healthy. Proteins, carbohydrates, vitamins, minerals, and fiber are essential elements of a nutritious diet. Proteins make the cells, while carbohydrates provide energy. Vitamins regulate chemical processes in which the body converts food into energy and tissues. Minerals such as calcium are essential for building strong bones and teeth. Fiber helps keep the digestive system functioning smoothly.
3. Tell students to list what they eat over the course of three days. Make sure students include the amounts of each food, as in "two waffles" or "1 cup of cereal with 1 cup of low-fat milk."
4. After students have completed their lists, hand out copies of the Food Guide Pyramid from by the U.S. Department of Agriculture. The guide can be found on many products, such as cereal and cracker boxes, or at the following Web site: <http://www.nal.usda.gov:8001/py/pmap.htm>.
5. Have students take a few minutes to look over the Food Guide Pyramid and recommended daily servings. These servings apply to all people, but to get enough calcium, adolescents should make sure to eat three or more daily servings from the milk, yogurt, and cheese group.
6. To help students understand what a serving is, share the following equivalencies:
 - Milk, Yogurt, and Cheese**
 - 1 serving = 1 cup of milk or yogurt
 - 1 serving = 1½ oz. of natural cheese, or 2 oz. of processed cheese

Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts

- 1 serving = 2-3 ounces of cooked lean meat, poultry, or fish (2 tablespoons of peanut butter = 1 oz. of lean meat)
- 1 serving = $\frac{1}{2}$ cup of cooked dry beans
- 1 serving = 1 egg
- (2 tablespoons of peanut butter or $\frac{1}{2}$ cup of peanuts is equivalent to 1 oz. of meat. Because nuts are high in fat, it may be wise to supplement these portions with other foods from that group. Two tablespoons of peanut butter is about half a serving, as is $\frac{1}{2}$ cup of peanuts.)

Vegetables

- 1 serving = 1 cup of raw leafy vegetables
- 1 serving = $\frac{1}{2}$ cup of other vegetables, cooked or raw
- 1 serving = $\frac{3}{4}$ cup of vegetable juice

Fruits

- 1 serving = 1 medium apple, banana, or orange
- 1 serving = $\frac{1}{2}$ cup of chopped, cooked, or canned fruit
- 1 serving = $\frac{3}{4}$ cup of fruit juice

Bread, Cereal, Rice, and Pasta

- 1 serving = 1 slice of bread
- 1 serving = 1 oz. of ready-to-eat cereal
- 1 serving = $\frac{1}{2}$ cup of cooked cereal, rice, or pasta

7. Using the Food Guide Pyramid and the serving information as guides, ask students to compare their typical daily diet with what is considered a well-balanced diet. Then have them modify their diets by cutting out unhealthful foods, adding healthful foods, or by increasing or decreasing the number of servings in a particular food group. Tell students that they should eat fats, oils, and sugars sparingly because these foods add calories but not nutrients.
8. Tell students that they should also consider metabolism when assessing their eating habits. Metabolism is defined as the number of calories your body needs at rest. A more active individual will have a higher metabolism.
9. Explain to students that all formulas for calculating metabolism give an approximate number of calories for each day. Counting calories is useful, but it is much more important to eat the right foods. Physical activity is equally important.



10. If you feel that providing formulas for students to determine their basal metabolic rate would give them useful information, suggest that they follow these steps:
- (1.) Women: $661 + (4.38 \times \text{weight in pounds}) + (4.33 \times \text{height in inches}) - (4.7 \times \text{age}) = \text{BMR}$
 - (2.) Men: $67 + (6.24 \times \text{weight in pounds}) + (12.7 \times \text{height in inches}) - (6.9 \times \text{age}) = \text{BMR}$
 - (3.) To estimate the total number of calories your body needs each day, multiply your BMR by the appropriate number given below:
 - 1.2 for people who get little exercise
 - 1.3 for people who get a moderate amount of exercise
 - 1.7 for people who are very active
 - 1.9 for people who are extremely active
11. Ask students what they learned about their eating habits and metabolism. Challenge them to follow the diet they devised based on the Food Guide Pyramid and basic serving information. After a few days, ask them if they have more energy or if they are less tired. Encourage students to continue to eat a healthful diet.

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students had a strong grasp of the subject matter; demonstrated an above-average ability to apply knowledge to personal experience; and participated actively in class discussions.
- **2 points:** Students showed on-grade understanding of the subject matter; demonstrated average ability to apply knowledge to personal experience; and participated in class discussions.
- **1 point:** Students showed a weak understanding of the subject matter; had difficulty applying knowledge to their own experience; and did not participate in class discussions.

Vocabulary

calorie/Calorie

Definition: With a lowercase c, the term refers to the amount of energy needed to raise the temperature of 1 gram of water 1 degree Celsius. With an uppercase C, the term refers to the amount of energy required to raise one kilogram of water (about 2.2 pounds) one degree Celsius; one Calorie, or kcal, is equal to 1,000 calories.

Context: When it comes to staying healthy, counting calories is not as important as eating a balanced diet.



diet

Definition: A person's usual food and drink

Context: Eating a balanced diet helps prevent high cholesterol, high blood pressure, and cardiovascular disease.

Food Guide Pyramid

Definition: A visual representation designed by the U.S. Department of Agriculture of the number of recommended daily servings in each of the six food groups

Context: Look at the Food Guide Pyramid to find out how much of each kind of food you should eat daily.

metabolism

Definition: The number of calories burned at any given moment. An individual's basal metabolic rate (BMR) is a measure of the number of calories needed while the body is at rest.

Context: You can increase your metabolism by engaging in more physical activity.

Academic Standards**National Academy of Sciences**

The National Academy of Sciences provides guidelines for teaching science in grades K–12 to promote scientific literacy. To view the standards, visit this Web site:

<http://books.nap.edu/html/nses/html/overview.html#content>.

This lesson plan addresses the following science standard:

- Life Science: Structure and function in living systems

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit link:

<http://www.mcrel.org/compendium/browse.asp>

This lesson plan addresses the following national standards:

- Health – Understands essential concepts about nutrition and diet
- Science – Life Sciences: Understands the structure and function of cells and organisms

Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>

