High School Lesson Plan

Energy Balance
Understanding Energy Balance
Grades 9-12

I. Lesson Objectives:
   A. Students will explain the concept of energy balance.
   B. Students will list and explain the nutrients that provide energy.
   C. Students will explain the importance of physical activity as a part of energy balance.

II. Behavior Outcomes:
   A. Maintain appropriate calorie balance during each stage of life.

III. Pennsylvania Educational Standards:
   A. 10.1 Concepts of Health
   B. 10.2 Healthful Living
   C. 10.4 Physical Activity
   D. 11.3 Food Science and Nutrition

IV. Materials
   A. Laptop/Projector with PowerPoint presentation
   B. Handouts – “Energy Balance” worksheet, “How Much Do I Need?” and “Plan a Menu for a Day” worksheets
   C. Optional Handouts – Find Your Balance or Maintain a Balance from Learning ZoneXpress or a similar handout explaining energy balance
   D. Reinforcement that conveys the appropriate nutrition message
   E. Hand wipes
   F. Food tasting and any necessary supplies
   G. Ten Tips Sheet: Enjoy Your Food, But Eat Less

V. Procedure: Text in italics are instructions for the presenter, non-italicized text is the suggested script.
   A. Introductory
      1. Lesson Introduction
         a. Introduce yourself and the nutrition education program/organization presenting the lesson.
         b. Review previous lesson.
         c. Briefly introduce lesson topic. Explain that today’s topic is energy balance.
2. Icebreaker
   b. Prompt further as needed. For example: What energy are we trying to balance? Why might it be important to balance our energy? Discuss responses.
   c. Explain: We will be talking about balancing the energy we take into our body every day with the energy that we use every day. Maintaining energy balance can help us to maintain a healthy body weight. Maintaining a healthy body weight can help us to reduce the risk of disease, such as heart disease, diabetes, hypertension, and cancer.

B. Developmental

   2. Slide 2: Project Sponsors

   3. Slide 3: Maintenance Check
      a. Think of your body like a car. If you don’t take good care of a car, it might not last long. For a car you have to change the oil, get maintenance checks, and replace parts every now and then. Our body is like a car because we need to take care of it too. Today we will discuss balance in the way we fuel our body and use our energy.

   4. Slide 4: ENERGY IN
      a. Like a car, our bodies need fuel.
      b. Ask the students: What provides fuel, or energy, for our bodies? Solicit answers. Everything we eat and drink provides the energy or fuel for our bodies.
      c. Ask the students: How do we measure the energy in our food? Solicit answers. Calories are the measure of the energy in food.
      d. Ask the students: What compounds in food provide calories? Solicit responses. Carbohydrate, protein, and fat are the nutrients in food that provide us with energy. These nutrients are called essential nutrients because we must have all of them in our diets.

   5. Slide 5: ENERGY OUT
      a. Ask the students: How do we use the energy that we get from food? Discuss students’ answers and how they relate to the categories below.
      b. There are three ways in which we use energy:
         i. Basal Metabolism: this term is also referred to as “metabolism.” This is the energy that our body uses at rest. This is the energy that we use to pump the heart, breathe, think, cells to regenerate, etc.
         ii. Physical Activity: This is the energy that we use to perform any body movement. Sitting, standing, turning your head, raising your hand, walking
across the room, running, playing a sport, exercising, or any bodily movement.

iii. Thermic Effect of Food: This is the energy that we need to digest our food. We need to use energy to eat, digest, and absorb the food that we eat. This is not a large amount of calories though, so we do not count this as a significant part of energy out.

6. Slide 6: ENERGY BALANCE
   a. If we have a scale and put “Energy In” on one side and “Energy Out” on the other, where would we want the scale to be in order to maintain our current weight? If students have trouble answering this question, remind them of the name of the lesson. We want the scale to be in the middle, or balanced. We call this “Energy Balance”. In order to be in “energy balance” our “energy in” needs to be equal to our “energy out.”

7. Slide 7: ENERGY IN
   a. As we discussed, our bodies need energy, but it is important to be aware of how we are getting calories to fuel our bodies.
   b. Over the next few slides, we will take a further look at where we get “energy in.”

8. Slide 8: Carbohydrates
   a. Carbohydrates are one of the nutrients in food that provide calories. One gram is about 4 calories. Tell students that a gram is a measure of weight that is equal to the weight of a paper clip.
   b. There are two types of carbohydrates. Ask students: Does anyone know what they are?
   c. Simple Sugars – these are small molecules that our bodies digest quickly. Some simple sugars occur naturally in food, such as the sugar in fruit and milk. Other simple sugars are added to foods, such as the sugar in soda and candy.
   d. Complex Carbohydrates – these are larger molecules that take longer for our bodies to digest. Foods that contain complex carbohydrates include starchy vegetables, whole grains, and beans.

9. Slide 9: Protein
   a. Protein is important for muscle growth and repair and to help build new body tissue. It also provides 4 calories/gram.
   b. It is important to choose low-fat protein sources such as lean meats, fish, and shellfish.
   c. We should limit our intake of fried foods like fried chicken or fish because they are high in saturated fat.
   d. Lunch meats and other processed meats can also be very high in fat and sodium, so we should try to eat them less frequently.
   e. Beans, nuts, seeds, eggs, and milk are great choices, especially if you are a vegetarian and choose not to eat meat.
10. Slide 10: Fat
   a. We need fat in our diet to transport important vitamins, protect our vital organs and keep our body insulated. We should try to choose more healthy fats and cut back on solid fats in our diet.
   b. EAT MORE – Unsaturated Fat: This type of fat is good for us, and it is found in vegetable oil, olive oil, nuts, and fish. If you or someone at home cooks a lot, consider using olive, vegetable, or canola oil to cook with instead of butter or lard.
   c. EAT LESS – Saturated Fat: This type of fat can raise your cholesterol, which can increase risk for heart disease. Examples of foods that have saturated fat are dairy products, fatty meats, and fast food. This is why we should try to switch to fat-free or low-fat (1%) milk and dairy products.
   d. EAT LESS – Trans-Fat: This type of fat is also considered not as healthy because it can lead to increased risk for heart disease. Foods that are high in trans-fat include fried foods and baked goods.

11. Slide 11: Energy Out
   a. Now that we know where we get our “energy in”, we will look further into how we use our energy in “energy out”.

12. Slide 12: How Do I Use Energy?
   a. As we discussed earlier there are three different ways we use energy:
      i. Basal Metabolism: This is the energy that is needed to stay alive. It is about 60% of our total calorie expenditure, but does vary depending on gender, amount of lean body mass (muscle), age, and even genetics.
      ii. Physical Activity: This is the energy that we burn when we move our muscles on purpose. Physical activity is about 30 to 40% of our total calorie usage.
      iii. Thermic Effect of Food: This is the energy needed to digest food, which is only about 10% of the total amount of energy we use each day.
   b. Ask the students: Which of these do we have the most control over? We have the most control over our physical activity. Many people today don’t do as much physical activity because we have machines and computers that do a lot of our manual labor. Therefore, we have to put in extra effort to get enough physical activity every day.

   a. This chart gives a very general breakdown of the calorie needs for male and female high school students. As you can see, the amount of calories you need depends on your gender and your activity level. On average, males need more calories than females because they are usually bigger and have greater muscle mass.
   b. The amount of calories you need also depends on how active you are. The more active you are, the more calories you need.
c. Ask yourself what activity level category you fit into.
   i. If you are sedentary, then you probably don’t get much exercise. Maybe you get up in the morning take the bus to school, sit in class all day, then head home and watch TV, play video games, or use the computer until dinner.
   ii. If you are moderately active, you may walk to and from school. Maybe you do some other light activities during the week. Even walking around the mall would count as being moderately active.
   iii. If you are active, you may play a sport or work out vigorously for an hour or more on most days of the week.

14. Slide 14: Why is Physical Activity Important?
   a. As you saw on the previous slide, activity level is an important factor in determining a person’s calorie needs.
   b. Ask students: Why is physical activity important?
   c. Being physically active can help you:
      i. Increase your chances of living longer
      ii. Feel better about yourself
      iii. Decrease your chances of becoming depressed
      iv. Sleep well at night
      v. Move around more easily
      vi. Have stronger muscles and bones
      vii. Stay at or get to a healthy weight
      viii. Be with friends or meet new people
      ix. Enjoy yourself and have fun

15. Slide 15: Physical Activity and Your Health
   a. Ask students: Why is physical activity important for your health? If you are not physically active, what does that put you at risk for?
   b. A lack of physical activity increases the risk of:
      i. Heart disease
      ii. Diabetes
      iii. Hypertension
      iv. High blood cholesterol
      v. Stroke

   a. According to the 2008 Physical Activity Guidelines teenagers need:
      i. At least 60 minutes of physical activity each day
      ii. Most of it should be either moderate or vigorous intensity aerobic activity
      iii. Try to include muscle-strengthening activity 3 days a week and bone-strengthening activity 3 days a week
17. Slide 17: Types of Physical Activity
   a. Aerobic: Moving continuously in a rhythm. These activities make you breathe harder and make your heart beat faster. Examples include running, jumping rope, swimming, dancing, and biking.
   b. Muscle-strengthening: Making muscles work harder than usual. Includes climbing, tug-of-war, lifting weights, and push-ups.
   c. Bone-strengthening: This could be either aerobic or muscle-strengthening activity. It is when we move our bones against the force of gravity. Examples include running, jumping rope, basketball, tennis, and weight-lifting.
   d. Balance and stretching: Enhance physical stability and flexibility, which reduces risk of injuries. Examples are gentle stretching, dancing, yoga, martial arts, and t’ai chi.

18. Slide 18: Intensity of Physical Activity
   a. The guidelines tell us that most of our 60 minutes of physical activity each day should be moderate or vigorous in intensity.
   b. Moderate-intensity activities include biking, hiking, rollerblading, and brisk walking.
   c. Vigorous-intensity activities include running, jumping rope, and sports like soccer, hockey, basketball, swimming, and tennis.

19. Slide 19: So What Happens When...
   a. Ask the students: So what can happen when our “energy in” does not equal our “energy out?” Answer: We either gain or lose weight.

20. Slide 20: How Weight Loss Happens
   a. If we consistently take in fewer calories than we use, over time we will lose weight.

21. Slide 21: How Weight Gain Happens
   a. If we consistently take in more energy than we use, over time we will gain weight.
   b. (Optional discussion) If a person ate an average of 200 extra calories every day, how much weight would they gain in a year? 200 calories is about one 20-ounce bottle of soda. Let’s figure out how much weight we would gain if we drank an extra soda every day for a year.
   c. Do the math: 200 calories x 365 days in a year = 73,000 calories. There are 3,500 calories in 1 pound. So 73,000 calories divided by 3,500 calories = 20 pounds of weight gained by the end of the year.

22. Slide 22: To Maintain Weight: Maintain Energy Balance
   a. Ask the students: How can we maintain energy balance? “Energy in” must equal “energy out.”
b. Ask the students: Where does the “Energy In” come from? Our foods and beverages. Remember to choose nutrient-dense foods to make sure you are getting all of your nutrients, but not getting too many calories.

c. Ask the students: Where does the “Energy Out” come from? The energy we need to live, digest foods, and perform activities through the day.

23. Slide 24: Maintaining Energy Balance
   a. What can we do to tip the scale in the right direction to maintain energy balance? There are a few simple shifts we can make to balance the scale.
   b. Energy In
      i. Most of the calories we consume should be from nutrient-dense foods that provide calories along with important nutrients like vitamins, minerals, and fiber.
      ii. We want to limit the amount of “empty” calories we consume from foods that are high in solid fats or added sugars and low in other nutrients.
      iii. We should be mindful of our portion sizes, especially for foods that contain empty calories.
   c. Energy Out
      i. Physical activity is the one factor that we have the most control over on the “Energy Out” part of the equation.
      ii. Make sure to stay active and aim for 60 minutes of physical activity daily.

24. Slide 23: Activities
   a. How Much Do I Need? Distribute copies of the handout. Read directions and explain to students that they will be estimating the amount of calories they need daily based on their activity level. Remind students that this is just an estimate, and they can find personalized recommendations on ChooseMyPlate.gov.
   b. Plan a Menu for a Day: Distribute copies of the handout (or copy double-sided with “How Much Do I Need” worksheet). Read directions and explain to students that they will be planning a menu for a day based on the calorie level and MyPlate amounts they determined on the “How Much Do I Need?” handout.

25. Alternate Activity: Plan a Menu for the Day using SuperTracker
   a. Have students determine their personalized calorie needs using the SuperTracker tool from Choose MyPlate.
      i. Go to choosemyplate.gov and click on the link for SuperTracker.
      ii. Have students create a profile. Optional: they may register by creating a username and password so that they can log into their profile in the future.
      iii. Have students view their personalized plan to see how many calories and the amounts from each food group they need per day.
   b. Distribute copies of “Plan a Menu for a Day” worksheet to students and have them enter their calorie needs and food group amounts from their SuperTracker plan.
   c. Have students complete the worksheet by choosing foods to meet their needs.
d. After choosing foods on the worksheet, have students enter the foods using the Food Tracker tool from SuperTracker to check that their menu meets their calorie needs. Students may adjust their plan as needed to meet their needs.

e. Additional follow-up ideas using SuperTracker
   i. Have students use the Food-a-Pedia tool on SuperTracker to look up the calorie content of their favorite foods.
   ii. Have students keep a food record for a length of time (determined by the instructor), and then enter their record using the Food Tracker tool. Have students compare their intake to their plan.
   iii. In addition to recording the foods they eat, students can also track their activity using the Physical Activity Tracker tool. Students can compare the physical activity they did to their recommendation.

26. Slide 25: Questions

A. Conclusion

1. Review take-away messages from lesson.
   a. Ask students to explain the concept of energy balance.
      i. In order to maintain energy balance, “energy in” must equal “energy out.”
      ii. Maintaining energy balance is important to maintaining a healthy body weight.
   b. Ask students to list and explain the nutrients that provide energy.
      i. Carbohydrates, protein, and fat provide energy for our bodies.
      ii. We should focus on nutrient dense foods and limit empty calorie foods.
   c. Ask student to explain the importance of physical activity.
      i. We should incorporate physical activity to stay healthy and balance energy intake.

2. Distribute hand wipes.

3. Provide each student with a food tasting and encourage him or her to make small changes in his or her diet now. Explain why the food is a healthy option.

4. Distribute the reinforcement, read the message and/or explain the reason why they are receiving the reinforcement.

5. Distribute Ten Tips Fact Sheet (or other appropriate fact sheet) and encourage students to share it with their families.

6. Thank the students for their participation and answer any question they may have.
Energy Balance

Directions: Answer the following questions as the instructor presents the slides. The instructor will review the correct answers at the end of the presentation.

1. What provides energy for our bodies? ____________________

2. How is energy in food measured? ________________

3. What 3 different nutrients provide us with energy?
   ____________________  ____________________  ____________________

4. What are the three different ways our bodies use energy?
   ____________________  ____________________  ____________________

5. Match the ways we use energy in the left column to the description in the right column (draw a line to connect them):
   
   Basal Metabolism  Needed for digestion
   Physical Activity  To stay alive
   Thermic Effect of Food  Needed for muscular work


   ___________________________________________________________________
   ___________________________________________________________________

7. Why is physical activity important?

   ___________________________________________________________________
   ___________________________________________________________________

8. Explain how weight gain happens

   ___________________________________________________________________
   ___________________________________________________________________

9. We should choose _______________-dense foods more often and try to consume less ________________ calories.
Energy Balance- KEY

Directions: Answer the following questions as the instructor presents the slides. The instructor will review the correct answers at the end of the presentation.

1. What provides energy for our bodies? **Food and beverages**

2. How is energy in food measured? **Calories**

3. What 3 different nutrients provide us with energy?
   - Carbohydrates
   - Protein
   - Fat

4. What are the three different ways our bodies use energy?
   - Basal Metabolism
   - Physical Activity
   - Thermic Effect of Food

5. Match the ways we use energy in the left column to the description in the right column (draw a line to connect them):
   - Basal Metabolism: Needed for digestion
   - Physical Activity: To stay alive
   - Thermic Effect of Food: Needed for muscular work

6. Describe “Energy Balance”
   **Energy balance occurs when Energy In and Energy out are equal**

7. Why is physical activity important?
   - Physical activity can help to balance energy intake and can keep your body healthy.
   - A lack of physical activity can increase risk for certain disease such as heart disease and diabetes.

8. Explain how weight gain happens
   **Weight gain happens when Energy In is greater than Energy Out**

9. We should choose nutrient-dense foods more often and try to consume less empty calories.
How Much Do I Need?

Name ___________________________________________________ Date _______________

**Directions:** Read the descriptions of the activity levels below and decide which one best describes you. Then look at the chart to see how many calories you need daily based on your activity level.

**Sedentary:** Doing only the light physical activity associated with typical day-to-day life, such as taking a shower, getting dressed, and taking the bus to school. Example: Someone who sits most of the day doing activities such as riding in a bus or car, watching TV, playing video games, or using a computer.

**Moderately Active:** Doing physical activity equivalent to walking 1.5 to 3 miles a day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life. Example: Someone who bikes for half an hour a day but doesn’t break a sweat.

**Active:** Doing physical activity equivalent to walking more than 3 miles a day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life. Example: Someone on a basketball team.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Sedentary</th>
<th>Moderately Active</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>14-18</td>
<td>1800 calories</td>
<td>2000 calories</td>
<td>2400 calories</td>
</tr>
<tr>
<td>Male</td>
<td>14-18</td>
<td>2000-2400 calories</td>
<td>2400-2800 calories</td>
<td>2800-3200 calories</td>
</tr>
</tbody>
</table>

*Males: use the lower end of the range if you are younger and use the upper end of the range if you are older

My daily calorie needs:_______________________

**Directions:** Now look at the chart below to see how much you need from each food group based on your calorie level. Circle the row with the amounts that you need.

<table>
<thead>
<tr>
<th>Calories</th>
<th>Grains</th>
<th>Vegetables</th>
<th>Fruit</th>
<th>Dairy</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>1800</td>
<td>6 ounces</td>
<td>2.5 cups</td>
<td>1.5 cups</td>
<td>3 cups</td>
<td>5 ounces</td>
</tr>
<tr>
<td>2000</td>
<td>6 ounces</td>
<td>2 ½ cups</td>
<td>2 cups</td>
<td>3 cups</td>
<td>5 ½ ounces</td>
</tr>
<tr>
<td>2200</td>
<td>7 ounces</td>
<td>3 cups</td>
<td>2 cups</td>
<td>3 cups</td>
<td>6 ounces</td>
</tr>
<tr>
<td>2400</td>
<td>8 ounces</td>
<td>3 cups</td>
<td>2 cups</td>
<td>3 cups</td>
<td>6 ½ ounces</td>
</tr>
<tr>
<td>2600</td>
<td>9 ounces</td>
<td>3 ½ cups</td>
<td>2 cups</td>
<td>3 cups</td>
<td>6 ½ ounces</td>
</tr>
<tr>
<td>2800</td>
<td>10 ounces</td>
<td>3 ½ cups</td>
<td>2 ½ cups</td>
<td>3 cups</td>
<td>7 ounces</td>
</tr>
<tr>
<td>3000</td>
<td>10 ounces</td>
<td>4 cups</td>
<td>2 ½ cups</td>
<td>3 cups</td>
<td>7 ounces</td>
</tr>
<tr>
<td>3200</td>
<td>10 ounces</td>
<td>4 cups</td>
<td>2 ½ cups</td>
<td>3 cups</td>
<td>7 ounces</td>
</tr>
</tbody>
</table>

MyPlate Amounts by Calorie Level

**EAT RIGHT NOW!**

**Funded by the Pennsylvania (PA) Department of Human Services (DHS) through PA Nutrition Education Tracks, a part of USDA’s Supplemental Nutrition Assistance Program (SNAP). To find out how SNAP can help you buy healthy foods, contact the DHS toll-free Helpline at 800-692-7462 or 215-430-0656. USDA is an equal opportunity provider and employer.**
Plan a Menu for a Day

Name ___________________________________________ Date _____________

Directions: Using the “How Much Do I Need” worksheet or your personalized plan from SuperTracker, fill in the number of calories you need daily and the number of servings you need from each food group (or use the standard amount for 2000 calories). Then, in the second table check (✓) off the foods you would eat in order to meet the needs listed in the first table. If you want a larger portion than what is listed, use more than one check (✓) mark. For example if you need to use 2 slices of bread for a sandwich, put two ✓ next to bread.

<table>
<thead>
<tr>
<th>Calories</th>
<th>Grains</th>
<th>Vegetables</th>
<th>Fruit</th>
<th>Dairy</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>6  oz.</td>
<td>2 ½ cups</td>
<td>2 cups</td>
<td>3 cups</td>
<td>5 ½ oz.</td>
</tr>
</tbody>
</table>

### Grains
- 1 slice whole-wheat toast (1 oz. eq.)
- 5 whole-wheat crackers (1 oz. eq.)
- 1 slice white bread (1 oz. eq.)
- 1 slice of whole-wheat bread (1 oz. eq.)
- 1 cup of whole-grain cereal (1 oz. eq.)
- ½ cup brown rice (1 oz. eq.)
- 1 cup of noodles (2 oz. eq.)
- 1 a hamburger bun (2 oz. eq.)
- 3 cups of popcorn (1 oz. eq.)

### Vegetables
- 6 baby carrots (½ cup eq.)
- 1 large ear of corn (1 cup eq.)
- 1 medium baked potato (1 cup eq.)
- 1 cup cooked greens (1 cup eq.)
- 3 broccoli spears (1 cup eq.)
- 1 large sweet potato (1 cup eq.)
- ½ cup vegetable juice (½ cup eq.)
- 1 cup chopped lettuce (½ cup eq.)

### Fruit
- 1 small apple (1 cup eq.)
- 1 large orange (1 cup eq.)
- 1 cup of canned peaches (1 cup eq.)
- 1 cup 100% orange juice (1 cup eq.)
- 1 small wedge of watermelon (1 cup eq.)
- 1 medium wedge of cantaloupe (½ cup eq.)
- 1 small boxes of raisins (½ cup eq.)

### Dairy
- ½ cup low fat cottage cheese (¼ cup eq.)
- 1 cup fat free milk (1 cup eq.)
- 2 oz. of low fat American cheese (1 cup eq.)
- 1 ½ oz of cheddar cheese (1 cup eq.)
- 1 ½ cup of light ice cream (1 cup eq.)
- 1 cup of low fat yogurt (½ cup eq.)
- 1 cup of 1% milk or 2% milk (1 cup eq.)

### Protein
- 1 oz nuts (2 oz. eq.)
- 1 cup split pea soup (2 oz. eq.)
- 1 small chicken breast half (3 oz. eq.)
- 1 small lean hamburger (3 oz. eq.)
- 1 egg (1 oz. eq.)
- 1 tablespoon peanut butter (1 oz. eq.)
- ¼ cup of black beans (1 oz. eq.)
- 1 sandwich slice of turkey (1 oz. eq.)