Understanding Energy Balance

I. Nutrition Education Objectives:
   Goal 1: Students will comprehend concepts consistent with USDA guidance related to eating and physical activity for good health.
   
   Objective: As a result of Pennsylvania’s SNAP-Ed plan, student will know, understand, analyze and apply concepts, as developmentally appropriate, that are consistent with USDA guidance about the benefits of:
   1. Balancing calorie intake with calories expended.
   2. Being physically active every day as part of a healthy lifestyle.

   Goal 2: Students will apply skills consistent with USDA guidance related to eating and physical activity for good health.
   
   Objective: As a result of Pennsylvania’s SNAP-Ed plan, students will be able to:
   1. Assess personal health practices.

II. Pennsylvania Educational Standards:
   A. 2.5 Mathematical Problem Solving and Communication
   B. 10.1 Concepts of Health
   C. 10.2 Healthful Living
   D. 10.4 Physical Activity
   E. 11.3 Food Science and Nutrition

III. Outcomes:
   A. Students will discuss the relationship among energy intake, energy expenditure and body weight.
   B. Students will explain the importance of aiming for a healthy weight.
   C. Students will identify health concerns related to sedentary lifestyles.
   D. Students will state at least two benefits of daily physical activity.

IV. Materials:
   A. Laptop/Projector with PowerPoint presentation
   B. Handouts: “How much do I need?” & “Plan a Menu for a Day”
   C. Optional handout: “Energy Balance” fill in the blanks worksheet
   D. Food Tasting
   E. Reinforcement that conveys the appropriate nutrition message
   F. Caregiver newsletter: Physical Activity
   G. Hand Wipes
   H. Extension lessons for the teacher
V. Procedure:
   A. Introductory:
      1. Introduction of nutrition educator and lesson being presented
      2. Review of last lesson, if applicable
      3. Brief introduction about the lesson and its importance to high school students
         Today we will be discussing energy balance. Does anyone know what that means? Why do you think it might be important to balance our energy?
   
   B. Developmental:
      1. Slide 1: Energy Balance
      2. Slide 2: Project Sponsors
      3. Slide 3: Basic Maintenance Check
         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. In fact, it is a lot harder to take care of our body then to take care of a car. There are probably some people that actually take better care of their car then they take care of themselves.
      4. Slide 4: How Do I GET Energy?
         a. Like a car, our bodies need fuel. What provides fuel, or energy, for our bodies? Discuss student responses.
         b. Food provides energy for our bodies. How do we measure energy in our food? (Calories) What in food is actually providing calories? Discuss student responses, provide clues if necessary
         c. There are three types of nutrients that provide calories: carbohydrates, protein, and fat.
      5. Slide 5: How Do I USE Energy?
         a. How do our bodies use the energy we get from food? Discuss student answers and display the categories as students mention them.
         b. There are three different ways our body uses energy:
            • Basal Metabolism: We often just call this metabolism. This is the energy that is needed to stay alive even when we are not moving. What do our bodies do that requires energy even when we are lying down or sleeping? (Pumping blood, breathing, brain thinking)
            • Physical Activity: This is the energy that we burn when we are moving our bodies on purpose. Usually we only think of burning energy when we exercise, but this includes all basic movements. Even when you stand up you are using energy for physical activity.
            • Thermic Effect of Food: This is the energy needed to digest food. It actually takes our bodies a small amount of energy to digest and absorb the nutrients from food. REMEMBER: Eating does not count as exercise or physical activity.
         a. “Energy In” is the calories that we take in from the food and drinks we consume.
         b. “Energy Out” is the calories that we use for the three categories that we just discussed.
c. 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 intake needs to be equal to our energy output.
d. What do you think happens when the “energy in” is heavier or greater than the “energy out”? (weight gain)
e. What do you think happens if the “energy out” is heavier or greater? (weight loss)
f. How can we stay in “Energy Balance”? What are factors that we can control?
   • Energy In: Make healthy food choices to stay within our daily calorie limit
   • Energy Out: Balance our energy intake with physical activity

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. Most of the calories we consume should be from nutrient-dense foods that provide calories along with important nutrients like vitamins, minerals, and fiber. 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.

8. Slide 8: Carbohydrates
   a. Carbohydrates are one of the nutrients in food that provide calories. There are two types of carbohydrates. Does anyone know what they are?
   b. 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.
   c. 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.
   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. Not all fat is bad. We need some 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 food that have saturated fat are dairy products, fatty meats, and fast food. This is 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: Estimated Calorie Needs
   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 then 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.
      - 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.
      - 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.
      - If you are active then you might play a sport in school and go to practice everyday. Or maybe you play basketball with a group of friends every day.
   d. Ask students: How can someone who is sedentary get more physical activity?

12. Slide 12: A Typical Day?
   a. This a sample meal plan of all the foods a person might eat in a day.
   b. Ask students: Does this seem like a reasonable amount of food? What kind of person do you think might need this amount of food? How many calories do you think this person consumed that day?
   c. The foods listed here add up to 2000 calories. For high school students, this is the amount that a moderately active female or a sedentary male might need.

   a. Now let’s talk about “energy out” since we now have an idea of how many calories we need.

14. Slide 14: How Do I Use Energy?
   a. As we discussed earlier there are 3 different ways we use energy:
      - 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.
      - 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.
      - 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.

15. **Slide 15: Why is Physical Activity Important?**
   a. *Ask students:* Why is physical activity important?
   b. Being physically active can help you:
      - Increase your chances of living longer
      - Feel better about yourself
      - Decrease your chances of becoming depressed
      - Sleep well at night
      - Move around more easily
      - Have stronger muscles and bones
      - Stay at or get to a healthy weight
      - Be with friends or meet new people
      - Enjoy yourself and have fun

16. **Slide 16: 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. When you are not physically active, you are more likely to:
      - Get heart disease
      - Get type 2 diabetes
      - Have high blood pressure
      - Have high blood cholesterol
      - Have a stroke

17. **Slide 17: 2008 Physical Activity Guidelines for Americans**
   a. You are probably wondering how much exercise you need to maintain energy balance. The 2008 Physical Activity Guidelines provide recommendations to follow for how much and what kind of physical activity you should be doing each day. These are the recommendations for teenagers:
   b. Get at least 60 minutes of physical activity each day
   c. Most of it should be either moderate or vigorous intensity aerobic activity
   d. Try to include muscle-strengthening activity on 3 days of the week and bone-strengthening activity on 3 days of the week

18. **Slide 18: 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.

19. **Slide 19: 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.

20. **Slide 20: So What Happens When…**
   a. *Ask the students:* So what can happen when our energy in does not equal our energy out? We either gain or lose weight.
   b. *Ask the students:* How can we maintain energy balance? Choose nutrient-dense calorie sources and balance food intake with physical activity.

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)* In the US, Americans consume an average of 200 extra calories every day. That 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: Activities**
   a. How Much Do I Need? Distribute copies handout. Read directions and explain to students that they will be figuring out how many 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 handout. 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.

VI. Conclusion of lesson:
   A. Distribute hand wipes.
   B. 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.
   C. Distribute the reinforcement, read the message and/or explain the reason why they are getting the reinforcement.
   D. Distribute caregiver newsletter.
   E. Thank the students for their participation and answer any questions the students may have.

VII. Extension Lessons:
   A. Keeping the Balance
   B. Hidden Fat
   C. Make Your Calories Count

Drexel University, HS Energy Balance Lesson Plan, revised 7/14, Page 6
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>

*Funded by the Pennsylvania (PA) Department of Human Services (DHS) through
PA Nutrition Education Tracts, 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 215-430-0558. USDA
is an equal opportunity provider and employer.

Drexel University, HS Energy Balance Lesson Plan, revised 7/14, Page 7
**Plan a Menu for a Day**

**Name ___________________________________________ Date ___________**

**Directions:** Using the “How Much Do I Need” worksheet, fill in how many calories you need daily and how much 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 slice 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 ounces</td>
<td>2 ½ cups</td>
<td>2 cups</td>
<td>3 cups</td>
<td>5 ½ ounces</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grains</th>
<th>Vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>1 slice whole-wheat toast (1 oz. eq.)</td>
<td>6 baby carrots* (½ cup eq.)</td>
</tr>
<tr>
<td>5 whole-wheat crackers* (1 oz. eq.)</td>
<td>1 large ear of corn (1 cup eq.)</td>
</tr>
<tr>
<td>1 slice white bread (1 oz. eq.)</td>
<td>1 medium baked potato (1 cup eq.)</td>
</tr>
<tr>
<td>1 slice of whole-wheat bread (1 oz. eq.)</td>
<td>1 cup cooked greens* (1 cup eq.)</td>
</tr>
<tr>
<td>1 cup of whole-grain cereal* (1 oz. eq.)</td>
<td>3 broccoli spears* (1 cup eq.)</td>
</tr>
<tr>
<td>½ cup brown rice (1 oz. eq.)</td>
<td>1 large sweet potato* (½ cup eq.)</td>
</tr>
<tr>
<td>1 cup of noodles (2 oz. eq.)</td>
<td>½ cup vegetable juice (½ cup eq.)</td>
</tr>
<tr>
<td>1 a hamburger bun (2 oz. eq.)</td>
<td>1 cup chopped lettuce (½ cup eq.)</td>
</tr>
<tr>
<td>3 cups of popcorn (1 oz. eq.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Dairy</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>1 small apple (1 cup eq.)</td>
<td>½ cup low fat cottage cheese (¼ cup eq.)</td>
</tr>
<tr>
<td>1 large orange (1 cup eq.)</td>
<td>1 cup fat free milk (1 cup eq.)</td>
</tr>
<tr>
<td>1 cup of canned peaches (1 cup eq.)</td>
<td>2 oz. of low fat American cheese (1 cup eq.)</td>
</tr>
<tr>
<td>1 cup 100% orange juice (1 cup eq.)</td>
<td>1 ½ oz of cheddar cheese (1 cup eq.)</td>
</tr>
<tr>
<td>1 small wedge of watermelon (1 cup eq.)</td>
<td>1 ½ cup of light ice cream (1 cup eq.)</td>
</tr>
<tr>
<td>1 medium wedge of cantaloupe (½ cup eq.)</td>
<td>1 cup of low fat yogurt (½ cup eq.)</td>
</tr>
<tr>
<td>1 small boxes of raisins (½ cup eq.)</td>
<td>1 cup of 1% milk or 2% milk (1 cup eq.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______</td>
</tr>
<tr>
<td>1 oz nuts (2 oz. eq.)</td>
</tr>
<tr>
<td>1 cup split pea soup (2 oz. eq.)</td>
</tr>
<tr>
<td>1 small chicken breast half (3 oz. eq.)</td>
</tr>
<tr>
<td>1 small lean hamburger (3 oz. eq.)</td>
</tr>
<tr>
<td>1 egg (1 oz. eq.)</td>
</tr>
<tr>
<td>1 tablespoon peanut butter (1 oz. eq.)</td>
</tr>
<tr>
<td>¼ cup of black beans (1 oz. eq.)</td>
</tr>
<tr>
<td>1 slice of turkey (1 oz. eq.)</td>
</tr>
</tbody>
</table>

EAT. RIGHT. NOW.

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Energy Balance

Circle or fill in the best answer 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
   - Physical Activity
   - Thermic Effect of Food
   
   - Needed for digestion
   - To stay alive
   - Needed for muscular work

6. Describe “Energy Balance”
   ___________________________________________________________________
   ___________________________________________________________________

7. We should choose _______________-dense foods more often and try to consume less _______________ calories.

8. Why is physical activity important?
   ___________________________________________________________________
   ___________________________________________________________________

9. Explain how weight gain happens
   ___________________________________________________________________