



Energy Balance

4th – 5th Grade Lesson

Goal: Students will understand the concept of energy balance and be able to apply it to their own lives.

Objectives:

1. Students will be able to define “calorie” as a unit that describes the measurement of energy.
2. Students will be able to explain that people get energy from their food and use that energy on activities to stay alive and be active.
3. Students will be able to explain that you have to balance energy in with energy out to maintain a healthy weight.

Materials Needed

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| <input type="checkbox"/> MyPlate | <input type="checkbox"/> Energy balance scale pictures |
| <input type="checkbox"/> McDonald’s dinner picture | <input type="checkbox"/> 1lb fat block |
| <input type="checkbox"/> Measuring height picture | <input type="checkbox"/> Foods for energy balance activity |
| <input type="checkbox"/> Scale picture | <input type="checkbox"/> Hand sanitizer |
| <input type="checkbox"/> Measuring cups and spoons picture | <input type="checkbox"/> Student handouts |
| <input type="checkbox"/> Nutrition labels | <input type="checkbox"/> Parent handouts |
| <input type="checkbox"/> Energy out slides | <input type="checkbox"/> Optional materials: measuring tape, cereal and water for measuring demonstration. |
| <input type="checkbox"/> Who will burn more calories pictures | |

Lesson	
Talking Points	Materials/Activities/Notes
Review	
<ul style="list-style-type: none"> Who remembers what we talked about last time I was here? Who can tell me a food that you ate this past week? What food group is it in? What nutrient superheroes are found in it? 	Review whatever topics were covered before.
Mind Grabber	
<ul style="list-style-type: none"> Has anyone ever eaten a meal that looks like this? Most of us have. How many calories do you think are in this meal? There are 1260 calories in this one meal! That’s a lot! The average person only needs about 2000 calories a day. That’s more than half of the calories you need in just one meal! Today, we are going to talk about calories, how many our bodies need, and what we do with extra calories. 	Show students the McDonald’s meal picture.
Discussion	
<ul style="list-style-type: none"> We just talked about how this meal has 1260 calories in it, but can anybody tell me what a calorie is? A calorie is a unit of measurement kind of like when you measure weight or length, only a calorie is a unit of measurement of energy. A unit describes 	Show students the McDonald’s meal picture.

how much of something you measure. It gives a name to what you are measuring.

- For example, what units do you use to describe how tall you are? Inches, feet, centimeters, etc. And we can use this device to measure height. It's called a stadiometer (but you don't need to know that!)
- If you want to know how much you weigh, what device do you use and what units do you use to describe how much you weigh? Pounds, ounces, grams, tons, etc.
- If you are measuring out some milk or cereal, what instruments and units do you use? Cups, spoons, teaspoons, tablespoons, etc.
- We use all sorts of instruments and units to measure different things in our lives. We've already talked about how food gives our bodies energy and there is a way we can measure how much energy food gives our bodies. A calorie is the way we measure energy in food. When you hear a food contains 100 calories, it's a way of describing how much energy your body could get from eating or drinking it. The instrument we use to measure the energy in food is called a calorimeter. A calorimeter measures the amount of calories in a food by burning the food. Luckily, we don't have to have a calorimeter at home to know how much energy is in the food we eat – we just have to look at the nutrition label. Take a look at these two nutrition labels. See where the calories are listed. Which food gives us more energy if we eat it?
- Are calories bad for you? No – your body needs calories for energy, but eating too many calories and not burning enough of them off through activity, can lead to weight gain.
- Most foods and drinks contain calories. Some foods have few calories and some foods have a lot of calories.
- There are three nutrient superheroes that provide our bodies with energy – Captain Carbohydrate, PowerProtein, and FatCat. Vitamins and minerals don't give our bodies energy.
 - Captain Carbohydrate and PowerProtein both give us four calories per gram and FatCat gives us nine calories per gram.
 - If we know how many grams of each of these nutrients are found in a food, then we can figure out how many calories are in the food. Let's practice.
- Now that we know all about calories, let's talk about energy balance. One of the reasons people eat food is because it gives them energy.
- What is energy? It is a source of power that we can use. It make us able to do work.
 - Can we see energy? No! Well, if we can't see it, how do we know it is there? We can see the action that uses the energy – if we are walking or moving we know that we have energy.
 - Where do we get the energy we need? That's right –from food!
- We measure the energy we get from our food in calories. We call that **Energy In** because it is energy going into our bodies.
- We can also measure the energy we use in exercise and other activities of daily living in calories. We call that **Energy Out** because it is energy going out of our bodies.
- When we talk about energy balance, we're looking at the relationship between Energy In and Energy Out.

Show picture of stadiometer (height measuring device).
Optional activity – have students practice measuring height with a tape measure against a wall.

Show picture of scale.

Show picture of measuring cups and spoons.
Optional activity – practice by having a volunteer measure a cup or tablespoon of water or cereal.

Show students two nutrition labels – one for pretzels and one for a candy bar.

Practice figuring out how many calories are in a food using the pretzels or candy bar nutrition label used previously.

Energy In

- Let's talk about Energy In first. Different foods give us different amounts of energy or calories.
 - Lower calorie foods give us small amounts of energy. In which food groups do you think we would find lower calorie foods? They include vegetables and fruits, low fat dairy products, and some grains without a lot of added fat and sugar. Who can think of an example of a lower calorie food?
 - Higher calorie foods give us large amounts of calories. They include foods that are high in fat and/or sugar. What are some examples of higher calorie foods? Fried foods, nuts, seeds, candy, cake, cookies...

Show Energy In slide.

Energy Out

- Now let's talk about Energy Out. We use energy for many things: walking, running, breathing, digesting our food, keeping our heart beating. There are three things that make up Energy Out:
 1. Activities of Daily Living: Your body needs energy just to stay alive for activities like digesting food, breathing, and heartbeat. Each of us burns a certain amount of calories (energy) every day, whatever we do, even when we are sleeping. Each of us needs a certain amount of energy just to stay alive. Just staying alive uses about half of the energy we get from food.
 2. Growing: Children your age also need some energy just to keep growing.
 3. Exercise: Exercise (also known as physical activity) is another way we burn calories or use energy. Changing how much we exercise is the only way we can make easy changes to the energy we spend.
- Energy out includes all these activities: breathing + digestion + heart beat + growing + exercise. Our bodies use energy to do ALL of these things!
- How much energy we burn depends on our body size and composition – larger, more muscular people burn calories faster than smaller, less muscular people. No two people are quite the same.

Show students "Energy Out slides" as you discuss each point.

Show students "Who will burn more calories" pictures and have them determine who will burn more calories.

Energy Balance

- When we get the same amount of energy (calories) from our food as we use for activities to stay alive, grow, and exercise – **Energy In = Energy Out** – our weight stays the same.
- When we get more energy or calories from our food than we use in everything we do, when $\text{Energy In} > \text{Energy Out}$, our bodies store extra energy as body fat and we gain weight.
- When we get less energy from our food than we use for everything we do, when $\text{Energy out} > \text{Energy In}$, we lose some of our body fat and we lose weight.
- Now, let's examine how eating and activity are related.

Demonstrate energy balance using your arms like a scale, scale pictures, or energy balance slides.

Show students the 1lb fat block; demonstrate energy in vs. energy out using your arms like a scale, scale pictures, or energy balance slides.

Energy Balance Activity

Option 1—Eating and physical activity for the whole class

- Let's have a couple of baby carrots (or grapes). Each one gives us about 4 calories, so each of us is eating 8 calories in total.
- Now let's think about how we can spend those 8 calories. But, remember that all of these numbers are estimates—each of us burns calories at different

Have students use sanitizer or wipes and give each student 2 baby carrots (or two grapes).

rates: larger people and those who are more muscular burn calories faster; those who are smaller or less muscular burn calories more slowly. Some of the energy from the carrots will go to support your basal metabolism, but we're just going to look at the activity that you can do to spend the energy or calories from the carrots

- We can do any of the following activities to burn off the 8 calories from the carrots. What would you all like to do? We can:
 - Walk slowly for a little over 3 minutes
 - Dance for about 2 minutes
 - Run in place for a little more than 1 minute.
 - Jump rope for almost 1 minute
- Instead of carrots, now let's try something that is the same color as a carrot and just as crunchy—Hot Cheetos. What is the difference between a carrot and a Hot Cheeto? A carrot is a vegetable in its natural state, and it has vitamins and minerals. A Hot Cheeto is fried corn flour with flavoring and coloring—high in fat with very few vitamins or minerals.
- One other difference between carrots and Hot Cheetos is the energy they contain. While each baby carrot has about 4 Calories, each Hot Cheeto has about 8. Remember that foods high in fat and/or sugar are generally higher Calorie foods. Our two Hot Cheetos, which are high in fat, will give us 16 Calories.
 - To burn up all the energy in our two Hot Cheetos, we will need to exercise twice as long as we did for the carrots. We'll have to run in place for about two minutes and 20 seconds to burn all the energy in just two Hot Cheetos. Let's get started.
 - Suppose you eat a small package of Hot Cheetos that gives you 170 Calories. How long would you have to run in place to use up all that energy? You would have to run for about 24 minutes. If you were just walking, it would take you about 68 minutes or over 1 hour!
- Finally let's try something that has a lot of fat AND sugar—a chocolate kiss. Even though it is small, it has 22 Calories. You may eat it, but only if you're willing to exercise it off. You will have to run in place for about 2 minutes and 45 seconds to use up those 22 Calories.

Option 2—Volunteers eating and doing physical activity

- To save time, instead of having the whole class eat and exercise, ask for volunteers to choose food to eat. Then have them exercise to use up the energy from the food. Have small amounts of several of the foods listed below (some higher calorie and some lower calorie), and know how much activity it will take to burn all of the calories. Preferably choose several volunteers of different sizes and shapes, and make the point that each will burn calories at different rates. Remind students that the numbers that we are giving them are only estimates or averages. All volunteers can eat their foods at the same time. Then all can start to exercise at the same time. You can keep track of the time, stopping the person who ate the lowest calorie food first, then the person with the medium calorie food, finally the one who ate the highest calorie food. After each volunteer has had the opportunity to eat and exercise off their food, ask the class what they observed about the relationship between the food eaten and the exercise. Be sure that these points are covered:
 - Foods have different amounts of calories. Those like carrots that are

Give each student 2 Hot Cheetos.

Show student a snack-sized package of Hot Cheetos.

If time is short, let students who want to eat the candy and run do so while wrapping up the class.

near their natural states are usually lower in calories while those with lots of added fat and/or sugar like Hot Cheetos and candy bars are usually higher calorie foods.

- Higher calorie foods require more physical activity to burn off than lower calorie foods. You saw this when you had to run twice as long to burn off the Hot Cheetos as you did to burn off the carrots, and almost 3 times as long to burn off the candy Kiss than the carrots.
- The amount of calories you burn by being active varies by the type of activity you do and the intensity of the activity. Intensity describes how fast you move or how hard you work at the activity. The higher the intensity (faster, harder activities), the more Calories you burn.
- If you want to change your weight, you can either change the amount of energy you get by eating different foods or change the amount of energy you spend by doing more or less physically active things each day. The most effective way to change your weight is to change both eating and activity. For example, if a person wants to weigh less, that person can eat fewer calories by choosing lower calorie foods and burn more calories by exercising more.

Option 3—Calculating energy balance

- Looking at Energy In and Energy Out on paper, remember that your body uses energy in three ways: basic body processes like digesting food, heartbeat, and breathing; growth; and physical activity. The one that we can change easily is how much physical activity we do.
- Today we will look at some snack foods and consider how much physical activity we would have to do to use up or burn off all of the energy in each snack.

Option 4 – Burning off a meal

- Using the McDonald’s dinner picture, have students calculate how long they would have to do certain activities to burn off the entire meal. Split the class into 4-5 groups. Have each group calculate how long it would take to burn off the McDonald’s dinner using the following information and then share with the rest of the class:
 - Running (10 min = 100 calories)
 - Soccer (20 min = 120 calories)
 - Jump rope (10 min = 40 calories)
 - Walking (15 min = 60 calories)
 - Watching TV (1 hr = 60 calories)

Review

- What have we learned from doing all of this eating and exercising?
 - Foods have different amounts of calories. Those like carrots that are near their natural states are usually lower in calories while those with added fat and/or sugar like Hot Cheetos and candy bars are usually higher calorie foods.
 - Higher calorie foods require more physical activity to burn off than lower calorie foods. You saw this when you had to run twice as long to burn off the Hot Cheetos as you did to burn off the carrots, and about 3 times as long to burn off the candy bar than the carrots. (Or, you saw this when you practiced on paper with different foods and activities.)
 - The amount of calories you burn by being active varies by the type of activity you do and how long you do it.

Use the handout “Balancing Food and Activity: An Energy Balance Exercise” to work through this option.

- If you want to change your weight, you can either change the amount of energy you get by eating different foods or change the amount of energy you spend by doing more or less physically active things each day. The most effective way to change your weight is to change both eating and activity. For example, if a person wants to weigh less, that person can eat fewer calories by choosing lower calorie foods and burn more calories by exercising more.
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Wrap-Up

- Now let's go back to basics before our time together is over and be sure you remember a few important things.
 - What unit do we use to describe the measurement of energy? (calorie)
 - Where do we get the energy our bodies need to do all the things we need to do each day? (from our food)
 - How do we spend the energy we get from our food? (growth, basal metabolism—breathing, heartbeat, digestion, etc.—and physical activity)
 - What happens if we get more energy from our food (Energy In) than we spend (Energy Out)? (We store it as body fat.)
- If we don't want to store body fat, what can we change about our Energy In and Energy Out? (We can eat less food or lower calorie foods and/or exercise longer or more intensely.)

Challenge

- We you go home tonight, teach someone in your family or one of your friends about energy balance. Be sure to tell them about the energy you get from food and how you spend it on activity. You can use your "Balancing Food and Activity" handout to practice with them if you want to be a really good teacher. I'll ask you about how this went next time we're together.
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Taste Test Ideas

- N/A: Carrots, Hot Cheetos, and chocolate can be the taste test.

Student Handouts

- Energy Balance Notes Page (and key)
- Balancing Food and Activity
- My Energy Balance
- Dinner Calorie Math (and key)
- Energy Balance Word Search (and key)
- Energy Balance Quiz

Parent Handouts

- Today in Nutrition Class...Energy Balance (English & Spanish)
- Eat & Move in Balance (English & Spanish)
- Energy Balance Parent Handout (English & Spanish)
- 10 Tips – Be a Healthy Role Model (English & Spanish)

Lesson Roadmap

- Review
- Mind Grabber
- Discussion
 - What's a calorie?
 - Units of measurement
 - Energy In
 - Energy Out
 - Energy Balance
- Energy Balance Activity
- Wrap Up
- Challenge



Public Health

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