

## Lesson: Physiology of Shoveling (and Other Heart-pounding Exercise) - Outdoors

**7th Grade Colorado Academic Standard 2.2: The human body is composed of atoms, molecules, cells, tissues, organs, and organ systems that have specific functions and interactions.**

---

**FEO 2.2b: Students can develop, communicate and justify an evidence-based scientific explanation regarding the functions and interactions of the human body.** Students can develop, communicate, and justify the changes that occur to their respiration rate, breathing rate, heart rate, and perspiration rate through measuring these variables in their own body.

---

**Vocab: cardiovascular system, pulmonary system, digestive system, heart, arteries, arterioles, venules, veins, muscles, beats per minute, oxygen, carbon dioxide, cellular respiration, exergonic, perspiration.**

**Brief Lesson Description:** In this lesson, students will learn about the changes induced in their bodies due to aerobic and anaerobic exercise and then test these changes in a real life setting in lab groups by measuring heart rate, breathing rate, perspiration rate, and respiration rate.

**Performance expectations:** Students will be expected to gather information on their lab test subjects to form conclusions about how our bodies change during exercise.

**Specific learning outcomes:** Students will be able to explain the function of the heart, lungs, sweat glands, muscles, and how their output responds to the demands of exercise.

### Supplies:

TK journals

Handouts

Timers- at least 25

25 scales

Cotton balls

Candy as incentives

**Introduce yourself: What is Trails 2000?**

**Build, plan, and maintain trails on Municipal, BLM, National Forest, and private lands. We also educate trail users, and encourage connectivity on road, path, and trail. I am here to educate you guys! But today we are not going to be learning about trails, but about our bodies, and the change that they go through when we use trails and do trail work.**

### Lesson Plan

#### ENGAGE

- **What is the most important organ system in the body?**
  - Gather answers, ask for reasons why they think that.
  - Push them a little more

## Lesson: Physiology of Shoveling (and Other Heart-pounding Exercise) - Outdoors

- **Why not the kidneys or excretory system?** They filter your blood, make sure you don't get dehydrated or overhydrated.
- **What about the digestive system?** They break down and absorb food which gives you nutrients to power your body. That could be the most important!

### EXPLAIN: concepts and vocabulary

- All organ systems really work together to form a comprehensive body that functions together.
  - Some organs really are the fundamental powerhouses, though. Some make it so that others can exist and do their job and their output can be changed quickly, and that's what we will talk about later. Some, if not working, have an immediate effect on your life if they are NOT working (Draw on board a pic of the human bod and then fill in organs as we go)
    - They are: **Nervous** and **cardiovascular** systems: **What do they consist of?**
      - **Brain, spinal cord, nerves, lungs, heart, arteries, veins, arterioles, venules, capillaries.**
    - What do they DO: **brain controls a lot of our organs, and tells the heart to beat**
      - **Heart pumps oxygen, nutrients, hormones, and other things around our body that our organs NEED.**
    - We are going to be focusing on changes that the **cardiovascular system** undergoes today! As well as two other systems that I will have you guess in a moment.
      - Because these systems are what we will be using on the day that we do trail work and exercise more than anything.
  - Before we dive into these organ systems, we need to understand **cellular respiration**:
    - Cellular respiration is the process in which our body's cells takes sugar and changes it into usable energy using oxygen inside of a cell. It is **exergonic**, which means it releases heat!
    - The equation is:



- Simplified for our sake, it is:

Sugar + oxygen → carbon dioxide + energy for work + heat

- Now, let's put our thinking caps on.
  - Some of these inputs and outputs in this equation must not only get into the body and into a cell, but out of a cell and out of the body

## Lesson: Physiology of Shoveling (and Other Heart-pounding Exercise) - Outdoors

- This is where organ systems come in.
  - How do we get sugar into our bodies?
    - **Digestive system:** breaks down complex sugars
    - **Cardiovascular system:** heart pumps the sugar from the stomach and small intestine
  - What about oxygen?
    - **Pulmonary: Lungs** expand to pull in **oxygen**
    - **Cardiovascular: oxygen** gets transferred to the blood and pumped throughout the body by the **heart**
  - What about getting carbon dioxide out?
    - **Cardiovascular:** carbon dioxide gets pumped away from the body
    - **Pulmonary:** carbon dioxide is breathed out!
  - What about getting heat out?
    - **Exocrine system:** sweat glands that produce sweat- evaporative processes cause the body to dissipate heat.
  - And lastly, what gets energy out?
    - This is a trick question...
    - Every system! They all need energy to work
- What happens when the body's need for **oxygen** and **sugar** goes up? What would that be called? Exercise! Or just movement that's above **homeostasis** or resting.
  - What happens to our:
    - Heart?
    - Lungs?
    - sweat?
 ...when exercising??
    - All of these rise!
  - What happens when we run out of sugar from our digestive system? We bonk. Not fun people.
  - Now, we are going to get into groups outside and measure this! Through these variables:
    - Heart rate
    - Lungs
    - Temperature
    - Perspiration

### ELABORATE: applications and extensions

- How do we monitor our exercise?
  - Go above a certain BPM and you could be using too much sugar. This could lead to bonk-ing, or running out of your caloric storage in your liver. Know what will push you too hard to bonk.

**EVALUATE:** Hand out the experiment sheet, tools, and assist in the experiment. Kids will answer questions.