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# TEACHER GUIDE

## HUMAN BODY SYSTEMS
## GRADES 3-5

## COMMON MISCONCEPTIONS

- **Human body systems work independently of each other.**
  Students don't realize that body systems all interact in order to make us able to function. Students often study each body system separately without learning how they're all connected.

- **When one human body system is working the others are not.**
  Students don't realize that all body systems are constantly working. This may be related to the idea that body systems work independently of each other. However, they need to know that when one system is not functioning properly it impacts the other systems.

## HUMAN BODY SYSTEMS

The human body is made of eleven different body systems. The video focuses on the circulatory, digestive, respiratory, muscular, and nervous systems. In general, each system is made of cells, tissues, and organs. The organs within each system interact with each other to keep the body alive and maintain homeostasis. Homeostasis is the process of maintaining a constant internal environment in the body despite changes that occur in the external environment. Each system has specific functions - for example, the nervous system directly controls the action of specific organs in the body. But all systems are interconnected and dependent on one another. This idea of interconnectedness is illustrated throughout the video. An example of this is when Dr. Jeff discusses how the circulatory and respiratory system function to circulate oxygenated (and deoxygenated) blood throughout the body.

## RESPIRATORY SYSTEM

All living things must breathe in order to live. This is because they must use oxygen, which is essential to life. The respiratory system has a primary function, which is to have the body breathe in (or inhale) air containing oxygen and breathe out (or exhale) air containing carbon dioxide. Carbon dioxide is a type of waste produced by cells in the body. Oxygen is essential for life and survival. When a person inhales air it enters the body through the nose and mouth. After the air travels through the airways it is carried into the lungs. The lungs are the sites where fresh oxygen is exchanged with carbon dioxide in the blood. This oxygen is transported through the blood so that it can be sent to the rest of the body. Cells use oxygen to create much needed energy for the body.

## CIRCULATORY SYSTEM

The primary function of the circulatory system is to provide the body with oxygen and nutrients that are transported in the blood. It is composed of the heart and blood vessels. The blood vessels consist of arteries, veins, and capillaries. Arteries take blood away from the heart so that the blood can be sent to the organs and tissues of the body. Veins return blood to the heart. Capillaries are the smallest of all three blood vessels, and they form a network that ensures blood is circulated throughout the tissues and organs in the body.

The heart is the essential organ of the circulatory system. As a muscle, it pumps blood throughout the body - this is its main function. A person's heart rate ranges from 60 to 100 beats per minute, but it can go faster when needed. How fast a person's heart rate is will depend on the needs of the body. For example, while sitting on a couch, just enough blood is pumped to ensure enough oxygen is provided while at rest. If a person is jogging, the heart rate increases to deliver more oxygen to the body.

## DIGESTIVE SYSTEM

This consists of a series of organs that work together to help convert food into energy. It consists of several different organs that collectively make up the gastrointestinal tract. This system is important because the body relies on nutrients from food in order to stay healthy and function properly. The process of digestion consists of five different stages. By the time food makes its way through the final stage, the body has absorbed enough nutrients that can be used for energy, growth, and cell repair.

## MUSCULAR SYSTEM

The muscular system's primary function is to generate body movement. This movement is completed with the help of the skeletal bones and muscles in the body. The system also helps with other bodily functions such as breathing, posture, and regulating body temperature. There are three types of muscle in the body – skeletal, smooth, and cardiac. The skeletal muscle is a type of voluntary muscle that is attached to the bones of the body. When they contract, this allows the bones to move. For example, when a person bends their arm, the bicep muscle contracts and the tricep muscle relaxes. This action allows the bones in the arm to move so that the person can bend the arm. Both smooth and cardiac muscle are under involuntary conscious control.

## NERVOUS SYSTEM

The nervous system is made of many cells called neurons. These cells transmit information in the form of electrical signals throughout the body. This form of signaling allows the body to interact with the external environment, and it helps control many mechanisms that take place inside the body. For example, the reaction a person feels from touching a hot plate occurs because the brain communicates with the external environment using special signals and nerves. The primary function of the nervous system is to directly control the function of various organs in the body. This system is made of the brain and spinal cord along with other organs. In general, the system is divided into two different forms: central nervous system (CNS) and peripheral nervous system (PNS). The CNS is the command center of the body. It functions to organize and analyze information. The purpose of the PNS is to follow the commands of the CNS. Consider the earlier example about a person touching a hot plate. The CNS organizes and analyzes the information it receives about the sense of touching something hot. It interprets this information and instructs the PNS to transmit signals that will have the person remove their hand from the hot plate.