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The Interconnected Systems of the Human Body

Students collaborate to reach a working definition of what counts as a system, using examples from everyday life. Students learn how the human body is organized into systems of multiple interacting subsystems through an infographic.

GRADES

5 - 8

SUBJECTS

Biology, Health

CONTENTS

1 PDF, 1 Resource

OVERVIEW

Students collaborate to reach a working definition of what counts as a system, using examples from everyday life. Students learn how the human body is organized into systems of multiple interacting subsystems through an infographic.

For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/interconnected-systems-human-body/

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DIRECTIONS

This activity is part of the Misunderstood Microbes unit.

1. Prompt students to briefly review their Human Body Microbial Maps and the class *Know and Need to Know* chart from the *Introduction to Microbes and Human Body Systems* activity to activate their previous ideas.

- Ask students to share one or two of the body systems shown on their maps with another set of partners.
- Lead a class discussion to elicit and discuss a few student ideas about how the body system is organized.
    - Ideas to listen for: There are multiple systems of the human body that perform different functions necessary for survival; those systems are composed of cells that form tissues and tissues that form organs.
    - Then review some of the questions that students generated in the *Need to Know* column of the class *Know & Need to Know* chart, which will likely include questions related to how the body is structured.
    - If following the *Misunderstood Microbes* unit, explain that before students can continue to address the unit's Driving Question (*Which microbes should we protect or eradicate to keep our bodies healthy?)*, they will need to learn more about the human body and how it is organized, which is the focus of the next two activities.

2. Lead a brainstorm discussion to reach a working definition of systems.

- Spark student thinking about systems by asking how the school is a system: *What are the inputs, outputs, what happens when it breaks down?* Elicit other ideas about systems in students' lives.
- Pass out the *Organization and Structure of the Human Body* infographic and ask students to talk with a partner about how our bodies are also systems.
- Ask: *What do all these systems have in common?*
- Prompt students to come to a common working definition of system that addresses these commonalities. If needed, build on this definition: collection of items or organisms that are linked and related, functioning as a whole.

3. Students use the *Organization and Structure of the Human Body* infographic to understand how the body is organized.

- Hand out the Human Body Organization Tracker. Have students work in pairs to complete the tracker as they refer to the infographic.
- Then have students revise their Human Body Microbial Maps in their original small groups, to reflect on their learning, and add in new understanding about body systems.
- Encourage students to draw from what they just learned about the structure of the human body as a system as they change or add more details to the body systems already on their maps. Prompt them to also add in other systems they had not considered.

4. Students collaboratively brainstorm and model different examples of how body systems rely on all levels of organization to function.

- Present an example scenario and its impacts on a body system: Describe what would happen if someone who has a peanut allergy unintentionally ingests peanuts. Elicit from students what system they think may be affected (immune system).
- Draw or use a model (similar to this one) that illustrates what happens when a person has an allergic reaction and describe the process using the information below. As you do so, have students keep track of the different levels of organization (cells, tissues, organs, and systems) that react or are impacted.
    - Cells in the immune system first identify the allergen (peanuts, in this case) as an invader. In response, the cells start overreacting by producing antibodies to fight off the invader. These antibodies travel to cells in other body systems that release chemicals, causing a widespread allergic reaction. This reaction usually causes symptoms in the nose, lungs, throat, sinuses, ears, lining of the stomach, or on the skin. Symptoms may include: increased mucus production, swelling of skin and muscles, drop in blood pressure, hives on the skin, constriction of airways, nausea.
    - Giving a dose of epinephrine (the main chemical in an epi-pen, which students may have heard of or even have one of their own) treats an allergic reaction across body systems by tightening the blood vessels to decrease swelling and increase blood pressure, increase heart rate, and relax muscles around airways.
    - Ask students: *What could happen after administering epinephrine if one component of the body system didn't work?* (Suggested response: The allergic reaction could continue, causing severe bodily distress, or even death.)

- Break up the class into four groups. Depending on your class size, the groups can be divided further into smaller groups of three to four students.

- As you modeled with the allergic reaction example, have each group determine and describe the cascading events that can result when something goes wrong with one of the body systems listed below (aligns with those introduced on the *Organization and Structure of the Human Body* infographic).

    - Digestive System
    - Respiratory System
    - Nervous System
    - Integumentary (skin/hair/nails) System

- Prompt groups to use markers and chart paper to create a diagram showing their ideas about how body systems rely on all levels of organization to function.

5. Students review and critique classmates' ideas about body systems as they present their models.

- Have each group present about their focal body system and how that system relies on all levels of the organization to function.
- After each presentation, prompt audience members to give feedback by praising new and interesting ideas, as well as asking clarifying questions about inaccurate ideas or representations on their peers' models.
    - Model for students how to ask clarifying questions that are grounded in the content of a group's ideas rather than the presentation or depiction on their model.
    - Emphasize that feedback should be helpful, specific, and kind.

Provide time for groups to come back together to review and address the questions posed to them by their classmates.

Tip

Step 5: Read about the benefits of peer critique and strategies for supporting students in providing helpful and kind feedback.

Informal Assessment

Keep track of students' ideas about body systems and organization that surface through the opening and debrief discussions, so that you can use and leverage their ideas in subsequent activities.

OBJECTIVES

Subjects & Disciplines

Biology

- Health

Learning Objectives

Students will:

- Apply their understanding of the human body's structural organization by revising their Human Body Microbial Maps (from the Introduction to Microbes and the Human Body activity).

Teaching Approach

- Project-based learning

Teaching Methods

- Cooperative learning
- Discussions
- Multimedia instruction

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Information, Media, and Technology Skills
    - Information, Communications, and Technology Literacy
  - Learning and Innovation Skills
    - Critical Thinking and Problem Solving
- Science and Engineering Practices

- Developing and using models
- Obtaining, evaluating, and communicating information

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **CCSS.ELA-LITERACY.SL.7.1:**
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

NEXT GENERATION SCIENCE STANDARDS

• **MS. From Molecules to Organisms: Structures and Processes:**
MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Preparation

What You'll Need

REQUIRED TECHNOLOGY

- Internet Access: Optional
- Tech Setup: 1 computer per classroom, Color printer, Projector

PHYSICAL SPACE

- Classroom

GROUPING

- Large-group instruction
- Large-group learning
- Small-group learning

OTHER NOTES

This activity uses a full-color infographic; if color printing isn't an option, students can access the infographic online. Alternatively, you could project the infographic for all students to view.

RESOURCES PROVIDED: HANDOUTS & WORKSHEETS

- Human Body Organization Tracker

RESOURCES PROVIDED: IMAGES

- The Organization and Structure of the Human Body

BACKGROUND & VOCABULARY

Background Information

The human body is structured into levels of interrelated systems, which the body relies on to function. From the smallest level, it is organized into cells, tissues, organs, and larger systems. As such, it is a key example of a system: a collection of items or organisms that are linked and related, functioning as a whole. When something goes wrong with one part of a body system, it has cascading effects throughout the whole system and human body.

Prior Knowledge

["Organisms process and react to different types of information received through their senses"]

Recommended Prior Activities

- Introduction to Microbes and Human Body Systems
- Microbes Across the Tree of Life

Vocabulary

Term	Part of Speech	Definition
allergen	*noun*	substance (such as pollen) that induces a negative bodily reaction, such as sneezing, wheezing, itching, or difficulty breathing.
allergic	*adjective*	having a consistent, unusual, negative reaction to a substance.

Term	Part of Speech	Definition
allergy	*noun*	sensitivity to a specific substance (such as pollen) which causes a negative bodily reaction, such as sneezing, wheezing, itching or difficulty breathing.
digestive system	*noun*	series of organs and glands responsible for the ingestion, digestion, and absorption of food. Also called the alimentary canal.
immune system	*noun*	network of chemicals and organs that protects the body from disease.
integumentary system	*noun*	set of organs that form the external covering of the body and protects it from many threats such as infection (in humans, this includes skin).
interaction	*noun*	relationship between two or more forces, objects, or organisms.
nervous system	*noun*	cells, organs, and tissues including the brain and spine that respond to internal and external stimuli.
organ	*noun*	group of tissues that perform a specialized task.
respiratory system	*noun*	system where oxygen is taken into the body and an exchange of oxygen and carbon dioxide takes place; in humans consisting especially of the nose and lungs.
subsystem	*noun*	system that is part of a larger system.
symptom	*noun*	sign or indication of something.
system	*noun*	collection of items or organisms that are linked and related, functioning as a whole.
tissue	*noun*	cells that form a specific function in a living organism.

For Further Exploration

Video

- Amoeba Sisters: Human Body Systems Functions Overview: The 11 Champions

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