What's Gonna Work? Teamwork! How Organ Systems Work Together

Unit	Utah SEEd Standard / NGSS Performance Expectation	Estimated Lesson Time:
7.3.3	Construct an explanation using evidence to explain how body systems have various levels of organization. Emphasize that cells form tissues, tissues form organs, and organs form systems specialized for particular body functions. Examples could include relationships between the circulatory, excretory, digestive, respiratory, muscular, skeletal, or nervous systems.	**45 minutes**

LESSON OVERVIEW

Learning Objective:

Students can explain how various organ systems interact to meet the organism's needs.

Anchor Phenomenon

Video of an excavator arm in motion, performing various tasks. https://www.youtube.com/watch?v=jJK7pjiJE8c

Driving Question(s)

How are the systems that allow the excavator arm to function related to the systems that allow a human arm to function?

Lesson Level Performance Expectations (

Students will **construct an explanation** comparing the **structure and function** of an excavator and a human arm, showing how the **systems work together to perform specific tasks.**

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LESSON SNAPSHOT

LESSON SUMMARY:

	Estimated Time	Section Overview	How are students answering the driving question or meeting the learning objectives? (Highlight SEPs, DCIs, and CCCs)
Experience the Phenomenon		https://www.youtube.com/watch?v=jJK7pjiJE8c	Students are exploring how excavators work and perform a function
Investigate the Phenomenon		Jigsaw Activity: Groups will read an article on an assigned organ system to learn about its structures (organs) and functions. They will prepare a short presentation to share with the other groups.	Students are learning about the various organ systems in the body, their anatomy, and their functions.
Model the Phenomenon		Each group will outline a human figure and use it to model their assigned diagram, explaining how the system's structure enables it to function and perform its role in the human body. Complete a model of a human body, and compare it to the systems of the excavator. Muscular system and rams in red, skeletal system and frame in orange, nervous system and controls in purple, digestive system and engine in green.	Students are comparing the parts of the human body to those of an excavator and how these parts work together to perform a function.

DISCIPLINARY CORE IDEAS	SCIENCE & ENGINEERING PRACTICES	CROSSCUTTING CONCEPTS
NGSS Appendix E All living things are made up of cells. In organisms, cells work together to form tissues and organs that are specialized for particular body functions.	NGSS Appendix F Construct an explanation using models or representations. Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real world phenomena, examples, or events.	NGSS Appendix G Students model complex and microscopic structures and systems and visualize how their function depends on the shapes, composition, and relationships among its parts. They analyze many complex natural and designed structures and systems to determine how they function. They design structures to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.
This lesson could be one in a series of lessons building toward the following Performance Expectation: Students will develop an explanation of how the structure and function of organ systems interact to enable an organism to function.		
Related knowledge and skills from prior grades		

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Disciplinary Core Idea: NGSS Appendix E Organisms have both internal and external macroscopic structures that allow for growth, survival, behavior, and reproduction.	Science and Engineering Practices NGSS Appendix F Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard).	Crosscutting Concept: NGSS Appendix G Students learn different materials have different substructures, which can sometimes be observed, and substructures have shapes and parts that serve functions.

Materials

Link to all materials on the 3DRST website (3drst.byu.edu): https://3drst.byu.edu/7th-7-3-3-body-systems
Link to all materials on Canvas Commons:

Student Materials	Teacher Materials	Lab Materials/Other Resources
Per student: Body System Student Sheet Per group: Articles on organ systems 1 copy of a human outline printed on tracing paper Checklist for activity	Body Systems Teacher Slides Body Systems Rubric Diagram of Excavaor and Person	Tracing paper Colored markers Diagram of Excavator and Person (attached)

Lesson Preparation

Material Preparation:
4 – 36-inch sheets of tracing paper or tissue (if the class period is less than 60 minutes, it is suggested that the teacher trace the body outline before class)
Per student:
Body System Student Sheet

Per group:
Articles on organ systems. (attached)
4 copies of human outline printed on tracing paper
Permanent markers (different colors for each system)
Checklist for activity

Required Previous Knowledge:
Students will build on their knowledge of body systems that work together to help the body function properly.
Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

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Supports students will need/adaptations:
Group students heterogeneously to ensure that students of all reading levels understand the reading on the different body systems.

Vocabulary Definitions:
System: A group of interacting parts that work together to achieve a goal or function
Organ: A group of tissues that work together to perform a specific function.

EXPERIENCE THE PHENOMENON/PROBLEM (ENGAGE)

What Students Are Doing
Students will watch the video and make observations about the moving parts, what causes them to move, and how they work together. After the video, students will use their own arm to pick up, move, and then set their pencil back down.
What Teachers Are Doing
The teacher will play 1-2 minutes of the video. Any 1-2 minutes in the video should work. The teacher will then direct the students to pick up their pencil, move it, and set it back down.

INVESTIGATE THE PHENOMENON (EXPLORE)

What Students Are Doing	Teacher Tips
Students will be divided into groups. Each group will read an article on their assigned organ system. As the students read the articles, they will fill out their worksheet, identifying the function and organs of the system. Students will follow the checklist for the jigsaw activity. Each group reads one of the following articles: Digestive Systems Nervous System Skeletal System Muscular System Each group will outline a human figure and use it to model their assigned diagram, explaining how the structure of the system allows it to function and complete its role in the human body. The students will outline the human figure based on a student or a provided outline. Each group will draw the organs of their system on their tracing paper.	Walk around to each group and make sure that all students are participating in the exploration. If needed, assign jobs for each student, such as having one student focus on the organs. Depending on the class, you can assign groups to an organ system. **Depending on class time, you may want to have outlines prepared – in our experience, tracing took a long time.** **Option for larger classes:** After each group has completed their research, students will break into smaller groups to teach about their system and

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After the groups have had time to conduct their research, each group will come to the front of the class and present their system. Works best to have all group members come and present. Complete a model of an excavator and human body, comparing the structure and function of each system. Each organ system and part of the excavator should be color-coded to show similar systems. For example: Muscular system and pistons in red. Skeletal system and frame in yellow/orange. Nervous system and controls in purple/blue. Digestive system and motor in green.	learn about the other systems. For example, students within a group of four that are working on the skeletal system are assigned a number 1-4, and all 1's go to this group, and so on. Each new group should have a member from the skeletal, nervous, muscular, and digestive systems. **For this section, it would be good to have a time limit. We recommend about 7 minutes.**
What Teachers Are Doing	**Teacher Tips**
The teacher is observing all the groups and clarifying any misunderstandings.	As support for students, teachers can simplify or repeat the parts and functions of each organ system as groups present.

MODEL THE PHENOMENON (EXPLAIN)	
What Students Are Doing	**Teacher Tips**
Students will participate in a discussion on how one organ system cannot function independently. They will examine just the frame of the excavator and discuss what would be needed for it to move. (Optionally, you can discuss another system on the excavator, like the engine) Students will then answer the questions about how all four systems work together to make the excavator move and function. They will then discuss how the human body can move due to the organ systems working together. On the back of the worksheet, students will answer the first question about the excavator not working and why, both on the paper and on a sticky note. The students will move up to the whiteboard and group their reasoning. (Now would be a great time to clarify any misconceptions.) After clarifying misconceptions, they will answer the final question of the worksheet.	Lead a discussion about how the systems work together – Compare the human systems working together to the parts of the excavator working together. "What does this system do? How does it move?" "Could it move without help from another system?" Show the video again to help students fully integrate the ideas.
What Teachers Are Doing	**Teacher Tips**
The teacher is observing all the groups and clarifying any misunderstandings.	When students are explaining how the four systems work together, cue them to use all four parts or organ systems in their explanation.

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POSSIBLE EXTENSIONS/ALTERNATIVE ADAPTATIONS

Students could research another machine, such as a robotic hand, and identify the four systems associated with it (skeletal, muscular, digestive, and nervous). Students could also determine if there are organ systems that might relate to the machine (such as the circulatory or respiratory system). This video demonstrates a robotic arm that could aid in discussion: https://www.youtube.com/watch?v=N-_1nxhkiKQ.

Alternatively, ask students to come up with an idea of another object that they could use to model these systems and how they work together.

This lesson was created by Brindy Grange, Megan Sitterud, Denver Smith, and Parker Peterson

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