

## Lesson Title: Organ Systems

### Foundation 7: Science Content Knowledge & Inquiry Skills

#### Science Grade 7

Arkansas Science Curriculum Framework
<b>Nature of Science—Life Science</b> Standard 1: Characteristics and Processes of Science Students shall demonstrate and apply knowledge of the characteristics and processes of science using appropriate safety procedures, equipment, and technology.
LS.2.7.6—Identify human body systems: nervous, digestive, circulatory, respiratory, excretory, integumentary, skeletal/muscular, endocrine, reproductive LS.2.7.8—Investigate functions of human body systems LS.2.7.9—Describe interactions between major organ systems LS.2.7.10—Investigate careers, scientists, and historical breakthroughs related to life systems
<b>Scientific and Engineering Practices (NRC Framework)</b> 1. Asking questions (for science) and defining problems (for engineering) 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information

#### Materials

- notebook paper for creating a T-chart
- Engage Movie
- *Body System* Power Point presentation
- Project Power Point Template
- chart paper
- sticky notes
- stopwatch or other timing device
- *How Fast Can You Recover?* Student Project Page, Data Collection Sheet, and Rubric and Scoring Sheet
- Teacher selected websites on each body system or <http://at.glenview34.org/webresources/science/bodysystems.htm>
- *Body Systems* Student Project Page, Information Collection Grid, and Rubric and Scoring Sheet
- *Medical Technology* Activity Sheet from *Science Readers: Life Science*
- music for exercising
- speakers to play music during exercise

# Teacher Created Materials

P U B L I S H I N G

- student access to computers/laptops (one per group of 3–4), needs to include Microsoft Excel and Internet access
- miscellaneous art supplies: markers, tape, cups, pipe cleaners, yarn, craft sticks, stapler, glue
- *Investigating the Human Body* quiz

## **Background Information**

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Organisms are made up of cells that work together to make up tissues. These specialized tissues work together to make up organs, and the organs work together to make up organ systems. The organ systems are those such as the respiratory, endocrine, skeletal, circulatory, muscular, integumentary, nervous, excretory, and reproductive system. Each organ system has vital organs that are a major part of its function. Overall, the organ systems work together for an organism to survive.

In this lesson, students will learn the cells, tissues, and organs that make up various organ systems. Students will also learn the function of the organ systems. Students will measure and record the function of their circulatory system and respiratory systems at rest and after exercising. They will apply their knowledge of body systems to design a device to assist a person with a disability.

## **Essential Question**

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How do your body systems work together to help your body perform everyday functions?

## **Learning Objectives**

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Students will understand the following:

1. Identify the major body systems.
2. Identify functions of these body systems.
3. Identify major organs of these body systems.
4. Describe how cells, tissues, and organs are related to body systems.
5. Measure and calculate heart and respiratory rates in order to understand the circulatory and respiratory system.

## **Phase One: Engage the Learner**

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These activities mentally engage students with an event or question. Engagement activities capture students' interest and help them to make connections with what they know and can do. The teacher provides an orientation to the unit and assesses students' prior understanding of the concepts addressed in the unit.

In this section, students participate in a discussion about the body systems and learn about how the systems work together to provide your body with fuel.

## **Procedures**

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1. Distribute a sticky note to each student.

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2. Show a quick video of people doing sports/exercise activities.  
Ask students the following questions and have them put their responses on sticky notes:
  - *What do these activities all have in common?*
  - *What body systems are the people using in the video?*
3. Post their response sticky notes on the chart paper.
4. As a whole class, discuss student responses to see if any students were able to make connections to the lesson topic. Tell students today they are going to learn about how our body systems work together to provide our body fuel.

## **Phase Two: Explore the Concept**

Students encounter hands-on experiences in which they explore the concept further. They receive little explanation and few terms at this point, because they are to define the problem or phenomenon in their own words. The purpose at this stage of the model is for students to acquire a common set of experiences from which they can draw upon to make sense of the concept.

Students must spend significant time during this stage of the model talking about their experiences, both to articulate their own understanding and to understand another's viewpoint. In this section, students focus on the respiratory and circulatory systems and conduct a study to determine their own heart rates.

## **Procedures**

1. Ask students the following: What happens to your body when you exercise? Why do you think your heart beats faster? Do you think it is good for your heart to beat faster when you exercise? Why or why not? How can a person tell if they are in good “shape?” Do you think an elite athlete’s heart rate is faster or slower than an average person’s heart rate at rest? What about if they are both doing the same exercise?
2. Review cardiovascular system facts with students. Explain to students that the better shape a person is in, the less their heart works to maintain a given activity level. An athlete’s heart rate is much lower at rest than the average person’s heart rate. An athlete’s heart rate will recover faster after exercise.
3. Read the *How Fast Can You Recover?* Project Page to students. Explain that they will record their data on the *How Fast Can You Recover?* Data Collection Sheet and then transfer it to *Microsoft Excel* template. Then, review the criteria on the *How Fast Can you Recover?* Rubric and Scoring Sheet
4. Teach the students how to measure their heart rate by taking their pulse. Either from their wrist (radial artery) or their neck (carotid artery), they should count the beats for 15 sec then multiply by 4 to calculate the beats per min (BPM).
5. Have students exercise vigorously for 10 minutes. In the classroom, have students spread out and dance to a favorite song. Or do an outdoor activity, such a brisk jog. After the 10 minutes, students should take their pulse again. Students will need to take the first time point pulse rate immediately upon stopping.
6. Then, have students continue taking their pulse for the listed time points, recording their data on the *How Fast Can You Recover?* Data Collection Sheet.

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7. Next, students should transfer the heart rate data to the *Microsoft Excel* template, and design spreadsheet formulas to convert the rates to beats/minute. They can compare these values to the ones they previously calculated by hand on the data collection sheet.
8. Students should then create a chart in the spreadsheet to show the recovery rate over time and insert at least three pictures that are related to the topic from clipart.
5. Finally, students should write an explanation of their formulas and what made their heart rate increase and then decrease. See the *Microsoft Excel How Fast Can You Recover?* spreadsheet example for clarification.
9. **Formative Assessment:** Have students evaluate themselves using the *How Fast Can You Recover?* Rubric and Scoring Sheet. Then use the rubric to evaluate students' spreadsheets. Check for misconceptions in the students' explanations of their formulas and what caused their heart rate to increase and then decrease.

## Phase Three: Explain the concept and define terms

Only after students have explored the concept are the students provided with the scientific explanation and terms for what they are studying. The teacher may present the concepts via lecture, demonstration, reading, or multimedia (video, computer-based). Students then use the terms to describe what they have experienced, and they begin to examine mentally how this explanation fits with what they already know.

In this section, students work in small groups to learn more in-depth information about the organ systems, and design posters to display in the class for the duration of this unit.

## Procedures

1. Break students into groups of 3.
2. Assign each group a different system from below:
  - a. Cardiovascular System
  - b. Respiratory System
  - c. Digestive System
  - d. Urinary System
  - e. Skeletal System
  - f. Muscular System
  - g. Nervous System
  - h. The Endocrine System
  - i. The Reproductive System
  - j. Immune System
  - k. Lymphatic System
  - l. Integumentary System
3. Students will research their body system by using teacher approved websites.
4. Provide students with the *Body Systems* Student Project Page and *Body Systems* Information Data Collection Grid. Explain to students that they will work in small groups to research one body system, which will be assigned to them. They will need to learn about the body system's function and explain why this system is essential to body function and cannot be eliminated as per the *Body System* Student Project describes. They will record the information they collect on the *Body Systems* Information Collection Grid.

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5. With their researched information they will create a four slide power point presentation pleading their case, explaining why this particular system cannot be eliminated.
6. Have students read the *Body Systems* Student Project Page in their small groups.
7. Discuss with students the project criteria. Review the *Body Systems* Rubric and Scoring Sheet. The power point slides should include the following:
  - a. Name of the system
  - b. Functions of the system
  - c. Reasons why the system cannot be eliminated
  - d. A diagram of the system
8. Students may use the text from the website article to complete the project. They may also need to conduct additional research. Make sure each group has a working laptop with internet access.
9. Allow students at least 30 minutes to work in their groups.
10. Have students share designs via student presentations as display in the room or as presentations.
11. **Formative Assessment:** Have students evaluate themselves using the *Body System* Rubric and Scoring Sheet. Then, use the rubric to evaluate students' spreadsheets. Check for misconceptions in the students' explanations of their formulas and what caused their heart rate to increase and then decrease.

## **Phase Four: Elaborate the Concept**

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Students elaborate on their understanding of the concept. They are given opportunities to apply the concept in unique situations, or they are given related ideas to explore and explain using the information and experiences they have accumulated so far. Interaction between the students is essential during the elaboration stage. By discussing their ideas with others, students can construct a deeper understanding of the concepts.

In this section, students will use the information learned about each system and discuss and elaborate about the system if it becomes disabled. They will use their creativity to design a device to assist the body with a disability.

## **Procedures**

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1. The human body systems are very commonly to a machine. Discuss this analogy. List the different systems identified in the website articles. Use the research groups of students already established for this activity. Ask the class if they have ever known anyone with a disability, discuss briefly.
2. Distribute the *Medical Technology* Activity Sheet to students. Read the information together.

3. Complete an example as a class model. One might be a student whose hands were burned in a fire and who has trouble writing. The technology device may be a glove programmed to help a student form letters and numbers correctly. Develop a possible illustration on the board. Which body system would this device serve? How would it work?
4. Allow time for students to complete their own devices and to share their ideas with the class. If available, students can use supplies such as: cups, pipe cleaners, yarn, craft sticks, etc. to create a model of their device. They can then create an advertising poster for it, including a “how-to” guide for its use.
5. Display the students’ work during a mini classroom expo.
6. **Formative Assessment:** Evaluate students’ explanations of their devices to identify misconceptions or gaps in understanding of how body systems work together.

## **Phase Five: Evaluate students’ Understanding of Concept**

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The final stage of the model has a dual purpose. It is designed for the students to continue to elaborate on their understanding and to evaluate what they know now and what they have yet to figure out. Evaluation of student understanding should take place throughout all phases of the instructional model. The evaluate stage, however, is when the teacher determines the extent to which students have developed a meaningful understanding of the concept.

In this section, students examine the Essential Question of the lesson and reflect on their learning.

## **Procedures**

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1. Discuss the Essential Question with students: How do your body systems work together to help your body perform everyday functions?

## **Assessment**

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2. Have students complete the *Investigating the Human Body Reader Quiz*.