LESSON PLAN

Body Systems

Teacher Notes:

SC State Standards:

4-2.3-- Explain how humans and other animals use their senses and sensory organs to detect signals from the environment and how their behaviors are influenced by these signals.

7-3.1-- Summarize the levels of structural organization within the human body (including cells, tissues, organs, and systems).
7-3.2-- Recall the major organs of the human body and their functions within their particular body system
7-3.3-- Summarize the relationships of the major body systems (including the circulatory, respiratory, digestive, excretory, nervous, muscular, and skeletal systems).

Common Core Literacy Standards:

CCSS.ELA-Literacy.RST.6-8.1-- Cite specific textual evidence to support analysis of science and technical texts.
CCSS.ELA-Literacy.RST.6-8.2-- Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
CCSS.ELA-Literacy.RST.6-8.3-- Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
CCSS.ELA-Literacy.RST.6-8.4-- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics*.
CCSS.ELA-Literacy.RST.6-8.7-- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
CCSS.ELA-Literacy.RST.6-8.8-- Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

CCSS.ELA-Literacy.RST.6-8.9-- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

CCSS.ELA-Literacy.RST.9-10.1-- Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
CCSS.ELA-Literacy.RST.9-10.3-- Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

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CCSS.ELA-Literacy.RST.9-10.4-- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.
CCSS.ELA-Literacy.RST.9-10.8-- Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

CCSS.ELA-Literacy.RST.11-12.3-- Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCSS.ELA-Literacy.RST.11-12.4-- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.
CCSS.ELA-Literacy.RST.11-12.7-- Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CCSS.ELA-Literacy.RST.11-12.8-- Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCSS.ELA-Literacy.RST.11-12.9-- Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Common Core Mathematics Standards:

CCSS.Math.Content.4.MD.A.1-- Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*

CCSS.Math.Content.4.MD.A.2-- Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

CCSS.Math.Content.5.MD.A.1-- Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

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CCSS.Math.Content.6.EE.C.9-- Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.

CCSS.Math.Content.7.EE.A.1-- Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
CCSS.Math.Content.7.EE.A.2-- Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."*
CCSS.Math.Content.7.RP.A.2b-- Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

CCSS.Math.Content.HSN-Q.A.1-- Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
CCSS.Math.Content.HSN-Q.A.2-- Define appropriate quantities for the purpose of descriptive modeling.
CCSS.Math.Content.HSN-Q.A.3-- Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Timing:

Approximately 30-45 minutes of data collection at ***WonderWorks***.

Target Classes:

- Elementary School – Life Science, specially 4th grade
- Middle School – Life Science, specially 7th grade

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Summary of the Activity:

This unit was designed as a compilation of three separate activities providing the teacher with the option of incorporating one, two, or all three into their body systems unit of instruction. The intention is for the teacher to introduce the basics of the content or skills in question prior to attending the field trip at Wonderworks (see below). Then, when the students are at WonderWorks, they complete the data collection portion of the lesson. Back in the classroom after the field trip, the students will use their data collected to serve as reinforcement of the content being learned.

Essentially, the lessons below are a type of three-day lab in which the set-up is done the day before the field trip. The data is collected during the field trip at WonderWorks. Finally, the evaluation portion is conducted on the day after the field trip.

These are by no means comprehensive lessons, but more of a general framework, which allows the teacher the opportunity for students to practice their data collection skills while on the field trip. We encourage teachers to take a look at what data the students will be collecting (on the Body Systems Scavenger Hunt), and elaborate upon our framework in order to create an educational experience that works for you, in your classroom, for your students.

In brief, the lessons are as follows:

The heart rate lesson involves having students participate in an exhibit at WonderWorks and monitor their heart rate at different intervals throughout.

The circulatory lesson involves having students observe changes in skin color after exposing their extremities to extreme cold.

The muscular systems lesson involves students thinking critically about the involvement of the musculoskeletal system in helping to achieve certain motions through participation in various WonderWorks exhibits.

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Pre-Field Trip Activities:

Spend 1-2 days covering the body system on which we plan to focus

- Pre-assessment (formal or informal) to gauge students' knowledge
- Give an overview of relevant vocabulary
- Identify the general organs of the nervous/musculoskeletal and integumentary/circulatory system
- Describe the general function of the nervous/musculoskeletal and integumentary/circulatory system
    - If teaching circulatory system, walk students through how to safely and accurately obtain their heart rate
    - Make a chart of all students resting heart rates. Will add in results after field trip.
- Introduce the topic of homeostasis
- Write a narrative of the red blood cells journey through the circulatory system
        - Examples include: organs, hinder etc…
        - Example stories: cab ride or bus ride

Variations of the lesson include:

- Print several versions of the worksheet with the questions in different orders. Give different worksheets to each group to minimize waiting in line for each exhibit.
- Assign different groups of students' different #'s of jumps for the "How High Can You Jump?" exhibit.
- For ESE/ESOL students:
    - Deliberate grouping of ESE/ESOL students with standard students/chaperones
    - Go over directions of each exhibit before field trip with ESE/ESOL students

WonderWorks Activity: Please print the Body Systems Lesson Scavenger Hunt file.

Post-Field Trip Activities:

- Fill in Heart Rate chart with observations
- "How Cold is It?" – ask students to raise their hand, if they could keep it in the water for 5 seconds or longer. Increase the number to 10 seconds, 15 seconds, and so forth until you reach the highest number of seconds. Ask the students who held their hands underwater for the shortest period of time, to compare their observations in how their hands felt and looked compared to the students who held their hands underwater for the longest period of time.

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- Have students analyze their data and write:
  - "Why do you think that is the case?"
  - "What would happen if you left your hand in the water for 5 minutes?"
- Describe the 5 functions of bones. (Each description should be at least 1 sentence long.)
- Write why the joint is an important component of the musculoskeletal system based on the exhibits that you visited. Use evidence and data to support your answer.