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Georgia Performance Standards Framework for Science – Grade 5

Cells/Microorganisms Unit: (3 weeks)

OVERVIEW: At this level students have difficulty with the idea that cells are the basic units in which life processes occur. The story must be kept simple by explaining that functioning cells have the same needs as do larger organisms: growing, taking in nutrients such as food, water and air, eliminating waste, reproducing, giving structure, and moving. Students will locate parts of cells responsible for these functions. They should use microscopes to observe these structures in plants and animals as well as examples of microorganisms. This unit is not on classifying microorganisms. It builds on the third and fourth grade understandings of habitat and food chains. This unit focuses on evidence of harmful and beneficial organisms in the ecosystem.

STANDARDS ADDRESSED IN THIS UNIT

Focus Standards:

S5P1. Students will verify that an object is the sum of its parts.

- b. Investigate how common items have parts that are too small to be seen without magnification.

S5L3. Students will diagram and label parts of various cells (plant, animal, single-celled, multi-celled).

- a. Use magnifiers such as microscopes or hand lenses to observe cells and their structure.
- b. Identify parts of a plant cell (membrane, wall, cytoplasm, nucleus, chloroplasts) and of an animal cell (membrane, cytoplasm, and nucleus) and determine the function of the parts.
- c. Explain how cells in multi-celled organisms are similar and different in structure and function to single-celled organisms.

S5L4. Students will relate how microorganisms benefit or harm larger organisms.

- a. Identify beneficial microorganisms and explain why they are beneficial.
- b. Identify harmful microorganisms and explain why they are harmful.

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RELATED STANDARDS ADDRESSED IN THIS UNIT

Habits of the Mind

S5CS2. Students will have the computation and estimation skills necessary for analyzing data and following scientific explanations.

- a. Add, subtract, multiply, and divide whole numbers mentally, on paper, and with a calculator.
- b. Use fractions and decimals, and translate between decimals and commonly encountered fractions – halves, thirds, fourths, fifths, tenths, and hundredths (but not sixths, sevenths, and so on) – in scientific calculations.
- c. Judge whether measurements and computations of quantities, such as length, area, volume, weight, or time, are reasonable answers to scientific problems by comparing them to typical values.

S5CS3. Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities.

- a. Choose appropriate common materials for making simple mechanical constructions and repairing things.
- b. Measure and mix dry and liquid materials in prescribed amounts, exercising reasonable safety.
- c. Use computers, cameras and recording devices for capturing information.
- d. Identify and practice accepted safety procedures in manipulating science materials and equipment.

S5CS4. Students will use ideas of system, model, change, and scale in exploring scientific and technological matters.

- a. Observe and describe how parts influence one another in things with many parts.
- b. Use geometric figures, number sequences, graphs, diagrams, sketches, number lines, maps, and stories to represent corresponding features of objects, events, and processes in the real world. Identify ways in which the representations do not match their original counterparts.
- c. Identify patterns of change in things—such as steady, repetitive, or irregular change—using records, tables, or graphs of measurements where appropriate.
- d. Identify the biggest and the smallest possible values of something.

S5CS5. Students will communicate scientific ideas and activities clearly.

- a. Write instructions that others can follow in carrying out a scientific procedure.
- b. Make sketches to aid in explaining scientific procedures or ideas.
- c. Use numerical data in describing and comparing objects and events.
- d. Locate scientific information in reference books, back issues of newspapers and magazines, CD-ROMs, and computer databases.

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S5CS6. Students will question scientific claims and arguments effectively.

- a. Support statements with facts found in books, articles, and databases, and identify the sources used.
- b. Identify when comparisons might not be fair because some conditions are different.

The Nature of Science

S5CS7. Students will be familiar with the character of scientific knowledge and how it is achieved.

Students will recognize that:

- a. Similar scientific investigations seldom produce exactly the same results, which may differ due to unexpected differences in whatever is being investigated, unrecognized differences in the methods or circumstances of the investigation, or observational uncertainties.
- b. Some scientific knowledge is very old and yet is still applicable today.

S5CS8. Students will understand important features of the process of scientific inquiry.

Students will apply the following to inquiry learning practices:

- a. Scientific investigations may take many different forms, including observing what things are like or what is happening somewhere, collecting specimens for analysis, and doing experiments.
- b. Clear and active communication is an essential part of doing science. It enables scientists to inform others about their work, expose their ideas to criticism by other scientists, and stay informed about scientific discoveries around the world.
- c. Scientists use technology to increase their power to observe things and to measure and compare things accurately.
- d. Science involves many different kinds of work and engages men and women of all ages and backgrounds.

ENDURING UNDERSTANDINGS

Cells

- Many cells cannot be seen with the naked eye.
- Animal and plant cells are structured differently.
- Organisms can be single-celled or multi-celled.
- Some objects are too small to be seen without magnification.
- Microscopes make it possible to see that living things are made up mostly of cells.
- Some organisms' cells vary greatly in appearance and perform very different roles in the organism.
- Some organisms are made of a collection of similar cells that benefit from cooperating.

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<p>Microorganisms</p> <ul style="list-style-type: none"> • Microorganisms can be beneficial. • Microorganisms can be harmful. • Microorganisms are too small to be seen with the naked eye. • Microorganisms are living things. • Microorganisms are not plants or animals. 	
ESSENTIAL QUESTIONS:	
<ul style="list-style-type: none"> • What do we see when we take a closer look? • How are the structures of the animal cell and plant cell similar? • How are the structures of the animal cell and plant cell different? • How can you differentiate a single-celled organism from a multi-celled organism? • If you can't see them, can they harm you? • How are microorganisms controlled? • Where did all of those little things come from? • Why aren't microorganisms in tap water? 	
MISCONCEPTIONS	PROPER CONCEPTIONS
<ul style="list-style-type: none"> • Organisms contain cells, such as blood cells. • Cells are too small and numerous to observe. • Microorganisms are non-living. • All microorganisms are harmful. • Bacteria and viruses are the same. 	<ul style="list-style-type: none"> • Organisms are mostly made up of cells that work together. • Many cells such as onion skin cells and cheek cells can be viewed with magnification. • A microorganism is a living single-celled organism of microscopic size. • Some microorganisms are harmful, but some are beneficial. Decomposers are microorganisms. Many microorganisms are used in the food-making processes and aid in human digestion. • Bacteria are the simplest living group of organisms and inhabit practically all environments. Viruses are generally regarded as non living and therefore are not microbes.

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<ul style="list-style-type: none"> • Different diseases are caused by the same “germs.” 	<ul style="list-style-type: none"> • Different diseases are caused by different microorganisms. There are four major types of germs: bacteria, viruses, fungi, and protozoa.
CONCEPTS:	
<ul style="list-style-type: none"> • Compare/contrast parts of a plant/animal cell. • Summarize the functions of plant/animal cells. • What an animal and plant cell looks like under a microscope. • Explain the role and function of cells as the basis for all living things. • Use a microscope to observe, illustrate, and label a plant and animal cell. • Label the organelles of an animal cell (membrane, cytoplasm, and nucleus) and state the function of each. 	
LANGUAGE:	
<ul style="list-style-type: none"> • Cell, cell membrane, cell wall, cytoplasm, nucleus, chloroplasts, structure, function, magnifying, microscope, single-celled, multi-celled, microorganism, harmful, beneficial, disease, bacteria, virus, protists, protozoa, germs, microbe 	
EVIDENCE OF LEARNING:	
<p>By the conclusion of this unit, students should be able to demonstrate the following competencies:</p> <p>Culminating Activities:</p> <p>Performance Assessment: Wanted Poster</p> <p>Wanted posters are a very efficient means of catching criminals because they warn people. They (hopefully) bring criminals to justice, and they show the community who the criminals are. The same can be true of announcing microorganisms that are wanted either because they are beneficial or because they are harmful.</p> <ul style="list-style-type: none"> • Draw a wanted poster of a microorganism. • The wanted poster must warn people about the dangerous fugitives who are at large. The wanted poster could alert people to beneficial microorganisms as well/ • When making the poster, keep in mind the crime or beneficial event itself. You must give a detailed description of the events that occurred to make it a crime or a benefit. • Give some remarks on how to handle the microorganism if apprehended. • Always state how much the reward is and who is receiving the reward for capture. 	

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Performance Assessment: Brochure

- Pretend you are a scientist working in the food industry. You are in charge of human resources for your department. (You hire people.)
- Explain what skills the people you hire must have to study the effects of microorganisms on your product.
- Make a brochure including skills, tools used, terminology, and education needed.

GRASPS: Cells

Goal: Students will demonstrate an understanding of basic cell structure and function of the cell.

Role: You are the author of a booklet to explain the basic parts of plant and animal cells. You will explain their role in the cells and compare their structure to cells in microorganisms.

Audience: Other fifth graders

Scenario: Compile a booklet or multimedia presentation about the structure of basic cells. Develop a key that identifies the different structures in all cells. Sketch or find pictures of various cells in microorganisms, plants, and animals. Use the key to locate structures in the cells such as membrane, nucleus, cytoplasm, cell wall, and chloroplasts. Note that not all cells have all of these structures. Explain how the structures and the roles of the cells are similar and/or different in the cells shown. Discuss what would happen if one of more of the structures were missing from the cell.

Product: A multimedia presentation or booklet to share with the class.

Resources:

Centers for Disease Control: <http://www.cdc.gov>

Food and Drug Administration: <http://www.fda.gov>

Stalking the Mysterious Microbe: <http://www.microbe.org>

Yogurt: <http://www.foodsci.uoguelph.ca/dairyedu/yogurt.html>

Microbe Zoo: <http://commtechlab.msu.edu/sites/dlc-me/zoo>

American Dairy Association—I Love Cheese: http://www.ilovecheese.com/chees_health.asp

American Museum of Natural History—Infection Detection Protection: <http://www.amnh.org/nationalcenter/infection/infectionindex.html>

Microbe World: <http://www.microbeworld.org/home.htm>