Seventh Grade Science Curriculum

The Georgia Performance Standards are designed to provide students with the knowledge and skills for proficiency in science at the seventh grade level. The Project 2061's *Benchmarks for Science Literacy* is used as the core of the curriculum to determine appropriate content and process skills for students. The GPS is also aligned to the National Research Council's *National Science Education Standards*. Technology is infused into the curriculum. The relationship between science, our environment, and our everyday world is crucial to each student's success and should be emphasized.

The performance standards should drive instruction. Hands-on, student-centered, and inquiry-based approaches should be the emphases of instruction. This curriculum is intended as a required curriculum that would show proficiency in science, and instruction should extend beyond the curriculum to meet the student needs. Safety of the student should always be foremost in science instruction.

Science consists of a way of thinking and investigating, as well a growing body of knowledge about the natural world. To become literate in science, therefore, students need to acquire an understanding of both the **Characteristics of Science** and its **Content**. The Georgia Performance Standards for Science require that instruction be organized so that these are treated together. Therefore, **A CONTENT STANDARD IS NOT MET UNLESS APPLICABLE CHARACTERISTICS OF SCIENCE ARE ALSO ADDRESSED AT THE SAME TIME.** For this reason they are presented as co-requisites.

This Performance Standards include four major components. They are

The Standards for Georgia Science Courses. The Characteristics of Science co-requisite standards are listed first, followed by the Content co-requisite standards. Each Standard is followed by elements that indicate the specific learning goals associated with it.

Tasks that students should be able to perform during or by the end of the course. These are keyed to the relevant Standards. Some of these can serve as activities that will help students achieve the learning goals of the Standard. Some can be used to assess student learning, and many can serve both purposes.

Samples of student work. As a way of indicating what it takes to meet a Standard, examples of successful student work are provided. Many of these illustrate how student work can bridge the Content and Characteristics of Science Standards. The Georgia DOE Standards web site will continue to add samples as they are identified and teachers are encouraged to submit examples from their own classroom experiences.

Teacher Commentary. Teacher commentary is meant to open the pathways of communication between students and the classroom teacher. Showing students why they did or did not meet a standard enables them to take ownership of their own learning.

Georgia Performance Science Standards-- Explanation of Coding

Characteristics of Science Standards

SKCS1
Science **K**indergarten **C**haracteristics of **S**cience Standard #**1**

S8CS2
Science Grade **8** **C**haracteristics of **S**cience Standard #**2**

SCSh8
Science **C**haracteristics of **S**cience **h**igh school Standard #**8**

Content Standards

S5P3
Science Grade **5** **P**hysical Science Standard #**3**

S4E2
Science Grade **4** **E**arth Science Standard #**2**

S7L4
Science Grade **7** **L**ife Science Standard #**4**

SC1
Science **C**hemistry Standard #**1**

SB4
Science **B**iology Standard #**4**

SPS6
Science **P**hysical **S**cience Standard #**6**

SP3
Science **P**hysics Standard #**3**

Seventh grade students keep records of their observations and use those records to analyze the data they collect. They observe and use observations to explain diversity of living organisms and how the organisms are classified. They use different models to represent systems such as cells, tissues, and organs. They use what they know about ecosystems to explain the cycling of matter and energy. They use the concepts of natural selection and fossil evidence in explanations. Seventh graders write instructions, describe observations, and show information in graphical form. When analyzing the data they collect, seventh graders can recognize relationships in simple charts and graphs and find more than one way to interpret their findings. The students replicate investigations and compare results to find similarities and differences.

The middle school life science course is designed to give students the necessary skills for a smooth transition from elementary life science standards to high school biology standards. The purpose is to give all students an overview of common strands in life science including, but not limited to, diversity of living organisms, structure and function of cells, heredity, ecosystems, and biological evolution.

Major Concepts/ Skills:	**Concepts/Skills to Maintain:**
Diversity of living organisms	Characteristics of Science
Dichotomous key/classify (6 Kingdoms)	Records investigations clearly and accurately
Structure and function of cells	Uses hypotheses
Tissues, organs, and organ systems	Uses technology
Purpose of major human body organ systems	Uses safety techniques
Heredity, genes, and successive generations	Uses scientific tools
Ecosystems	Writes clearly
Cycling of matter and energy	Organizes data into graphs/tables/charts
Biological evolution	Interprets graphs/tables/charts
Natural selection and fossil record	Asks quality questions
	Analyzes/organizes scientific data via calculations and inference
	Recognizes the importance of explaining data with precision and accuracy

Co-Requisite – Characteristics of Science

Habits of Mind

S7CS1. Students will explore of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.

a. Understand the importance of—and keep—honest, clear, and accurate records in science.
b. Understand that hypotheses can be valuable, even if they turn out not to be completely accurate.

S7CS2. Students will use standard safety practices for all classroom laboratory and field investigations.

a. Follow correct procedures for use of scientific apparatus.
b. Demonstrate appropriate techniques in all laboratory situations.
c. Follow correct protocol for identifying and reporting safety problems and violations.

S7CS3. Students will have the computation and estimation skills necessary for analyzing data and following scientific explanations.

a. Analyze scientific data by using, interpreting, and comparing numbers in several equivalent forms, such as integers, fractions, decimals, and percents.
b. Use the mean, median, and mode to analyze a set of scientific data.
c. Apply the metric system to a scientific investigation that includes metric to metric conversion. (i.e. centimeters to meters)
d. Draw conclusions based on analyzed data.
e. Decide what degree of precision is adequate, and round off appropriately.
f. Address the relationship between accuracy and precision and the importance of each.

S7CS4. Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities.

a. Use appropriate technology to store and retrieve scientific information in topical, alphabetical, numerical, and keyword files, and create simple files.
b. Use appropriate tools for measuring objects and/or substances.
c. Learn and use on a regular basis standard safety practices for scientific investigations.

S7CS5. Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.

a. Observe and explain how parts can be related to other parts in a system such as predator/prey relationships in a community/ecosystem.
b. Understand that different models (such as physical replicas, pictures, and analogies) can be used to represent the same thing.

S7CS6. Students will communicate scientific ideas and activities clearly.

a. Write clear, step-by-step instructions for conducting particular scientific investigations, operating a piece of equipment, or following a procedure.
b. Write for scientific purposes incorporating data from circle, bar and line graphs, two-way data tables, diagrams, and symbols.
c. Organize scientific information using appropriate simple tables, charts, and graphs, and identify relationships they reveal.

S7CS7. Students will question scientific claims and arguments effectively.

a. Question claims based on vague attributions (such as “Leading doctors say...”) or on statements made by people outside the area of their particular expertise.
b. Identify the flaws of reasoning that are based on poorly designed research (i.e., facts intermingled with opinion, conclusions based on insufficient evidence).
c. Question the value of arguments based on small samples of data, biased samples, or samples for which there was no control.
d. Recognize that there may be more than one way to interpret a given set of findings.

The Nature of Science

S7CS8. Students will investigate the characteristics of scientific knowledge and how that knowledge is achieved.

Students will apply the following to scientific concepts:

a. When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, which often requires further study. Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as meaningful.
b. When new experimental results are inconsistent with an existing, well-established theory, scientists may pursue further experimentation to determine whether the results are flawed or the theory requires modification.
c. As prevailing theories are challenged by new information, scientific knowledge may change.

S7CS9. Students will investigate the features of the process of scientific inquiry.

Students will apply the following to inquiry learning practices:

a. Investigations are conducted for different reasons, which include exploring new phenomena, confirming previous results, testing how well a theory predicts, and comparing competing theories.
b. Scientific investigations usually involve collecting evidence, reasoning, devising hypotheses, and formulating explanations to make sense of collected evidence.
c. Scientific experiments investigate the effect of one variable on another. All other variables are kept constant.
d. Scientists often collaborate to design research. To prevent this bias, scientists conduct independent studies of the same questions.
e. Accurate record keeping, data sharing, and replication of results are essential for maintaining an investigator's credibility with other scientists and society.
f. Scientists use technology and mathematics to enhance the process of scientific inquiry.
g. The ethics of science require that special care must be taken and used for human subjects and animals in scientific research. Scientists must adhere to the appropriate rules and guidelines when conducting research.

Reading Standard Comment

After the elementary years, students are seriously engaged in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal learning. Students encounter a variety of informational as well as fictional texts, and they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas *in context.*

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

S7CS10. Students will enhance reading in all curriculum areas by:

a. Reading in All Curriculum Areas
   - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas
   - Read both informational and fictional texts in a variety of genres and modes of discourse
   - Read technical texts related to various subject areas

b. Discussing books
   - Discuss messages and themes from books in all subject areas.
   - Respond to a variety of texts in multiple modes of discourse.
   - Relate messages and themes from one subject area to messages and themes in another area.
   - Evaluate the merit of texts in every subject discipline.
   - Examine author's purpose in writing.
   - Recognize the features of disciplinary texts.

c. Building vocabulary knowledge
   - Demonstrate an understanding of contextual vocabulary in various subjects.
   - Use content vocabulary in writing and speaking.
   - Explore understanding of new words found in subject area texts.

d. Establishing context
   - Explore life experiences related to subject area content.
   - Discuss in both writing and speaking how certain words are subject area related.
   - Determine strategies for finding content and contextual meaning for unknown words.

Co-Requisite – Content

S7L1. Students will investigate the diversity of living organisms and how they can be compared scientifically.

a. Demonstrate the process for the development of a dichotomous key.
b. Classify organisms based on physical characteristics using a dichotomous key of the six kingdom system (archaebacteria, eubacteria, protists, fungi, plants, and animals).

S7L2. Students will describe the structure and function of cells, tissues, organs, and organ systems.

a. Explain that cells take in nutrients in order to grow and divide and to make needed materials.
b. Relate cell structures (cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria) to basic cell functions.
c. Explain that cells are organized into tissues, tissues into organs, organs into systems, and systems into organisms.
d. Explain that tissues, organs, and organ systems serve the needs cells have for oxygen, food, and waste removal.
e. Explain the purpose of the major organ systems in the human body (i.e., digestion, respiration, reproduction, circulation, excretion, movement, control, and coordination, and for protection from disease).

S7L3. Students will recognize how biological traits are passed on to successive generations.

a. Explain the role of genes and chromosomes in the process of inheriting a specific trait.
b. Compare and contrast that organisms reproduce asexually and sexually (bacteria, protists, fungi, plants & animals).
c. Recognize that selective breeding can produce plants or animals with desired traits.

S7L4. Students will examine the dependence of organisms on one another and their environments.

a. Demonstrate in a food web that matter is transferred from one organism to another and can recycle between organisms and their environments.
b. Explain in a food web that sunlight is the source of energy and that this energy moves from organism to organism.
c. Recognize that changes in environmental conditions can affect the survival of both individuals and entire species.
d. Categorize relationships between organisms that are competitive or mutually beneficial.
e. Describe the characteristics of Earth's major terrestrial biomes (i.e. tropical rain forest, savannah, temperate, desert, taiga, tundra, and mountain) and aquatic communities (i.e. freshwater, estuaries, and marine).

S7L5. Students will examine the evolution of living organisms through inherited characteristics that promote survival of organisms and the survival of successive generations of their offspring.

a. Explain that physical characteristics of organisms have changed over successive generations (e.g. Darwin's finches and peppered moths of Manchester).

b. Describe ways in which species on earth have evolved due to natural selection.
c. Trace evidence that the fossil record found in sedimentary rock provides evidence for the long history of changing life forms.