STRUCTURE OF THE STANDARDS

Each content standard in this document addresses the three scientific dimensions listed below as described in the 2012 National Research Council (NRC) publication, *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Standards outline the knowledge and skills of science and engineering that all students should know and be able to do by the end of high school.

DIMENSION 1: SCIENTIFIC AND ENGINEERING PRACTICES

- Asking questions (for science) and defining problems (for engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

DIMENSION 2: CROSSCUTTING CONCEPTS

- Patterns
- Cause and effect
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter
- Structure and function
- Stability and change

DIMENSION 3: DISCIPLINARY CORE IDEAS

- Physical Sciences
  - Matter and Its Interactions
  - Motion and Stability: Forces and Interactions
  - Energy
  - Waves and Their Applications in Technologies for Information Transfer

- Life Sciences
  - From Molecules to Organisms: Structures and Processes
  - Ecosystems: Interactions, Energy, and Dynamics
  - Heredity: Inheritance and Variation of Traits
  - Unity and Diversity

- Earth and Space Sciences
  - Earth's Place in the Universe
  - Earth's Systems
  - Earth and Human Activity

- Engineering, Technology, and Applications of Science
  - Engineering Design
  - Links Among Engineering, Technology, Science, and Society

CHECKLIST FOR REVIEWING THE STANDARDS

The following criteria were used to determine if the ACCRS science standards were written with care and rigor. Please consider these questions as you review the standards and provide feedback to the science course of study committee through your comments.

1. Will students completing Grade 12 be equipped with all of the science needed to enter college or a career? (College and career readiness)
2. Is the science content in the standard accurate and correct? (Erroneous content)
3. Are the appropriate words used to describe the desired outcome? (Level of rigor)
4. Do the standards progress in a logical manner from grade to grade and course to course? (Gaps in content)
5. Is there foundation in lower grades/courses for content in higher grades/courses? (Foundational content for each concept)
6. Does the grade/course have a reasonable amount of content to justify the awarding of a credit for completing the grade/course? Is all of the content required for the course? (Unnecessary content)
7. Does each standard and subcomponent(s) of the standard contain the three components of all science standards: content, practice, and cross-cutting concept written in user-friendly language? (Clearly written content)
8. Do the standards allow for easy assessment of varying degrees of learning? (Measurable content)
9. Is the requirement of content repeated from grade to grade or course to course? (Repetition of content)

LEARNING PROGRESSIONS

Reviewers will be able to follow the increase in depth and rigor of standards in a specific domain (Life Science, Physical Science, Earth and Space Science) through Learning Progressions across grade levels. Content standards in the 2014 *Alabama Course of Study: Science* follow a logical learning progression that addresses the same disciplinary core ideas across multiple grade levels. While every core idea is not addressed in every consecutive grade, the core idea is taught through developmentally appropriate approaches with increasing rigor and sophistication in a continuous and progressive manner.

Learning progressions of content standards within Grades K-12 ensure that science concepts are not taught in isolation, but rather in the context of disciplinary core ideas that are introduced in earlier grades and are built upon in subsequent grades leading to the goal of scientific and engineering literacy. Examples of the learning progressions of content across three of the domains are found in the table below. These examples indicate the grade or course where the standard is located, followed by the content standard number. **K.3.**, for example, specifies kindergarten, content standard number three.

PHYSICAL SCIENCES			
Motion and Stability: Forces and Interactions			
K-2	**3-5**	**6-8**	**9-12**
K.1. Investigate the resulting motion of objects when forces of different strengths and directions act upon them.	**3.1.** Plan and carry out an experiment to determine the effects of balanced and unbalanced forces on the motion of an object using one variable at a time, including number, size, direction, speed, position, friction, or air resistance, and communicate these findings graphically.	**8.9.** Use Newton's second law to demonstrate and explain how changes in an object's motion depend on the sum of the forces on the object and the mass of the object.	**Physical Science.2.** Apply Newton's laws to predict the resulting motion of a system by constructing force diagrams that identify the forces acting on the system. **Physics.2.** Identify forces in a system and apply Newton's laws graphically by using models such as free-body diagrams to explain how the motion of an object is affected, ranging from simple to complex, and including circular motion.
LIFE SCIENCES			
Ecosystems: Interactions, Energy, and Dynamics			
K-2	**3-5**	**6-8**	**9-12**
K.3. Distinguish between living and nonliving things and verify what living things need to survive.	**5.11.** Create an illustration to describe the movement of matter among producers; varying levels of consumers, including scavengers and decomposers; and the environment.	**7.5.** Examine the cycling of matter between abiotic and biotic parts of ecosystems to explain the flow of energy and the conservation of matter.	**Biology.9.** Develop and use models to describe the cycling of matter and flow of energy between abiotic and biotic factors in ecosystems. **Environmental Science.6.** Engage in argument from evidence to evaluate how biological or physical changes within ecosystems affect the number and types of organisms, and that changing conditions may result in a new or more resilient ecosystem.
EARTH AND SPACE SCIENCES			
Earth's Systems			
K-2	**3-5**	**6-8**	**9-12**
2.8. Make observations from media to obtain information about Earth events that happen over a short period of time or over a time period longer than one can observe.	**4.12.** Construct explanations by citing evidence found in patterns of rock formations and fossils in rock layers that Earth changes over time through both slow and rapid processes.	**6.5.** Use evidence to explain how different geologic processes shape Earth's history over widely varying scales of space and time.	**Earth and Space Science.9.** Obtain, evaluate, and communicate information to justify how the appearance of land features, including mountains, valleys, and plateaus; and seafloor features, including trenches, ridges, and seamounts; are a result of both constructive and destructive forces.