Dimensions of the *Framework for K-12 Science Education* Used to Develop the MS College- and Career-Readiness Standards for Science

Scientific and Engineering Practices

Asking Questions and Defining Problems

Scientific questions can be driven by curiosity about the world, inspired by a previous model, theory, or investigation or stimulated by the need to solve a problem. Scientific questions lead to explanations of how the natural works and can be empirically tested using evidence.

Students can ask questions about explanations of the natural world, facts from articles about scientific principles, or data that leads to additional investigations.

Planning and Carrying Out Investigations

Scientists and engineers plan and carry out investigations in the field or laboratory. An investigation is a systematic way to gather data about the natural world either in the field or in a laboratory setting.

Students can design investigations that will produce data that can be used to answer their questions; they can identify and analyze experimental variables, controls and investigational methods; they can conduct investigations to gather data using appropriate tools and methods.

Analyzing and Interpreting Data

Analyzing and interpreting data includes making sense of the data produced during investigations. Because data patterns and trends are not always obvious, scientists use a range of tools such as tables, graphs, and other visualization techniques.

Students can analyze and interpret data to determine patterns and relationships; represent data in tables and graphs to reveal patterns and relationships; and consider the limitations of data analysis such as sources of error.

Developing and Using Models

A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. Models can be represented by diagrams, drawings, physical replicas, dramatization, storyboards, mathematical representations, analogies, and computer simulations.

Students use modeling tools to develop questions, to explain and/or predict scientific phenomena, processes or relationships; to analyze and identify flaws in systems; and communicate ideas. Measurements and observations are often used to revise models and designs.

Constructing Explanations and Designing Solutions

The products of science are explanations and the products of engineering are solutions.

A scientific explanation is used to describe how or why a natural phenomenon occurs that is supported by evidence and scientific ideas.

Students can use evidence (measurements, observations) to construct or support an explanation, consider the qualitative or quantitative relationships between variables to explain results, or apply scientific ideas to construct or revise an explanation, project design or solution.

Engaging in Argument from Evidence

Argumentation is the process by which explanations and solutions are reached.

In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem. An argument from evidence helps to identify weaknesses and limitations in explanations and designs.

Students can use arguments to identify the best explanations for the results of an investigation, any flaws in predictions and reasoning, and to pinpoint better ways to design or construct models and designs.

Using Mathematics and Computational Thinking

In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions.

Students use mathematics to describe, measure, compare, and estimate quantities (e.g., weight, volume) to answer scientific questions and to organize data in graphs or charts. They use math to answer scientific questions and use digital tools to accomplish these goals when appropriate.

Obtaining, Evaluating, and Communicating Information

Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Scientists and engineers employ multiple sources to acquire information that is used to evaluate the merit and validity of claims, methods, and designs.

Students can read appropriate texts and related features to obtain scientific information. They can evaluate the information gathered from texts and other sources. Students can communicate information and ideas in multiple ways: using tables, diagrams, graphs, models, and equations as well as orally, in writing, and through extended discussions.

Adapted from the NSTA and based on content from the *Framework for K-12 Science Education*

Mississippi College- and Career-Readiness Standards for Science – Disciplinary Core Ideas for K-8				
		Life Science	**Physical Science**	**Earth and Space Science**
Elementary	**K**	L.K.1 Hierarchical Organization L.K.2 Reproduction and Heredity L.K.3 Ecology and Interdependence L.K.4.Adaptations and Diversity	P.K.5 Organization of Matter and Chemical Interactions	E.K.8 Earth and the Universe E.K.10 Earth's Resources
	1	L.1.1 Hierarchical Organization L.1.2 Reproduction and Heredity L.1.3 Ecology and Interdependence L.1.4.Adaptations and Diversity	P.1.6 Motions, Forces, and Energy	E.1.9 Earth's Systems and Cycles E.1.10 Earth's Resources
	2	L.2.1 Hierarchical Organization L.2.2 Reproduction and Heredity L.2.3 Ecology and Interdependence L.2.4.Adaptations and Diversity	P.2.5 Organization of Matter and Chemical Interactions P.2.6 Motions, Forces, and Energy	E.2.8 Earth and the Universe E.2.10 Earth's Resources
	3	L.3.1 Hierarchical Organization L.3.2 Reproduction and Heredity L.3.4.Adaptations and Diversity	P.3.5 Organization of Matter and Chemical Interactions P.3.6 Motions, Forces, and Energy	E.3.7 Earth's Structure and History E.3.9 Earth's Systems and Cycles E.3.10 Earth's Resources
	4	L.4.1 Hierarchical Organization L.4.2 Reproduction and Heredity	P.4.6 Motions, Forces, and Energy	E.4.9 Earth's Systems and Cycles E.4.10 Earth's Resources
	5	L.5.3 Ecology and Interdependence	P.5.5 Organization of Matter and Chemical Interactions P.5.6 Motions, Forces, and Energy	E.5.8 Earth and the Universe E.5.10 Earth's Resources
Middle	**6**	L.6.1 Hierarchical Organization L.6.3 Ecology and Interdependence L.6.4.Adaptations and Diversity	P.6.6 Motions, Forces, and Energy	E.6.8 Earth and the Universe
	7	L.7.3 Ecology and Interdependence	P.7.5 Organization of Matter and Chemical Interactions	E.7.9 Earth's Systems and Cycles
	8	L.8.2 Reproduction and Heredity L.8.4.Adaptations and Diversity	P.8.6 Motions, Forces, and Energy	E.8.7 Earth's Structure and History E.8.9 Earth's Systems and Cycles E.8.10 Earth's Resources

Crosscutting Concepts

Patterns
Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.

Cause and Effect: Mechanism and Explanation
Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.

Scale, Proportion, and Quantity
In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.

Systems and System Models
Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.

Energy and Matter: Flows, Cycles, and Conservation
Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.

Structure and Function
The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.

Stability and Change
For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.