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2007 Standard	1997 MLR	• How it's different	Implications
Unifying Themes: Students apply the principles of systems, models, constancy and change, and scale in science and technology.	**Systems** – Direct reference to systems found in Standards A, B,C H, and M. **Models** – Direct references to models in Standard E and L and embedded references in Standard M. **Constancy and change** – Direct and indirect references to constancy and change in standard B, D, E, F, G, I, and indirect references in M. **Scale** – Indirect references to scale in C, D, E, and G.	• The four themes were embedded in the 1997 MLR. The 2007 MLR describes a continuum of learning related to the concepts of scale, systems, models, and constancy and change.	• There will be a need for professional development to assist teachers in understanding the knowledge and skills related to the themes. • There will be a need for professional development to assist teachers in understanding how to make connects from Standard A to Standards D and E.
B. The Skills and Traits of Scientific Inquiry and *Technological Design*: Students plan, conduct, analyze data from and communicate results of in-depth scientific investigations; and they use a systematic process, tools, equipment, and a variety of materials to create a *technological design* and produce a solution or product to meet a specified need.	**J. INQUIRY AND PROBLEM SOLVING** **Students will apply inquiry and problem-solving approaches in science and technology.** *Scientific inquiry, problem solving, and the technological method provide insight into and comprehension of the world around us. A variety of tools, including emerging technologies assist, the inquiry processes. Models are used to understand the world.* **K. SCIENTIFIC REASONING** **Students will learn to formulate and justify ideas and to make informed decisions.** *This involves framing and supporting arguments, recognizing patterns and relationships, identifying bias and stereotypes, brainstorming alternative explanations and solutions, judging accuracy, analyzing situations, and revising studies to improve their validity.*	• Inquiry and Problem Solving, Scientific Reasoning and Communication are integrated into a singe scientific inquiry standard. • The learning goals for scientific inquiry and technological design are identified and described separately. • Learning goals for technological design in the 2007 MLR like scientific inquiry is described for each of the four grade spans Pre-K-Diploma.	• The standards will require schools to have a more comprehensive approach to instruction on technological design. • The role of technology educators (in traditional PreK-Diploma and CTE Centers) takes on greater significance.

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	L. COMMUNICATION **Students will communicate effectively in the applications of science and technology.** *Clear and accurate communication employs appropriate symbols and terminology, models, and a variety of media and presentation styles. Communication includes constructing knowledge through reflection, evaluation, refocusing, and critically analyzing information from a variety of sources. Individuals and collaborative groups must communicate effectively.*		

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C. **The Scientific and Technological Enterprise:** **Students understand the history and nature of scientific knowledge and technology, the processes of inquiry and *technological design*, and the impacts science and technology have on society and the environment.**	**M. IMPLICATIONS OF SCIENCE AND TECHNOLOGY** **Students will understand the historical, social, economic, environmental, and ethical implications of science and technology.** *Scientific and technological breakthroughs are influenced by prevailing beliefs and conditions which in turn are impacted by new ideas and inventions. By assessing the impacts of technological activity on the environment, students will develop their own sense of global stewardship.*	• The understandings identified under M. Implications of Science and Technology are divided into Understandings of Inquiry; Understandings about Science and Technology; Science, Technology, and Society; and History and Nature of Science the 2007 MLR.	• The organization of the new MLR will require schools to focus more attention on the practice of scientists and engineers.
D. **D. The Physical Setting:** **Students understand the universal nature of matter, energy, force, and motion and identify how these relationships are exhibited in Earth Systems, in the solar system and throughout the universe.**	**D. CONTINUITY AND CHANGE** **Students will understand the basis for all life and that all living things change over time.** *Fossils show past life, extinct species, and environmental changes over time. Organisms change and new species may arise due to genetically coded adaptations.* **E. STRUCTURE OF MATTER** **Students will understand the structure of matter and the changes it can undergo.** *Matter is made of atoms, each with characteristic properties, which can combine to form all substances in the universe. The state and properties of matter may differ when it experiences chemical, physical, and nuclear changes.* **F. THE EARTH**	• Understandings about energy are integrated into the performance indicators found in The Physical Setting and the Living Environment. • Ideas related to heredity and evolution previously grouped under continuity and change are separately described under the heredity and reproduction and the evolution performance indicators of the Living Environment. • Understandings about energy are integrated into the performance indicators found in The Physical Setting and the Living Environment.	• School programming will need to offer opportunity to learn for all students related to all performance areas. • Fewer performance indicators in The Physical Setting Standard should not be understood to mean that less instructional time should be devoted to ideas described in The Physical Setting. • Concepts described in Standards A, B, and C must be integrated with instruction related to Standards D and E.

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	Students will gain knowledge about the earth and the processes that change it. *The earth's surface undergoes steady or sudden changes due to forces of wind, water, ice, volcanism, and shifting of tectonic plates.* **G. THE UNIVERSE** **Students will gain knowledge about the universe and how humans have learned about it, and about the principles upon which it operates.** *This includes understanding the result of the relative positions and movement of the earth, moon, sun, stars, planets, and galaxies. It also entails an understanding of how scientists gather data and formulate explanations for phenomena in space.* **H. ENERGY** **Students will understand concepts of energy.** *Energy takes many forms which can exert forces and do work. The conversion of energy from one form to another offers useful applications and sometimes presents problems.* **I. MOTION** **Students will understand the motion of objects and how forces can change that motion.** *All objects are in motion, at least at an atomic/subatomic level. By understanding how forces (e.g., gravity, friction, and magnetism) act on objects, they can predict their effects on the motion of the object.*		

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E. <u>The Living Environment:</u> **Students understand that cells are the basic unit of life, that all life as we know it has evolved through genetic transfer and natural selection to create a great diversity of organisms, and that these organisms create interdependent webs through which matter and energy flow. Students understand similarities and differences between humans and other organisms and the interconnections of these interdependent webs.**	**A. CLASSIFYING LIFE FORMS** **Students will understand that there are similarities within the diversity of all living things.** *Modern classification systems are based on comparisons of the structure, function, life-cycles, and behavior of organisms.* **B. ECOLOGY** **Students will understand how living things depend on one another and on non-living aspects of the environment.** *Balance in ecosystems is based on an intricate web of relationships among populations of living organisms and on non-living factors such as water and temperature. Changes in specific populations or conditions affect other parts of the ecosystem. Individual systems continually change in response to human and other factors.* **C. CELLS** **Students will understand that cells are the basic units of life.** *The functions performed by organelles (specialized structures found in cells) within individual cells are also carried out by the organ system in multi-cellular organisms. This standard requires that students be conversant with magnifying devices, cell structure and function, body systems, and disease causes and the body's defense against them.*	• There has been a shift from a discrete focus on classification systems to a broader understanding of biodiversity. • Ideas related to heredity and evolution previously grouped under continuity and change are separately described under the heredity and reproduction and the evolution performance indicators of the Living Environment.	• Instruction will need to shift from a discrete focus on classification systems to a broader understanding of biodiversity. • Concepts described in Standards A, B, and C must be integrated with instruction related to Standards D and E.

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