# Attachment A

# Highlights of 2018 Science Standards of Learning Revisions

| 2018 Science Standards of Learning |
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| General |
| General changes to the 2018 Science Standards of Learning include:* rewording of the standards to be more conceptual in nature and to support the development of essential questions and Deeper Learning;
* explicit integration of the 5C’s into the science processes and skills;
* Science Investigation, Reasoning, and Logic strand changed to Scientific and Engineering Practices;
* reorganization of the Science and Engineering Practices to show vertical alignment and to support the integration of scientific inquiry and engineering design into content instruction;
* emphasis on the development of scientific understanding to support the tenets of the nature of science vs the memorization of historical people or objects;
* increased alignment between the stem of each standards and the bullets that serve as guardrails for instruction;
* elimination of redundancy of content;
* updated science concepts to reflect modern science understanding;
* inclusion of mathematics, computational thinking, and use of the engineering design process introductory statements at each grade level/subject
* introduction of yearly themes for grades K-6 to support interdisciplinary lessons;
* secondary courses placed in document in alphabetical order; and
* increased vertical alignment of science concepts and consistent use of vocabulary.
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| Kindergarten  |
| Theme***: Using my senses to understand my world***Greater focus on the vertical progression of the Force, Motion, and Energy strand* The development of force builds from concrete to more abstract K-5. The development of force in Kindergarten begins with the effect of pushes and pulls on the motion of object
* The study of senses moved from scientific investigation to Living Systems and Processes
* The concept of light expanded to include its ability to increase temperature and cause shadows.
* Patterns revised include daily weather, seasonal changes, and day and night. Animal and plant growth moved to K.7.
* Magnets moved to grade 2 with gravity as indirect forces

The use of senses shifted from Scientific Investigation strand to Living Systems and Life Processes |
| Grade 1 |
| Theme: ***How I interact with my world***Greater focus on the vertical progression of the Matter strand* The development of matter builds from concrete to more abstract K-5
* Physical properties of materials emphasized in first grade
* Interaction of materials with water moved to grade 3

Earth Resources standard expanded to include role of student in the use of natural resources |
| Grade 2 |
| Theme: ***Change occurs all around us***Greater focus on the vertical progression of the Force, Motion, and Energy strand* Introduction of the term force
* Inclusion of magnets and gravity as indirect forces

Emphasis placed on change to include that changes can happen quickly or slowly. This concept applied to both living systems and Earth processes.Fossils moved to third grade to support adaptations |
| **Grade 3** |
| Theme: ***Interactions in our world***Greater focus on the vertical progression of the Force, Motion, and Energy strand* Rewording to allow for explicit connection between force and simple machines
* Concept of net force introduced (aligns with introduction of concept in national standards)

Greater focus on the vertical progression of the Matter strand* Interactions of matter with water moved from first grade

Fossils used to support animal adaptations as a response to the environmentLiving Systems and Processes standards revised to emphasize population adaptations and the interrelationships of organisms in different ecosystemsStandard 3.8 eliminated to align with theme and due to abstract nature of the content (role of sun, moon and Earth in causing cycles and phases)-Moved to grade 6Sources of renewable and nonrenewable energy standards moved to fifth grade |
| Grade 4 |
| Theme: ***Our place in the solar system***Movement of content between fourth and fifth grade to allow for more concrete content in fourth grade and more abstract content in 5th grade (allows for additional time for maturation of cognitive ability in students)Movement of classification, and content from previous life processes and living system strand content from 5th to make more robust standards that align to theme.Force, Motion and Energy Strand moved to align with theme (moved to grade 5)Ocean environment added to align to theme and emphasis on the world |
| Grade 5 |
| Theme: ***Transforming matter and energy***Movement of content between fourth and fifth grade to allow for more concrete content in fourth grade and more abstract content in 5th grade (allows for additional time for maturation of cognitive ability in students)Emphasis on energy and energy transformations added to unify concepts of electricity, sound, and lightThe relationship between force and energy on objects supports vertical development of force conceptsThe transfer of energy in the form of electricity moved from fourth gradeMatter strand revised to reflect level of abstract reasoning of students and to prevent early misconceptions of matter interactions.Cell structure and role eliminated from elementary (allow for cognitive maturation and increase abstract reasoning)Earth and Space Systems strands revised to reflect the role of energy in Earth changeStandard added to reflect the conservation of matter and energy |
| Grade 6 |
| Theme: ***Our world, our responsibility***Strand names have been eliminated.Standards have been reorganized to start at the level of solar system. The concepts in the solar system was reorganization in order to form a standard pertains to the organization and components of the solar system and a standard that deals solely with the relationship between the Earth, Moon, and Sun. |
| Life Science |
| Classification of organisms built into LS.3 to tie into structural organization of living thingsAddition of unicellular and multicellular organismsAddition of cellular respiration as a process of energy transferEmphasis shifted from plants and animals to include all organisms |
| Physical Science |
| Particle theory of matter updated to show the Kinetic Molecular Theory of Matter (aligns to chemistry)Organization of chemistry standards revised to reflect the atom, properties of processes of matter, ant the periodic tool. Conservation of matter moved to support chemical and physical processes.PS.5 revised to support the concept of energy prior to building specifics in later standards.PS.6 Revised to emphasize the role of waves in the transfer of energy. Properties of sound waves and terminology included in the revised standard.PS.7 Revised to reflect electromagnetic energy. Concepts of temperature and heat moved to support physical change.PS.9 Greater emphasis placed on magnetic fields. |
| Earth Science  |
| ES.2 content incorporated into the revised skills and processes.Order of standards revised. ES.11 moved to ES.2ES.12 Global climate explicitly addressed. |
| Biology |
| Bullets reorganized to reflect central idea of each standard stem.The relationship between surface area and volume and material transport removed.Protein synthesis moved to Bio.2 to reflect that it is a biochemical process.Bio.4 revised to emphasize bacteria and viruses.Human Biology omitted in standards.Synthetic biology added to support genetics strand. |
| Chemistry |
| Removal of redundant content from 8th grade standards. Content reorganized to form standards on solution and thermochemistry.Organic chemistry integrated into existing standards.Equilibrium removed from chemistry standards. |
| Physics |
| Ph.1-4 Reorganized and made into one comprehensive standardStems reorganized to include “The student will investigate and understand, through mathematical and experimental processes….”Optical systems added to standards. PH.5 (old PH.6) specific content on electromagnetic radiation built into light waves and the transmission of energy.PH.9 (old PH.12) updated to reflect modern physics. Update includes the standard model and dark matter and dark energy. |