



Middle School Science

The ISK Science program is designed to engage students' natural curiosity. Teachers begin by laying a foundation of knowledge, and then students' own interests and curiosity help guide the learning. Many units integrate concepts and skills multiple curricular areas, such as: math, library, art, music and technology.

Science units are designed to provide opportunities for students to learn through inquiry and hands-on activities. Units are centered around five general strands:

1. *Nature of Science and Scientific Inquiry (integrated into all units)*
2. *Life Sciences*
3. *Physical Sciences*
4. *Earth and Beyond*
5. *Environmental Sciences (integrated into all units)*



Grade 8

1. NATURE OF SCIENCE

Standard 1.1: Understand the nature of scientific inquiry (*Understand and use the scientific method*)

- 1.1.1 Design and conduct a scientific investigation
- 1.1.2 Know possible outcomes of scientific investigations
- 1.1.3 Understand why only one variable (independent) can be manipulated at a time and that all other variables must be controlled
- 1.1.4 Establish relationships based on evidence and logical argument (cause/effect)
- 1.1.5 Evaluate the results of scientific investigations, experiments, observations, theoretical and mathematical models, and explanations proposed by other scientists

Standard 1.2: Communicate scientific ideas and activities clearly

- 1.2.1 Explain why and how scientists determine if experimental results are reliable

Standard 1.3: Investigate using appropriate tools and instruments to conduct scientific activities

- 1.3.1 Use appropriate tools and techniques to gather, analyze, and interpret scientific data

Standard 1.4: Understand the nature of scientific knowledge and enterprise (*Understand why science is important*)

- 1.4.1 Know that scientific explanations must meet certain criteria to be considered valid
- 1.4.2 Understand that scientists' investigations are informed by current scientific theories and aim to collect evidence that will be interpreted through
- 1.4.3 Processes of logical argument
- 1.4.4 Understand ethics associated with scientific study
- 1.4.5 Know ways in which science and society influence one another

2. LIFE SCIENCES

Standard 2.1: Understand biological evolution and diversity (scientific comparisons)

- 2.1.1 Know that evidence supports the idea that there is unity among organisms despite the fact that some species look very different
- 2.1.2 Know basic ideas related to biological evolution
- 2.1.3 Know that the fossil record, through geologic evidence, documents the appearance, diversification and extinction of many life forms

Standard 2.2: Understand the structure and function of cells and organisms

- 2.2.1 Know that cells use inorganic compounds to make materials that the cell or organism needs
- 2.2.2 Know that cells convert energy obtained from food to carry on the many functions needed to sustain life
- 2.2.3 Know the difference between meiosis and mitosis

Standard 2.3: Understand the relationships among organisms and their environment

- 2.3.1 Know how energy is transferred through food webs in an ecosystem

Standard 2.4: Understand the cycling of matter and the flow of energy through ecosystems

- 2.4.1 Know how matter is recycled within ecosystems

Standard 2.5: Understand the principles of heredity and related concepts

- 2.5.1 Know that reproduction is a characteristic of all living things and is essential to the continuation of a species
- 2.5.2 Know that the characteristics of an organism can be described in terms of a combination of traits; inherited and environmentally influenced
- 2.5.3 Know the role of DNA in specifying characteristics of an organism

3. PHYSICAL SCIENCES

Standard 3.1: Understand the structure and properties of matter



Grade 8

- 3.1.1 Classify matter as an atom, molecule, element or compound
- 3.1.2 Explain that chemical energy is produced by chemical reactions and is dependent upon the arrangement of atoms
- 3.1.3 Use the periodic table to obtain information about a given element
- 3.1.4 Describe how elements combine to form new substances
- 3.1.5 Given data about characteristic properties of matter (e.g., melting points and boiling points, density, solubility, acid or base) identify, compare or classify different substances
- 3.1.6 Use data to infer or predict that the total amount of mass in closed system stays the same

Standard 3.3: Understand forces and motion

- 3.3.1 Explain that energy can change from one form to another
- 3.3.2 Explain the law of conservation of matter and energy
- 3.3.3 Describe variables that change an object's speed, direction, or both and identify and describe forces that cause change in motion
- 3.3.4 Interpret the relationships of distance versus time, speed versus time, and acceleration versus time graphs
- 3.3.5 Describe Newton's Laws of Motion; identify example and illustrate qualitatively and quantitatively.
- 3.3.6 Use data to determine or predict the overall effect of multiple forces on position, speed, and direction of motion of objects.

4. EARTH AND BEYOND

Standard 4.2: Understand the composition and structure of the universe and the Earth's place in it

- 4.2.1 Describe our sun, its place in our galaxy, and the galaxy's place and relative magnitude in the universe
- 4.2.2 Describe our solar system, including planets, moons, comets and asteroids
- 4.2.3 Know the structure of the universe (e.g. black holes, quasars, nebula...)
- 4.2.4 Know that the phases of the moon are caused by the moon's orbit around the earth, which changes what part of the moon is lighted by the sun and how much of that part can be seen from the earth
- 4.2.5 Explain how technology has helped humans to learn more about the universe

5. ENVIRONMENTAL SCIENCES

Standard 5.1: Understand atmospheric processes and cycles

- 5.1.1 Explain the importance of biodiversity

Standard 5.3: Identify, investigate and evaluate environmental problems and issues

- 5.3.1 Give examples of human impact on various ecosystems

Standard 5.4: Develop an understanding and commitment to environmental responsibility

- 5.4.1 Explain how human activities affect global and local sustainability
- 5.4.2 Describe factors affecting population growth of all organisms, including humans
- 5.4.3 Explain how the environment is perceived differently by various cultures
- 5.4.4 Explain and cite examples of how humans shape the environment