

Buoyancy

Grades K-4

Science as Inquiry

Abilities necessary to do scientific inquiry

- Ask a question about objects, organisms, and events in the environment.
- Plan and conduct a simple investigation.
- Employ simple equipment and tools to gather data and extend the senses.

Understandings about scientific inquiry

- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
- Scientists use different kinds of investigations depending on the questions they are trying to answer. Types of investigations include describing objects, events, and organisms; classifying them; and doing a fair test (experimenting).
- Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists obtain using only their senses.
- Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations.

Physical Science

Properties of objects and materials

- Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools, such as rulers, balances, and thermometers.

Position and motion of objects

- The position and motion of objects can be changed by pushing or pulling. The size of the change is related to the strength of the push or pull.

Science and Technology

Understandings about science and technology

- People have always had questions about their world. Science is one way of answering questions and explaining the natural world.

Grades 5-8

Science as Inquiry

Abilities necessary to do scientific inquiry

- Identify questions that can be answered through scientific investigations.
- Design and conduct a scientific investigation.
- Use appropriate tools and techniques to gather, analyze, and interpret data.
- Develop descriptions, explanations, predictions, and models using evidence.

Understandings about scientific inquiry

- Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.
- Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.

Physical Science

Motions and forces

- If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.

History and Nature of Science

Nature of science

- Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science, there is much experimental and observational confirmation. Those ideas are not likely to change greatly in the future. Scientists do and have changed their ideas about nature when they encounter new experimental evidence that does not match their existing explanations.

Grades 9-12

Science as Inquiry

Abilities necessary to do scientific inquiry

- Identify questions and concepts that guide scientific investigations.
- Design and conduct scientific investigations.

Understandings about scientific inquiry

- Scientists usually inquire about how physical, living, or designed systems function. Conceptual principles and knowledge guide scientific inquiries. Historical and current scientific knowledge influence the design and interpretation of investigations and the evaluation of proposed explanations made by other scientists.
- Scientists conduct investigations for a wide variety of reasons. For example, they may wish to discover new aspects of the natural world, explain recently observed phenomena, or test the conclusions of prior investigations or the predictions of current theories.
- Scientific explanations must adhere to criteria such as: a proposed explanation must be logically consistent; it must abide by the rules of evidence; it must be open to questions and possible modification; and it must be based on historical and current scientific knowledge.

Physical Science

Motions and forces

- Objects change their motion only when a net force is applied. Laws of motion are used to calculate precisely the effects of forces on the motion of objects. The magnitude of the change in motion can be calculated using the relationship $F = ma$, which is independent of the nature of the force. Whenever one object exerts force on another, a force equal in magnitude and opposite in direction is exerted on the first object.
- Gravitation is a universal force that each mass exerts on any other mass. The strength of the gravitational attractive force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.

Science and Technology

Understandings about science and technology

- Scientists in different disciplines ask different questions, use different methods of investigation, and accept different types of evidence to support their disciplines, including engineering. New disciplines of science, such as geophysics and biochemistry often emerge at the interface of two older disciplines.

History and Nature of Science

Historical perspectives

- Occasionally, there are advances in science and technology that have important and long-lasting effects on science and society. Examples of such advances include the following: Copernican revolution, Newtonian mechanics, relativity, geologic time scale, plate tectonics, atomic theory, nuclear physics, biological evolution, germ theory, Industrial revolution, molecular biology, information and communication, quantum theory, galactic universe, medical and health technology.