SAMPLE

K-12

SCIENCE

CURRICULUM

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"Science literacy for all," "less is more," and "first in the world in math and science achievement," are the catch phrases for improving science education in our nation's schools. Since 1989, Nebraska science educators have been aware of and involved with national reform efforts such as the National Science Teachers Association's "Scope, Sequence, and Coordination Project," and the American Association for the Advancement of Science's "Project 2061." In 1994, the Nebraska Department of Education published the Mathematics and Science Frameworks for Nebraska Schools. The National Research Council released the National Science Standards in December of 1995. Now science educators and curriculum developers have numerous resources to use as they decide what science knowledge and processes students need to know and how do they best learn those concepts.

The influx of all of these documents has overwhelmed science educators as they develop classroom curriculum guides. Questions are being asked such as "Which is the best one to use?" and "Is the content and philosophy of one document in conflict with another document?" However, the most pressing question Nebraska educators are asking is "How does all of this information translate into a meaningful science curriculum for our schools?" This Sample K-12 Articulated Curriculum provides Nebraska school districts with an example of a K-12 science curriculum guide to ensure science literacy for all students. It reflects a consensus of the content standards included in all of the recent science improvement efforts.

Because Nebraska has a strong tradition of local control, this is a sample resource, not a state mandate. It is intended to give science educators an idea of how the National Science Standards and Nebraska Science Frameworks could be implemented in local curriculum guides. Nebraska educators who have been involved with various science improvement efforts throughout the state are the authors. Care was taken not to include specific lessons to meet the content standards included in this sample. Each Nebraska district is still responsible to determine what curriculum materials to use in their schools. After reviewing this guide, local district curriculum developers may decide to closely follow this guide in the development of their district's science curriculum. Districts have the option of changing the sequence of these science standards. The content standard on life cycles in third grade could be moved to the second or fourth grade or the seventh grade standard on evidence, models, and explanation could be moved up or down a grade level. More detail about each of the content standards may be found in National Science Standards and Mathematics and Science Frameworks for Nebraska Schools.

Teachers from every grade level must be directly involved in the creation of their district's K-12 science curriculum. A look at the Table of Contents reveals an articulated science curriculum for grades K-10. Because Nebraska is a local control state, each district determines the amount of science credit a student must earn to graduate from high school. In most schools there is a two-year requirement. Enrollment figures for Nebraska reveal that most students meet complete science requirements during their freshman and sophomore years. Many students do not have a science course during their last two years of school. High schools may wish to develop integrated (life, earth, physical) science courses to ensure that all students learn the processes and concepts of all

science content standards in this sample curriculum. This includes standards in the familiar areas of physical, life, and earth, as well as standards for unifying concepts, inquiry, science and technology, personal and social perspectives, and the history and nature of science.

Senior high teachers of traditional content courses such as biology, chemistry, and physics should use both the ninth and tenth grade curriculum examples when developing their classroom curriculum guides. This will ensure that the subject area content is included, as well as unifying themes, inquiry, science and technology, personal and social perspectives, history and nature of science, and connections with other science disciplines.

Science literacy is necessary for all citizens to make choices in every day life, to participate in public discussions, to function in today's work force, and to enjoy our natural world. A K-12 science curriculum should ensure that all students have the opportunity to learn what is essential for scientific literacy. Nebraska schools are among the best in the nation. The Sample K-12 Science Curriculum is a resource to make the best even better.

KINDERGARTEN

Unifying Concepts and Processes in Science

Systems, order, and organization:
- Most objects are made of parts.
- Most objects are part of a whole.
- Objects can be sorted according to their properties.
- Objects may have more than one property.

Evidence, models, and explanation:
- Many of the toys children play with are like real things in some ways.
- Scientific inquiry starts with careful observation.

Constancy, change, and measurement
- Things stay the same in some ways and change in some ways.

Form and function
- Objects have many characteristics.

Science as Inquiry

Abilities necessary to do scientific inquiry:
- Ask questions about objects, organisms, and events in the student's environment.
- Manipulate objects in the student's environment.
- Describe objects in the student's environment using the five senses.

Understandings about scientific inquiry:
- Science involves asking and answering questions.

Physical Science

Properties of objects and materials:
- Objects have many properties.

Position and motion of objects:
- The position of an object can be described by locating it relative to another object (e.g. next to, behind, up, down).

Light, heat, electricity, and magnetism:
- Magnets can be used to make some things move without being touched.

Life Science

Characteristics of organisms:
- Organisms have basic needs.
- Different types of organisms live in different places.

Life cycles of organisms:
- Plants and animals closely resemble their parents.

Earth and Space Science

Properties of earth materials:

- Soils and rocks are materials of the earth.
- Soil is used to grow the plants we use as food.
- Soils have properties of color and texture.

Objects in the sky:

- Many things can be observed in the sky.
- The sun can be seen only in the daytime, whereas the moon can be seen sometimes at night and sometimes during the day.

Changes in earth and sky:

- Weather changes from day to day.

Science and Technology

Understanding about science and technology:

- Science tools used in exploration include balances, magnifiers, thermometers, and other measuring instruments.

Science in Personal and Social Perspectives

Personal health:

- Safety and security are basic needs of humans.

FIRST GRADE

Unifying Concepts and Processes in Science

Systems, order, and organization:
- A system may not work if some of its parts are missing.
- Objects in a group share some characteristics while differing in others.

Evidence, models, and explanation:
- A model is different from the real thing but can be used to learn about the real thing.
- Scientists raise questions about the world around them and seek answers to some of them by combining observations and trying things out.

Constancy, change, and measurement:
- Some things can be observed to move from place to place while other things stay in one location.

Form and function:
- Models can be used to represent features of objects being described.

Science as Inquiry

Abilities necessary to do scientific inquiry:
- Make observations to help answer questions.
- Measure objects in the student's environment (e.g. written, illustrations, oral).
- Communicate observations.

Understandings about scientific inquiry:
- In science, it is helpful to work with a team and share findings with others.

Physical Science

Properties of objects and materials:
- Objects are made of one or more materials.

Position and motion of objects:
- The position and motion of objects can be changed by pushing or pulling.
- Things near the earth fall to the ground unless something holds them up.

Light, heat, electricity, and magnetism:
- Magnets attract some kinds of materials.

Life Science

Characteristics of organisms:
- Each plant and animal has different structures that serve different functions in growth, survival, and reproduction.

Organisms and environments:
- All animals depend on plants.

Earth and Space Science

Properties of earth materials:
- Water is a material of the earth.
- Water is needed to support the growth of plants in our food supply.
- Soils vary in their ability to support the growth of plants.

Objects in the sky:
- The sun's properties and location can be observed and described.
- The sun provides light.

Changes in earth and sky:
- Weather changes with the seasons.
- The sun has a pattern of movement.

Science and Technology

Abilities of technological design:
- Develop the ability to explain problems in their own words.

Understanding about science and technology:
- Tools help scientists make better observations, measurements, and equipment for investigations.
- Problem solving investigations may occur within the home and school environments.

Science in Personal and Social Perspectives

Personal health:
- Individuals have responsibility for their own health.

History and Nature of Science

Science as a human endeavor:
- Men and women have made a variety of contributions throughout the history of science and technology.
- Science and technology have been practiced by people for a long time.

SECOND GRADE

Unifying Concepts and Processes in Science

Systems, order, and organization:
- When parts are put together, they can do things that they couldn't do by themselves.
- Some things are more likely to happen than others.
- Some events can be predicted more accurately than others.
- Sometimes people aren't sure what will happen because they don't know everything that might be having an effect on the event.
- Often a person can find out about a group of things by studying just a few of them.

Evidence, models, and explanation:
- One way to describe something is to say how it is like something else.

Constancy, change, and measurement;
- Things in nature and things people make have very different sizes, weights, ages, and speeds.
- Quantitative estimates of familiar lengths, weights, and time intervals can be confirmed by measurement.
- Things can change in different ways, such as in size, weight, color, and movement.
- Some changes are so slow or fast that they are hard to observe.

Form and function:
- The shape of an object is frequently related to use.

Science as Inquiry

Abilities necessary to do scientific inquiry:
- Make thorough observations to help answer questions.
- Compare and contrast objects and events and communicate their findings.
- Identify a simple problem, test a possible solution to the problem, and communicate the results (guess, test, tell).

Understandings about scientific inquiry:
- Instruments can be used to extend the senses.
- Learning can come from careful observation and simple experiments.

Physical Science

Properties of objects and materials:
- Objects can be described by their properties.

Position and motion of objects:
- An object's motion can be described by tracing and measuring its position over time.

Light, heat, electricity, and magnetism:
- Light travels in a straight line until it strikes an object.
- Heat can move from one object to another.

Life Science

Characteristics of organisms:
- Plants and animals are grouped by their features.
- Modern organisms may resemble extinct organisms.

Life cycles of organisms:
- Plants and animals have life cycles that include birth, growth, reproduction, and death.

Earth and Space Science

Properties of earth materials:
- Rocks come in all sizes from boulders to grains of sand.
- Soils differ in their capacity to retain water.
- Soil contains many living things.

Objects in the sky:
- The sun's movements can be observed and described.
- The sun's light provides the heat which influences the temperature at the earth's surface.

Changes in earth and sky:
- The pattern of the sun's movement changes slowly over the seasons.

Science and Technology

Abilities of technological design:
- Express how well their results or designs worked.

Understanding about science and technology:
- Develop the ability to work individually and collaboratively and to use suitable science tools.

Science in Personal and Social Perspectives

Personal health:
- Balanced nutrition is essential to health.

Changes in environments:
- Environments are the space, conditions, and factors around an individual.

History and Nature of Science

Science as a human endeavor:
- People choose science as a career or hobby.

THIRD GRADE

Unifying Concepts and Processes in Science

Systems, order, and organization:
- Events can be classified as probable, improbable, possible, or impossible.
- A group of objects may be sub classified in one or more ways.

Evidence, models, and explanation:
- Sketches can be useful in explaining procedures or ideas.

Constancy, change, and measurement:
- Some predictions can be made based on what is known about the past, assuming that conditions are pretty much the same now.

Form and function:
- The use of an object is related to its form.

Science as Inquiry

Abilities necessary to do scientific inquiry:
- Pose a question that can be investigated.
- Consult reliable sources for scientific information.
- Construct a test to investigate student's questions.
- Choose and appropriately use measuring tools.
- Demonstrate alternate ways to display data (diagram, chart, model, graph).
- Use data to construct reasonable explanations.
- Communicate results.

Understandings about scientific inquiry:
- Scientific investigations require comparing an answer with what scientists already know about the world.
- Scientists use different kinds of investigations depending on the questions they are trying to answer.
- Explanations are developed from observation and are based on what is already known about the world.
- Develop clearly stated instructions that others can follow in carrying out a procedure.
- Science experiments normally have reproducible results and work the same way when repeated.

Physical Science

Properties of objects and materials:
- Properties of objects can be measured using tools such as rulers, balances, and thermometers.
- Materials can exist in different states (solid, liquid, and gas).
- Common materials can be changed between states of matter by heating or cooling.

Light, heat, electricity, and magnetism:
- Heat can be produced in many ways (burning, rubbing, mixing).

Life Science

Characteristics of organisms:
- Internal and external cues influence behavior.

Organisms and environments:
- Plants and animals cause changes in their environments.
- An organism's pattern of behavior is related to its environment.
- Environmental change influences the life and death of plants and animals.
- All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat plants for food.

Earth and Space Science

Properties of earth materials:
- Earth materials may differ in their physical and chemical properties.
- Smaller rocks come from breakage and the weathering of bedrock and larger rocks.

Objects in the sky:
- The moon and stars have properties, locations, and movements that can be observed and described.

Changes in earth and sky
- Erosion and weathering change the surface of the earth slowly.
- The observable shape of the moon changes from day to day in a cycle that lasts about a month.

Science and Technology

Abilities of technological design:
- Communicate via oral, written, or other creative means, the results of their scientific explorations.

Abilities to distinguish between natural objects and objects made by humans:
- Understand that objects can be classified as either natural or of human design.

Science in Personal and Social Perspectives

Personal health:
- Regular exercise is important to the maintenance and improvement of health.

Characteristics and changes in populations:
- Human populations include groups of individuals living in particular locations.

Types of resources:
- Resources are things that we get from the living and non living environment to meet the needs and wants of a population.

Science and technology in local challenges:
- New ideas and inventions continue to affect people.

History and Nature of Science

Science as a human endeavor:

- Men and women have made a variety of contributions throughout the history of science and technology.
- Within an investigative team, each member has specific responsibilities and duties to perform.

FOURTH GRADE

Unifying Concepts and Processes in Science

Systems, order, and organization:
- Something may not work as well, or at all, if a part of it is missing, broken, worn out, mismatched, or misconnected.
- In something that consists of many parts, the parts usually influence one another.
- A small part of something may be special in some way, yet not give an accurate picture of the whole.

Evidence, models, and explanation:
- Records need to be kept during investigations and not created or altered later.

Constancy, change, and measurement:
- Finding out what the biggest and smallest possible values of something are is often as revealing as knowing the average value.
- Some features of things may stay the same even when other features change.
- Some patterns look the same when they are shifted, turned, reflected, or seen from a different direction.
- Numerical data can be useful in describing and comparing objects and events.

Form and function:
- Almost everything has limits on how big or small it can be.

Science as Inquiry

Abilities necessary to do scientific inquiry:
- Learn to pose a question that can be investigated.
- Construct a test to investigate student's questions.
- Use data and information to construct reasonable explanations.
- Base explanations on observations.
- Analyze alternative explanations.
- Communicate procedures and explanations.

Understandings about scientific inquiry:
- Good explanations are based on evidence from systematic scientific investigations.
- Scientists make the results of their investigations public, communicating in ways that enable others to repeat the investigation.
- Scientists review and ask questions about the results of other scientists' work.

Physical Science

Properties of objects and materials:
- Materials may react with other materials.
- Materials may be made up of parts that are too small to be seen without magnification.

Position and motion of objects:
- Vibrating objects produce sound.
- The pitch of sound can be varied by changing the rate of vibration.

Light, heat, electricity, and magnetism:

- Electrical circuits require a complete loop through which an electrical current can pass.
- Electricity in circuits can produce light, heat, sound, and magnetic effects.
- Magnets attract and repel each other and certain kinds of other materials.
- Light can be reflected by a mirror, refracted by a lens, or absorbed by an object.

Life Science

Life cycles of organisms:
- Characteristics of organisms are inherited or environmentally influenced.

Organisms and environments:
- Humans depend on their natural and constructed environments.

Earth and Space Science

Properties of earth materials:
- Fossils provide evidence of plants and animals that lived long ago.
- Fossils provide evidence of the environment that supported them.
- Earth materials are useful in industry and as sources of fuel.

Objects in the sky:
- Clouds have characteristics, locations, and movements that can be observed and described.

Changes in earth and sky:
- Weather can be described in measurable quantities, temperature, wind direction, and precipitation.

Science and Technology

Understanding about science and technology:
- Science is a way of answering questions and explaining the natural world.
- Men and women of all cultures have a history of inventing different ways of solving problems.
- Engineers and scientists work together, using technology to help explain and solve today's problems.

Science in Personal and Social Perspectives

Personal health:
- Different substances can damage the body and how it functions.
- Regular exercise is important to the maintenance and improvement of health.
- Tobacco increases the risk of illness.
- Alcohol and other drugs are often abused substances.
- Food provides energy and nutrients for growth and development.

Characteristics and changes in populations:
- The size of a population can increase or decrease.

Types of resources:
- Some resources are basic materials, such as air and water; some are produced from basic resources, such as food and fuel; and some resources are non-material, such as beauty and security.
- The supply of many resources is limited.

Changes in environments:
- Changes in environments can be natural or influenced by humans.

- Different consequences result from environmental changes occurring at different rates.

Science and technology in local challenges:

- Science and technology have greatly improved the quality of life for most people.

History and Nature of Science

Science as a human endeavor:

- Science has been practiced by different individuals in different cultures.

FIFTH GRADE

Unifying Concepts and Processes in Science

Systems, order, and organization:

- Events in nature often have probabilities which can be measured.
- It is easier to predict how many of a group will experience something than exactly which members will experience it.
- It is easier to predict how often something will happen than exactly when it will happen.
- Summary predictions are usually more accurate for large collections of events than for just a few.
- Extremely unlikely events may occur fairly often in very large populations.
- There is a danger in choosing only the data that is expected by the person doing the choosing.
- Objects and events can be classified as members of an ascending hierarchy.

Evidence, models, and explanation:

- Seeing how a model works after changes are made to it may suggest how the real thing would work if the same changes were done to it.
- Geometric figures, number sequences, graphs, diagrams, sketches, number lines, maps, and stories can be used to represent objects, events, and processes in the real world, although such representations can never be exact in every detail.
- Conclusions must be supported by reasons.
- Tables and graphs can help identify relationships.

Constancy, change, and measurement:

- Measurements and computations can be checked by comparing them to typical values.
- Often the best way to tell what is happening during a change is to make a table or graph of measurements.

Evolution and equilibrium:

- Sometimes a series of changes occurs so slowly or so rapidly that it is difficult to document the evolution.
- In evolving systems, change can be gradual, steady, repetitive, irregular, or in more than one way at the same time.

Science as Inquiry

Abilities necessary to do scientific inquiry:

- Differentiate those questions which are scientific in nature from those which are not.
- Demonstrate the ability to make systematic observations and accurate measurements of variables.
- Choose appropriate tools and techniques to gather data and display data.
- Differentiate between an explanation and a description.
- Listen to and respect the explanations proposed by other students.
- Communicate experimental methods, follow instructions, describe observations, summarize results, and tell others about their investigations and explanations.
- Use mathematics to gather, organize, present data, and ask further questions.

Understandings about scientific inquiry:

- Mathematics is important in all aspects of scientific inquiry.
- Scientific investigations sometimes result in new ideas and phenomena for study.

Physical Science

Properties and changes in properties of matter:

- Mixtures of substances can be separated using the characteristic properties of each.
- There are more than 100 known elements which may combine to form compounds.

Motions and forces:

- An object in motion continues in a straight line unless acted upon.
- Change in force applied to an object in motion will change the speed or direction of that object.

Transfer of energy:

- Energy is transferred in many ways.
- Heat flows from warmer to cooler objects until both reach the same temperature.

Life Science

Structure and function in living systems:

- Living systems at all levels of organization demonstrate the complementary nature of structure and function.
- All organisms are composed of cells.
- Human organisms have interacting systems.

Reproduction and heredity:

- Reproduction is a characteristic of all living systems.
- In sexual reproduction of organisms, females produce eggs and males produce sperm.

Regulation and behavior:

- All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.

Populations and ecosystems:

- A population consists of all individuals living together at a given place and time.
- All populations living together and the physical factors with which they interact compose an ecosystem.
- Populations of organisms can be categorized as producers and consumers by the function they serve in the ecosystem.
- Energy from the sunlight is passed through food webs in an ecosystem.

Earth and Space Science

Structure of the earth system:

- The solid earth is layered with a lithosphere, hot, convecting mantle, and dense metallic core.
- Old rocks at the earth's surface weather, forming sediments that are buried, then compacted, heated, and often re-crystallized into new rock.
- New rocks may be brought to the surface by the forces that drive plate motion thus continuing the rock cycle.
- Land forms are the result of a combination of constructive and destructive forces. Constructive forces include crust deformation, volcanic eruptions, and deposition of sediment; destructive forces include weathering and erosion.

Earth in the solar system:

- The earth is the third planet from the sun in a system that includes the moon, sun, eight other planets, and smaller objects such as asteroids and comets.
- The sun, an average star, is the central and largest body in the solar system.
- Stars are innumerable, unevenly dispersed, and of unequal brightness.

Science and Technology

Abilities of technological design:

- Show the use of appropriate technology for a given situation or problem.
- Understand that there are practical limits to the use of technology, including cost, time and availability of materials.

Understanding about science and technology:

- The benefits of science and technology are not available to all people.

Science in Personal and Social Perspectives

Populations, resources, and environments:

- Overpopulation degrades environments.

Science and technology in society:

- Science influences society through its knowledge and world view.
- People, cultures, and events in history have advanced science and technology.
- Scientists and engineers work in many different settings.

History and Nature of Science

Science as a human endeavor:

- Women and men of various social and ethnic backgrounds, working alone or in teams, engage in the activities of science, engineering, and related fields such as health professions.

Nature of Science:

- Scientific understanding changes when new experimental evidence does not match existing explanations.

History of science:

- Many individuals have contributed to the traditions of science.

SIXTH GRADE

Unifying Concepts and Processes in Science

Systems, order, and organization
- A system can include processes as well as things.
- Thinking about things as systems means looking at how every part relates to others.
- How probability is estimated depends on what is known about the situation.

Evidence, models, and explanation
- Models are often used to think about processes that happen too slowly, too quickly, or on too small a scale to observe directly, or that are too vast to be changed deliberately, or that are potentially dangerous.
- It is important in science to keep honest, clear, and accurate records.
- Predictions can be based on data from similar conditions in the past.

Constancy, change, and measurement
- Appropriate units for answers can be determined by examining the units of the inputs to the calculation.
- Symmetry or the lack of it may determine properties of many objects.

Form and function
- The function of an object is frequently related to its form; the form of an object frequently limits its function.

Science as Inquiry

Abilities necessary to do scientific inquiry:
- Refine and refocus broad and ill-defined questions to allow investigation.
- Demonstrate ability to identify and control variables.
- Use subject matter knowledge to conduct investigations and create explanations.
- Recognize data that does not fit a pattern.

Understandings about scientific inquiry:
- Scientific investigations sometimes generate new methods or procedures for an investigation or develop new technologies to improve the collection of data.

Physical Science

Properties and changes in properties of matter
- Chemical elements do not break down during normal chemical reactions.

Motions and forces:
- Motion of an object can be described by its position, direction, and speed.
- The force of friction may slow down or stop an object's motion.

Transfer of energy:
- Light interacts with matter by transmission, absorption, or scattering.

Life Science

Structure and function in living systems:
- Cells carry on many functions needed to sustain life.
- Disease in organisms results from an intrinsic failure in structures and functions or damage by infection.
- All organisms including plants and animals are classified by their characteristics.

Reproduction and heredity:
- Every organism requires a set of instructions for specifying its heredity traits.

Regulation and behavior:
- Behavior is one kind of response an organism can make to an internal or environmental stimulus.

Earth and Space Science

Structure of the earth system:
- Soil consists of weathered rocks and decomposed organic material from dead plants, animals, and bacteria.
- Soils are often found in layers, with each having a different composition and texture.
- Living organisms have played many roles in the earth system.
- Water, a solvent, passes through the water cycle dissolving minerals and gases and carrying them to the oceans.

Earth's history:
- Fossils provide evidence of how life and environmental conditions have changed.
- Layers of sedimentary rock confirm the long history of the earth and its changing life forms.

Earth in the solar system:
- Most objects in the solar system are in regular and predictable motion.
- Predictable motions explain such phenomena as the day, phases of the moon, and eclipses.

Science and Technology

Abilities of technological design:
- Organize materials and plan work using cooperative learning groups, when appropriate.
- Choose suitable tools and techniques to ensure adequate accuracy during investigations.
- Self-evaluate and modify technological designs or products when necessary.

Science in Personal and Social Perspectives

Personal health:
- The potential for accidents and the existence of hazards imposes the need for injury prevention.

Natural hazards:
- Internal and external processes of the earth system cause natural hazards.

Risks and benefits:
- Natural, chemical, biological, social, and personal hazards have risks.

Science and technology in society:

- Technology influences society through its products and processes.

History and Nature of Science

Science as a human endeavor:

- Science endeavors require different abilities, basic human qualities, and scientific habits of mind.

Nature of science:

- It is normal for scientists to differ with one another about the interpretation of the evidence or theory being considered.

SEVENTH GRADE

Unifying Concepts and Processes in Science

Systems, order, and organization:
- The output of one part of a system can become the input to other parts.
- Feedback can serve to control what goes on in a system.
- Comparison of data from two groups should involve mathematical analysis.

Evidence, models, and explanation:
- Models can be displayed on a computer and then modified to see what happens.

Constancy, change, and measurement:
- As the complexity of any system increases, gaining an understanding of it depends increasingly on summaries, such as averages and ranges, and on descriptions of typical examples of that system.

Evolution and equilibrium:
- A system may stay the same because nothing is happening or because things are happening but exactly counterbalance one another.
- Many systems contain feedback mechanisms that serve to keep changes within specified limits.

Science as Inquiry

Abilities necessary to do scientific inquiry:
- Identify the assumptions that influence and guide their investigations.
- Propose and critique alternative explanations and procedures.
- Use tools to analyze and interpret data.
- Cite subject matter knowledge when making judgments.
- Decide what data to use and what data to ignore in forming conclusions.
- Form a logical argument about cause-and-effect relationships in experiments.
- Summarize results of others' investigations.
- Use mathematics to structure convincing explanations.

Understandings about scientific inquiry:
- Technology used to gather data enhances accuracy.
- Technology helps scientists to analyze data more quickly and efficiently.
- Scientists suggest alternative explanations for the same observations.

Physical Science

Properties and changes in properties of matter:
- Substances often are placed in categories or groups if they react in similar ways.

Motions and forces:
- Motion of an object can be measured and represented on a graph.

Transfer of energy:
- The sun's energy arrives as infrared, ultraviolet, or visible light.
- Visible light is a narrow range of wavelengths in the electromagnetic spectrum.
- Energy cannot be created or destroyed.

Life Science

Structure and function in living systems:
- Specialized cells perform specialized functions in multi-cellular organisms.

Reproduction and heredity:
- Inherited traits are determined by genes.

Regulation and behavior:
- Regulation of an organism's internal environment involves sensing its internal environment and changing physiological activities to keep conditions within the range required to survive.
- All organisms depend on each other.

Populations and ecosystems:
- The number of organisms an ecosystem can support depends on the resources available and abiotic factors.

Diversity and adaptation of organisms:
- The unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical processes, and the evidence of common ancestry.

Earth and Space Science

Structure of the earth system:
- Lithospheric plates, the size of continents and oceans constantly move at a rate of centimeters per year in response to the movement of the mantle.
- Major geological events, such earthquakes, volcanic eruptions, and mountain building result from these plate movements.
- Water, which carves the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the water cycle.
- The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor.
- The atmosphere has different properties at different levels.

Earth's history:
- The earth processes we see today, including movement of lithospheric plates and changes in atmospheric composition, are similar to those that occurred in the past.
- Folding, breaking, and uplifting change the sedimentary sequence.

Earth in the solar system:
- Gravity is the force that keeps planets in orbit around the sun and governs the rest of the motion in the solar system.
- Gravity alone holds us to the earth's surface and explains the phenomena of the tides.

Science and Technology

Abilities of technological design:
- Summarize the stages of problem identification, solution design, implementation, and evaluation of their work.

Understanding about science and technology:
- Technology provides tools for investigations, inquiry, and analysis.

Science in Personal and Social Perspectives

Personal health:

- Natural environments may contain substances harmful to human beings.

Populations, resources, and environments:

- Causes of environmental degradation and resource depletion vary locally and globally.

Natural hazards:

- Hazardous activities induced by humans can accelerate natural changes.

Science and technology in society:

- Scientists and engineers follow ethical codes in their research.

History and Nature of Science

Nature of science:

- Scientists formulate and test their explanations using observation, experiments, and theoretical and mathematical models.

History of science:

- Tracing the history of science can show how difficult it was for scientific innovators to break through commonly held beliefs of their time to reach conclusions we take for granted.

EIGHTH GRADE

Unifying Concepts and Processes in Science

Systems, order, and organization:

- Any system is usually connected to other systems, both internally and externally; thus a system may be thought of as containing subsystems and as being a subsystem of a larger system.
- Complex classification schemes may contain multiple criteria for determining membership in a class.

Evidence, models, and explanation:

- Different models can be used to represent the same thing.
- Different explanations can often be given based on the same evidence and it is not always possible to tell which one is correct.
- Curiosity, honesty, openness, and skepticism are highly regarded in science.

Constancy, change, and measurement:

- Properties of systems that depend on volume, such as capacity and weight, change out of proportion to properties that depend on area, such as strength or surface properties.
- In any measurement, the degree of precision needed should be determined prior to measuring.

Evolution and equilibrium:

- Physical and biological systems tend to change until they become stable and then remain that way unless their surroundings change.
- Things that change in cycles, such as the seasons or body temperature, can be described by their cycle length or frequency, what the highest and lowest values are, and when they occur.

Science as Inquiry

Abilities necessary to do scientific inquiry:

- Apply scientific ideas, concepts, and relationships to their formulations of scientific questions.
- Clarify those ideas that are influencing and guiding their inquiry.
- Make connections between the content of science and the contexts within which scientists develop new knowledge.
- State explanations in terms of the relationship between two or more variables.
- Remain open to and acknowledge different ideas and explanations, be able to accept the skepticism of others, and consider alternative explanations.

Understandings about scientific inquiry:

- Current scientific knowledge and understanding guide scientific investigations.
- Different scientific disciplines employ different methods, core theories, and standards to advance scientific knowledge and understanding.
- Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories.
- The scientific community accepts and uses explanations until those explanations are displaced by better scientific ones.
- Scientists evaluate alternative explanations by examining evidence, comparing evidence, identifying faulty reasoning, and pointing out statements that go beyond the evidence.

Physical Science

Properties and changes in properties of matter:
- Properties of substances are not dependent on the size of sample.
- Compounds form when chemical reactions occur.
- In chemical reactions, total mass is conserved.

Motions and forces:
- Change in forces applied to an object in motion will change the speed or direction of that object.

Transfer of energy:
- In most chemical and nuclear reactions, energy is transferred into or out of a system.
- Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced.

Life Science

Reproduction and heredity:
- Characteristics result from inherited traits plus environmental interactions.
- Selective breeding causes small differences between parents and offspring to accumulate in successive generations so that descendants are very different from their ancestors.

Regulation and behavior:
- Behavior evolves through environmental adaptation.

Populations and ecosystems:
- A population consists of all individuals living together at a given place and time.
- All populations living together and the physical factors with which they interact compose an ecosystem.
- Populations of organisms can be categorized as producers and consumers by the function they serve in the ecosystem.

Diversity and adaptation of organisms:
- Diversity results from gradual biological evolution.
- Environmental changes may result in species extinction.

Earth and Space Science

Structure of the earth system:
- Global patterns of atmospheric movement influence local weather.
- Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.
- Clouds, formed by the condensation of water vapor, affect weather and climate.

Earth's history:
- Earth history is influenced by occasional catastrophes, such as the impact of an asteroid or comet.

Earth in the solar system:
- The sun is the major source of energy for phenomena on the earth's surface, such as growth of plants, winds, ocean currents, and the water cycle.
- Seasons result from variations in the amount of the sun's energy absorbed by the surface, due to the tilt of the earth's rotation on its axis.

Science and Technology

Abilities of technological design:

- Using technology to reduce risks, increase safety, and improve cost and efficiency often results in new technology.

Understanding about science and technology:

- Technology provides instruments and techniques which allows observations otherwise limited due to quantity, distance, location, size, and speed.
- Science helps drive technology and technology is essential to science.
- Technological changes are often accompanied by social, political, and economic changes.
- Science cannot answer all questions and technology cannot solve all human problems.

Science in Personal and Social Perspectives

Natural hazards:

- Natural hazards can present personal and societal challenges.

Risks and benefits:

- Risk analysis considers the type of hazard and estimates the number of people that may be exposed and the number likely to suffer consequences.
- Individuals can use a systematic approach to thinking critically about risks and benefits.
- Personal and social decisions are made based on perceptions of benefits and risks.

Science and technology in society:

- Societal challenges often inspire questions for scientific research, and social priorities often influence research priorities through the availability of funding for research.
- Science and technology have contributed to economic growth and productivity.
- Science cannot answer all questions and technology cannot solve all human problems or meet all human needs.

History and Nature of Science

Nature of science:

- It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists.
- While scientists may disagree during evaluations, they do agree that questioning, response to criticism, and open communication are integral to the process of science.

NINTH GRADE

Unifying Concepts and Processes in Science

Systems, order, and organization:

- Even in some very simple systems it may not always be possible to predict accurately the result of changing some part or connection.
- A system usually has some properties that are different from those of its parts but appear because of the interaction of those parts.
- The larger a well-chosen sample of a population is, the better it estimates population summary statistics.
- To avoid intentional or unintentional bias, samples are usually selected by some random system.

Evidence, models, and explanation:

- The idea of modeling is to show connections of objects and processes under investigation.
- A model may give insight about how something really works or may fit observations very well without any intuitive meaning.
- The way data are displayed can make a big difference in how they are interpreted.

Constancy, change, and measurement:

- Representing large numbers in terms of powers of ten makes it easier to think about them and to compare things that are greatly different.
- Data for two groups can be compared by representing averages and spreads.
- Measurement errors may have effects on calculations
- Scale drawings can make large periods of time or long distances more easily understandable.
- When people estimate a measurement, they may also be able to say how far off that estimation might be.
- Rate is a measure of change involving comparing one measured quantity with another measured quantity.

Evolution and equilibrium:

- A system in equilibrium may return to the same state of equilibrium if the disturbances it experiences are small, but large disturbances may cause it to escape that equilibrium and eventually settle into some other state of equilibrium.

Science as Inquiry

Abilities necessary to do scientific inquiry:

- Formulate a testable hypothesis and demonstrate the logical connections between the scientific concepts guiding a hypothesis and the design of an experiment.
- Design and conduct a scientific experiment in which they use evidence, apply logic, and construct an argument for their proposed explanation.
- Formulate physical, conceptual, and mathematical models.

Understandings about scientific inquiry:

- Science studies how physical, living, or designed systems function.
- Historical and current scientific knowledge influence the design and interpretation of investigations and the evaluation of proposed explanations made by other scientists.

Physical Science

Structure of atoms:

- Matter is made up of atoms.
- Each atom has a positively charged nucleus and negatively charged electrons.
- Nuclear forces are stronger than electrical forces.
- Fission is the splitting of a large nucleus into smaller pieces; fusion is the combination of two or more nuclei.

Structure and properties of matter:

- Atoms interact with one another by transferring or sharing electrons that are furthest from the nucleus, thereby governing the chemical properties of the element.
- Repeating patterns of elements called families are found in the periodic table of elements.
- An element is composed of a single type of atom.
- Bonds between atoms are created when electrons are shared or transferred.

Chemical reactions:

- Chemical reactions occur all around us.
- Chemical reactions may release or consume energy.
- Chemical reaction rates may be either very short or long.

Motions and forces:

- Electricity and magnetism are two aspects of a single electromagnetic force.
- Electrical force is a universal force that exists between any two charged objects.

Conservation of energy and increase in disorder:

- All energy can be considered to be either kinetic or potential.
- Heat consists of random motion of particles.

Interactions of energy and matter:

- All waves contain and can transfer energy.
- Movement of both electrons and heat is dependent upon the makeup of that material.
- Energy of waves can be changed into other forms of energy, just as other forms of energy can be transformed into wave energy.

Life Science

The cell:

- Cells have particular structures that underlie their functions.
- Plant cells contain chloroplasts which are the site of photosynthesis.
- Complex multi-cellular organisms are formed as highly organized arrangements of differentiated cells.

Molecular basis of heredity:

- Most human cells contain 23 pairs of chromosomes.
- Transmission of genetic information to offspring occurs through the union of germ cells which contain one representative of each chromosome pair.
- Union of the sex cells' chromosomes explains genetic variation.

Biological evolution:

- Organisms change over a long period of time.
- Niches filled with a diversity of organisms is a result of evolution.
- Natural selection and evolution explain the fossil record.
- Millions of different species are related by descent from common ancestors.
- Biological classifications are based on similarities which reflect evolutionary relationships.

Interdependence of organisms:

- Atoms and molecules on the earth cycle among the living and non living components of the biosphere.
- Energy flows through ecosystems in one direction.
- Organisms both cooperate and compete in ecosystems.
- Organisms have the capacity to produce populations of infinite size, but environments and resources are finite.
- Human beings live within and modify the world's ecosystems.

Matter, energy, and organization in living systems:

- Distribution and abundance of organisms in ecosystems are limited by the availability of matter and energy and the ability of the ecosystem to recycle materials.
- Ecosystems have cyclic fluctuations around the state of rough equilibrium.

Behavior of organisms:

- Multi-cellular animals have nervous systems that generate behavior.
- Organisms have behavioral responses to internal changes and to external stimuli.
- Behaviors have evolved through natural selections.

Earth and Space Science

Energy in the earth system:

- Earth systems have internal and external sources of energy, both of which create heat.
- The sun is the major external source of energy.
- The outward transfer of earth's internal heat drives convection in the mantle that propels the plates comprising the earth's surface.
- Heating of the earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans producing winds and ocean currents.

Geochemical cycles:

- The earth is a system containing essentially a fixed amount of each stable chemical atom or element. Each element can exist in several chemical reservoirs.
- The rock cycle consists of the formation, weathering, sedimentation, and reformation of rock.

Origin and evolution of the earth system:

- The sun, earth, and the rest of the solar system formed from a nebular cloud of dust long ago.
- Geologic time can be estimated by observing rock sequences and using fossils to correlate the sequences at various locations.
- The ongoing evolution of the earth is a result of interactions among the solid earth, oceans, atmosphere, and organisms.
- Changes take place in intervals from minutes to hundreds of millions of years.

Origin and evolution of the universe:
- Light travels to the earth from the sun in a few minutes, from the next nearest star in four years, and from the very distant galaxies in several billion years.
- The distance light travels in a few years would take the fastest rocket thousands of years to travel.
- Stars differ from each other in size, temperature, and age, but appear to be made up of the same elements and behave according to the same principles.

Science and Technology

Abilities of technological design:
- Identify problems or needs to change and improve current technology as needed.
- Use models and simulations in planning solutions.
- Use computer software and manipulation skills to implement solutions.
- Re-evaluate solutions for continued study.
- Use models, diagrams, and demonstrations to present their results.

Understanding about science and technology:
- New disciplines often emerge at the interface of two older disciplines.

Science in Personal and Social Perspectives

Personal and community health:
- Humans have a variety of mechanisms–sensory, motor, emotional, social, and technological–that can reduce and modify hazards.
- Personal choice concerning fitness and health involves multiple factors.
- An individual's mood and behavior may be modified by substances.
- Selection of foods and eating patterns determine nutritional balance.

Population growth:
- Populations may grow or decline or reach limits to growth.

Natural resources:
- Human populations use resources in the environment in order to maintain and improve their existence.
- The earth only has finite resources.
- Humans use many natural systems as resources.

Science and technology in local, national, and global challenges:
- Science and technology indicate what could happen not what should happen.
- Humans have a major impact on other species.

History and Nature of Science

Science as a human endeavor:
- Individuals and teams contribute to the scientific enterprise.

Nature of scientific knowledge:
- The study of science uses empirical standards, logical arguments, and skepticism.
- Scientific explanations must meet exacting scientific criteria.

Historical perspectives:

- Diverse cultures have contributed scientific knowledge and technological inventions.
- There are advances in science and technology that have important and long-lasting effects on science and society.

TENTH GRADE

Unifying Concepts and Processes in Science

Systems, order, and organization:

- Understanding how things work and designing solutions to problems of almost any kind can be facilitated by systems analysis.
- A believable correlation between two variables doesn't mean that either one causes the other; perhaps some other variable causes them both or the correlation might be attributable to chance alone.

Evidence, models, and explanation:

- Computer technology has greatly improved the power and use of models by performing difficult computations and providing graphic capabilities which are useful in the design and testing of devices and structures and in the simulation of complicated processes.
- The usefulness of a model can be tested by comparing its predictions to actual observations in the real world, but a close match does not necessarily mean that the model is the only "true" model or the only one that would work.
- Answers to problems can be judged as reasonable by reviewing the process used to find them and checking against typical values.

Constancy, change, and measurement:

- Because different properties are not affected to the same degree by changes in scale, large changes in scale typically change the way that things work in physical, biological, or social systems.
- As the number of parts of a system grows in size, the number of possible internal interactions increases much more rapidly, roughly with the square of the number of parts.
- Computer spreadsheets, graphs, and databases can assist in quantitative analysis.
- Disparities between estimates and calculated answers must be analyzed and explained.

Evolution and equilibrium:

- Things can change in detail but remain the same in general.
- Sometimes counterbalancing changes are necessary for a thing to retain its essential constancy in the presence of changing conditions.
- In many physical, biological, and social systems, changes in one direction tend to produce opposing, but somewhat delayed, influences leading to repetitive cycles of behavior.
- In evolutionary change, the present arises more or less gradually from the materials and forms of the past.
- Predictable or not, the precise future of a system is not completely determined by its present state and circumstances but also depends on the fundamentally uncertain outcomes of events on the atomic scale.

Science as Inquiry

Abilities necessary to do scientific inquiry:

- Revise models based on discussion and arguments.
- Defend models based on scientific knowledge, logic, and evidence.
- Decide which explanations and models are preferable based on current scientific understanding, weighing the evidence, and examining the logic used.
- Communicate and defend a scientific argument through writing and following procedures, expressing concepts, reviewing information, summarizing data, using language appropriately, developing diagrams and charts, explaining statistical analysis, speaking clearly and logically, constructing a reasoned argument, and responding appropriately to critical comments.

Understandings about scientific inquiry:

- Scientific explanations must be logically consistent, abide by the rules of evidence, be open to questions and modification, and be based on historical and current scientific knowledge.
- Scientists engage in public dialogue as they communicate and defend the results of their inquiry.

Physical Science

Structure of atoms:

- The atom's nucleus is composed of protons (positive charge) and neutrons (neutral or no charge).
- Atoms with different numbers of neutrons are called isotopes.
- Radioactive isotopes are unstable and undergo nuclear reactions.
- Electrical forces between the nucleus and electrons (negative charge) hold the atom together.
- Atomic theory to be studied and refined scientifically.

Structure and properties of matter:

- Physical properties of compounds reflect the nature of the interactions among its molecules.
- Solids, liquids, and gases differ in their molecular distances and angles and the energy that binds them together.
- Carbon atoms can bond together in chains, rings, and other structures producing large molecules essential to life.

Chemical reactions:

- Many reactions involve transfer of electrons or hydrogen ions in bond formation.
- Chemical reactions may be accelerated by use of catalysts.
- Radical (polyatomic ion) reactions control many environmentally important processes (ozone, greenhouse effect, and fossil fuel use).

Motions and forces:

- Objects change their motion when a net force is applied.
- Gravitation is a universal force that each mass exerts on any other mass.
- Between any two charged particles, electrical force is vastly greater than the gravitational force.
- Newton's three Laws of Motion can be used to calculate precisely the effect of forces on the motion of objects.

Conservation of energy and increase in disorder:

- Total energy in the universe is constant.
- Systems tend to become less organized and more disorderly over time.

Interactions of energy and matter:

- Electromagnetic waves result when a charged object is accelerated or decelerated.
- Energy is carried in packets.
- Wave length and frequency of electromagnetic waves are inversely related.
- Atoms or molecules can be identified by the amounts of energy they emit or absorb.

Life Science

The cell:

- Most cell functions involve chemical reactions.
- Cells store and use information to guide their functions.
- Cell functions are regulated.

Molecular basis of heredity:

- All organisms have DNA that code for genetic characteristics.
- Mutations occur spontaneously and at low rates.
- Some mutations make no difference to organisms, whereas others can change cells.
- Only mutations in germ cells can create variation that changes an organism's offspring.

Interdependence of organisms:

- Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability and, if not addressed, ecosystems will be irreversibly affected.

Matter, energy, and organization in living systems:

- Cellular energy can be used as energy for life processes.
- Chemical bonds of food molecules contain energy that is stored in the cell's ATP.
- Complexity and organization of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy used to sustain the organism.
- As matter and energy flow through different levels of organization of living systems, chemical elements are recombined in different ways.

Behavior of organisms:

- Behavioral biology has implications for humans as it provides links to psychology, sociology, and anthropology.

Earth and Space Science

Energy in the earth system:

- Two primary sources of internal energy are the decay of radioactive isotopes and the gravitational energy from the earth's original formation.
- Global climate is determined by energy transfer from the sun at and near the earth's surface, this energy transfer is influenced by dynamic processes such as cloud cover and the earth's rotation and static conditions such as the position of mountain ranges and oceans.

Geochemical cycles:

- Each element on earth moves among reservoirs in the solid earth, atmosphere and organisms as part of geochemical cycles.
- Movement of matter between reservoirs is driven by the earth's internal and external sources of energy.

- Movement of matter between reservoirs is often accompanied by a change in the physical and chemical properties of matter.

Origin and evolution of the earth system:

- The early earth was very different from the planet we live on today.
- Known decay rates of radioactive isotopes in rocks can be used to measure the time since the rock was formed.
- The evolution of life caused dramatic changes in the composition of the earth's atmosphere.

Origin and evolution of the universe:

- The origin of the universe remains one of the greatest questions in science.
- The big bang theory proposes that the universe has been expanding.
- Early in the history of the universe, matter clumped together to form stars.
- Billions of galaxies now form most of the visible mass of the universe.
- Stars produce energy from nuclear reactions.
- Fusion and other processes have led to the formation of the heavy elements.

Science and Technology

Understanding about science and technology:

- Engineering is a technological approach to science and uses science to advance technology.
- Creativity, imagination, and a good knowledge base are all needed to advance the work of science and engineering.
- Advances in science and technology may challenge people's beliefs.
- Scientific knowledge is first presented to the scientific community with resulting technological knowledge often not made public because of patents.

Science in Personal and Social Perspectives

Personal and community health:

- The severity of disease symptoms is dependent on many factors
- Families serve basic health needs.
- Sexuality is basic to the physical, mental, and social development of humans.

Population growth:

- Various factors influence birth rates and fertility rates.

Environmental quality:

- Natural ecosystems provide an array of basic processes that affect humans.
- Materials from human societies affect both physical and chemical cycles on earth.
- Many factors influence environmental quality.

Natural and human-induced hazards:

- Normal adjustments of earth, such as violent storms and earthquakes, may be hazardous for humans.
- Human activities can enhance or reduce potential for hazards.
- There are slow and progressive hazards that result in problems for individuals and society.
- Humans need to assess potential dangers and risks of all hazards.

Science and technology in local, national, and global challenges:

- Understanding basic concepts should precede active debate about scientific and technological challenges.
- Progress in science and technology can be affected by social issues and challenges.
- New research and technologies must be based on informed decisions.

History and Nature of Science

Science as a human endeavor:

- Scientists have ethical traditions.
- Science functions as a part of society.

Nature of scientific knowledge:

- All scientific knowledge is, in principle, subject to change as new evidence becomes available.

Historical perspectives:

- Usually, changes in science are small modifications in extant knowledge.
- Scientific knowledge is tentative.

THEME APPENDIX

SYSTEMS, ORDER, AND ORGANIZATION

Systems–A system is an organized group of related objects or components that form a whole. Systems can consist, for example, of organisms, machines, fundamental particles, galaxies, ideas, numbers, transportation, and education. The goal of this standard is to think and analyze in terms of systems, so that students keep track of mass, energy, objects, organisms, and event.

Order–Order is the behavior of units of matter, objects, organisms or events which can be described statistically. The goal of this standard is to think in terms of probability, certainty or uncertainty.

Organization–Organization provides useful ways of thinking about the world. The goal of this standard is to describe physical and living systems at different levels of organization.

EVIDENCE, MODELS, AND EXPLANATIONS

Evidence–Evidence consists of observations and data on which to base scientific explanations. The goal of this standard is to be able to use evidence to understand interactions and predict changes.

Models–Models are tentative schemes or structures that correspond to real objects, events, or classes of events, and that have explanatory power. The goal of this standard is to be able to make and use many models, including physical objects, plans, mental constructs, mathematical equations, and computer simulations.

Explanations–Explanations incorporate existing scientific knowledge and new evidence from observations, experiments, or models into internally consistent, logical statements such as hypotheses, laws, principles, and theories. The goal of this standard is create explanations which incorporate a scientific knowledge base, logic, and higher levels of analysis.

CONSTANCY, CHANGE, AND MEASUREMENT

Constancy–Constancy characterizes some objects and properties in nature. The goal of this standard is to recognize those conditions, states, or positions that cannot change or be changed.

Change–Changes in systems vary in rate, scale, and pattern, including trends and cycles. The goal of this standard is to identify and measure changes in properties of materials, positions of object, motion, and form and function of systems.

Measurement–Measurement makes quantitative distinctions between objects, events, or systems. The goal of this standard is to achieve competency in using tools of measurement and measurement systems and to achieve understandings of scales, and rates.

EVOLUTION AND EQUILIBRIUM

Evolution–Evolution is a series of changes, some gradual and some sporadic, that account for the present form and function of objects, organisms, and natural and designed systems. The goal of this standard is to recognize that the present arises from materials and forms of the past.

Equilibrium–Equilibrium is the physical state in which forces and changes occur in opposite and off-setting directions. The goal of this standard is to recognize systems that are in equilibrium.

FORM AND FUNCTION

Form–Form or shape of an object is frequently related to its use. The goal of this standard is to be able to describe and compare things in terms of number, shape, texture, size, weight, color, motion, and other characteristics.

Function–An object's use frequently relies on its characteristics. The goal of this standard is to be able to describe and explain how objects are used.

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