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ADOPTED TEMPORARY REGULATION OF THE NEVADA STATE BOARD OF EDUCATION

STATE BOARD FOR OCCUPATIONAL EDUCATION

(Effective February 9, 1999)

Explanation: Matter in italics is new; matter in brackets [ ] is material to be omitted.

SCIENCE

Statutory Authority: 385.080

Chapter 389 of NAC is hereby amended by adding the provisions effective July 1, 1999 as follows:

KINDERGARTEN AND ELEMENTARY SCHOOL

Instruction Through Second Grade

By the end of the second grade, students know and are able to do everything required in the previous grades for courses in Science offered in public elementary schools and must include instruction designed to teach the following content standards to the pupil by the completion of second grade:

1. For the areas of Physical Science:

(a) Forces and Motion-Students understand that forces such as gravitational, electrical, and magnetic influence the motion of objects.

(1) Observe and describe objects moving at different speeds.

(2) Assemble, take apart, and reassemble constructions using interlocking blocks, erector sets, and the like.

(b) Structure and Properties of Matter-Students understand that materials have distinct properties which depend on the amount of matter present, its chemical composition, and structure.

(1) Describe objects in terms of their observable properties (e.g., state of matter, size, shape, color, texture).

(2) Put small objects together to form bigger objects.

(c) Energy and Matter: Interactions and Forms-Students understand that changes in temperature and pressure can alter states of matter. Energy exists in many forms, and one form can change into another.

(1) Describe an object as hot or cold.

(2) Investigate and describe how objects can change state (e.g., melting ice cube).

(3) Investigate and describe how sound can be produced by vibrating objects and how it has different properties (e.g., high-low, soft-loud).

(d) Chemical Reaction-Students understand that chemical reactions change substances into different substances.

(e) Nuclear and Electromagnetic Energy-Students understand that nuclear energy and electromagnetic energy are produced from both natural and human-made sources in many forms.

2. For the area of Life Science:

(a) Structure and Function-Students understand that all life forms, at all levels of organization, use specialized structures and similar processes to meet life's needs.

(1) Investigate and describe how living things grow and change.

(2) Distinguish living from non-living things using established criteria.

(b) Internal and External Influences on Organisms-Students understand that organisms respond to internal and external influences.

(1) Explain that some diseases are caused by germs and some are not; diseases caused by germs may be spread by people who have them.

(c) Heredity and Diversity-Students understand that life forms are diverse, and that they pass some characteristics to their offspring.

(1) Investigate and describe how particular animals have offspring that are the same kind of animal.

(2) Investigate and describe how some living things look alike and others do not.

(d) Evolution - The Process of Biological Change-Students understand that life forms change over time.

3. For the areas of Earth and Space Sciences:

(a) Earth Structures and Composition-Students understand that the Earth is composed of interrelated systems of rocks, water, air, and life.

(1) Describe that rocks come in many sizes and shapes and have interesting textures, colors, and patterns.

(b) Earth Models-Students understand that the Earth may be represented by a variety of maps and models.

(c) Earth History-Students understand that Earth systems (such as weather and mountain formation) change or vary.

(1) Investigate and describe how changes happen to many things (e.g., weather).

(d) Cycles of Matter and Energy-Students understand that Earth systems have a variety of cycles through which energy and matter continually flow.

(1) Investigate and describe how the sun warms the land, air, and water.

(2) Investigate and describe how weather changes from day to day and throughout the year.

(e) The Solar System and the Universe-Students understand that the Earth is part of a planetary system within the Milky Way Galaxy, which is part of the known universe.

(1) Observe and describe the sun, moon, planets, and stars.

(2)Describe the movement of some of the objects in the sky.

4. For the area of Environmental Sciences

(a) Ecosystems-Students will demonstrate an understanding that ecosystems display patterns of organization, change, and stability as a result of the interactions and interdependencies among the life forms and the physical components of the Earth

(1) Investigate and describe the roles of plants as producers and animals as consumers and how living things may depend on each other.

(2) Investigate and describe how animals eat plants or other animals for food and may also use plants or even other animals (for shelter and nesting).

(b) Natural Resources-Students demonstrate and understand that natural resources include renewable and non-renewable materials and energy. All organisms, including human, use

resources to maintain and improve their existence, and the use of resources can have positive and negative consequences.

(1) Investigate and describe how some resources can be used and reused.

(2) Describe the various resources that provide the necessary things that are used by people in their daily lives.

(c) Conservation-Students understand that humans have the unique ability to change personal and societal behavior based on ethical considerations regarding other organisms, the planet as a whole and future generations.

(1) Describe how people live in different places in different ways.

(2) Describe how some things in students' daily lives change and other things stay the same.

5. For the area of the Nature and History of Science

(a) Scientific, Historical, and Technological Perspectives-Students understand that humans have the unique ability to change personal and societal behavior based on ethical considerations regarding other organisms, the planet as a whole and future generations.

(1) Explain that everybody can invent things and ideas.

(b) Reasoning and Critical Response Skills-Students understand that many decisions require critical consideration of scientific evidence

(c) Systems, Models, Risk, and Predictions--Students understand that a variety of models can be used to describe or predict things and events.

(1) Explain that something may not work if some of its parts are missing.

(d) Scientific Values and Attitudes-Students understand that science is an active process of systematically examining the natural world.

(1) Make observations and give descriptions using words, numbers, and drawings.

(2) Record observations of investigations over time in a notebook or journal. (e.g., growth of a plant, changes in weather)

(e) Communication Skills-Students understand that a variety of communication methods can be used to share scientific information.

(1) Follow verbal instructions accurately.

(2) Produce simple pictographs to describe observations.

(3) Cooperate and contribute ideas within a group.

6. For the area of Scientific Inquiry: Processes and Skills

(a) Scientific Applications of Mathematics-Students understand that scientific inquiry is enhanced and often communicated by using mathematics.

(1) Give rough estimates of numerical answers to problems before calculating.

(2) Recognize unexpected or unusual results in activities.

(b) Laboratory Skills and Safety-Students can appropriately and safely apply the tools and techniques of scientific inquiry.

(1) Keep a record of observations and measurements taken over time.

Instruction Through Third Grade

By the end of the third grade, students know and are able to do everything required in the previous grades for courses in Science offered in public elementary schools and must include instruction designed to teach the following content standards to the pupil by the completion of third grade:

1. For the areas of Physical Science:

(a) Forces and Motion-Students understand that forces such as gravitational, electrical, and magnetic influence the motion of objects.

(1) Apply unbalanced forces (a push or pull) to cause objects to change their motion (e.g., speed, direction or both).

(2) Investigate and describe the ways that different objects may balance or topple in various situations.

(3) Manipulate hammers and nails, screwdrivers and screws, scissors, and other simple tools.

(b) Structure and Properties of Matter-Students understand that materials have distinct properties which depend on the amount of matter present, its chemical composition, and structure.

(1) Describe objects in terms of their observable properties (e.g., state of matter, size, shape, color, texture).

(2) Sort and classify objects according to observable properties (e.g., size, weight, shape, color).

(c) Energy and Matter: Interactions and Forms-Students understand that changes in temperature and pressure can alter states of matter. Energy exists in many forms, and one form can change into another.

(1) Describe how hot or cold an object is by expressing its temperature.

(2) Investigate and describe how solid ice can melt and liquid water will disappear if allowed to stand in an open container.

(d) Chemical Reaction-Students understand that chemical reactions change substances into different substances.

(e) Nuclear and Electromagnetic Energy-Students understand that nuclear energy and electromagnetic energy are produced from both natural and human-made sources in many forms.

2. For the area of Life Science:

(a) Structure and Function-Students understand that all life forms, at all levels of organization, use specialized structures and similar processes to meet life's needs.

(1) Investigate and describe how plants and animals have life cycles and require food, water, air, and space.

(2) Investigate, compare, and contrast identifiable characteristics of plants and animals.

(3) Investigate and describe how plants and animals require certain conditions to survive.

(b) Internal and External Influences on Organisms-Students understand that organisms respond to internal and external influences.

(1) Investigate and describe how various living things behave differently under diverse conditions.

(2) Explain that if germs are able to get inside one's body, they may keep it from working properly.

(c) Heredity and Diversity-Students understand that life forms are diverse, and that they pass some characteristics to their offspring.

(1) Investigate and describe how offspring may resemble parents and siblings may resemble each other.

(2) Investigate and describe how some living things are alike in their appearance and behaviors; others are not.

(d) Evolution - The Process of Biological Change-Students understand that life forms change over time.

(1) Explain that many different kinds of living things exist on Earth.

(2) Explain how particular features of plants and animals help them live in different kinds of places.

3. For the areas of Earth and Space Sciences:

(a) Earth Structures and Composition-Students understand that the Earth is composed of interrelated systems of rocks, water, air, and life.

(1) Investigate and describe how the Earth is composed of different kinds of materials (e.g., rocks and soils, water, and the atmosphere).

(2) Describe how the Earth is composed of different landforms.

(3) Investigate and describe how the Earth is nearly spherical and covered with more water than land.

(b) Earth Models-Students understand that the Earth may be represented by a variety of maps and models.

(1) Describe that directions on the Earth can be represented by north, south, east, and west.

(2) Locate the state of Nevada on a national map and their own city on a Nevada state map.

(c) Earth History-Students understand that Earth systems (such as weather and mountain formation) change or vary.

(1) Investigate and describe how some changes are so slow (e.g., seasons) or so fast (e.g., lightening strikes) that they are hard to see.

(d) Cycles of Matter and Energy-Students understand that Earth systems have a variety of cycles through which energy and matter continually flow.

(1) Investigate and describe how things that give off light also often give off heat.

(2) Observe, record, and describe seasonal differences using words, numbers, and drawings.

(3) Investigate and describe how water can be a liquid or a solid and can go back and forth from one form to the other.

(e) The Solar System and the Universe-Students understand that the Earth is part of a planetary system within the Milky Way Galaxy, which is part of the known universe.

(1) Identify the sun, moon, and the Earth as components of our solar system.

(2) Explain that there are more stars in the sky than anyone can easily count.

4. For the area of Environmental Sciences

(a) Ecosystems-Students will demonstrate an understanding that ecosystems display patterns of organization, change, and stability as a result of the interactions and interdependencies among the life forms and the physical components of the Earth

(1) Investigate and describe how animals and plants that live in different places have similarities and differences.

(2) Investigate and describe the interactions of organisms within an ecosystem.

(b) Natural Resources-Students demonstrate and understand that natural resources include renewable and non-renewable materials and energy. All organisms, including human, use resources to maintain and improve their existence, and the use of resources can have positive and negative consequences.

(1) Explain that natural resources are used for many purposes.

(2) Describe how humans have obtained natural resources for thousands of years through farming, mining, and hunting and gathering.

(c) Conservation-Students understand that humans have the unique ability to change personal and societal behavior based on ethical considerations regarding other organisms, the planet as a whole and future generations.

(1) Explain that many materials can be recycled and used again, sometimes in different forms.

(2) Investigate and describe how patterns of change may be observable and predictable.

5. For the area of the Nature and History of Science

(a) Scientific, Historical, and Technological Perspectives-Students understand that humans have the unique ability to change personal and societal behavior based on ethical considerations regarding other organisms, the planet as a whole and future generations.

(1) Explain that science is a process that involves observing and asking questions about the natural world and seeking answers to those questions.

(2) Explain that accurate descriptions in science are important because they enable people to compare their observations with those of others.

(3) Recognize that science engages men and women of all ages and backgrounds.

(4) Give examples of the benefits of working with a team and sharing findings.

(5) Explain that tools are used to do things better or more easily (e.g. observe, measure, and make things) and to do some things that could not be done at all (e.g. see things that are too small to be seen unaided.

(b) Reasoning and Critical Response Skills-Students understand that many decisions require critical consideration of scientific evidence

(c) Systems, Models, Risk, and Predictions--Students understand that a variety of models can be used to describe or predict things and events.

(1) Compare a model with what it represents (e.g., a model of the Earth to the Earth itself).

(2) Identify observable patterns and predict future events based on those patterns (e.g. seasonal weather patterns.)

(3) Demonstrate that when parts are put together, they can do things together they couldn't have done by themselves.

(d) Scientific Values and Attitudes-Students understand that science is an active process of systematically examining the natural world.

(1) Observe and raise questions about the world, then seek answers through investigation.

(2) Record observations of investigations over time in a notebook or journal. (e.g., changes in an aquarium or terrarium)

(e) Communication Skills-Students understand that a variety of communication methods can be used to share scientific information.

(1) Follow verbal and written instructions to complete a procedure.

(2) Create illustrations, graphs, and charts to convey ideas and record observations.

(3) Cooperate and contribute ideas within a group.

6. For the area of Scientific Inquiry: Processes and Skills

(a) Scientific Applications of Mathematics-Students understand that scientific inquiry is enhanced and often communicated by using mathematics.

(1) Give rough estimates of numerical answers to problems before calculating.

(2) Decide whether measurements and descriptions are reasonably accurate.

(b) Laboratory Skills and Safety-Students can appropriately and safely apply the tools and techniques of scientific inquiry.

(1) Use equipment properly and safely in all science activities.

(2) Identify and gather tools and materials needed in an investigation.

(3)Keep a record of observations and measurements taken over time.

Instruction Through Fifth Grade

By the end of the fifth grade, students know and are able to do everything required in the previous grades for courses in Science offered in public elementary schools and must include instruction designed to teach the following content standards to the pupil by the completion of fifth grade:

1. For the areas of Physical Science:

(a) Forces and Motion-Students understand that forces such as gravitational, electrical, and magnetic influence the motion of objects.

(1) Investigate and describe the relationship that exists between the size of a change in motion of an object to the size of a push or pull on that object.

(2) Investigate and describe that objects usually move downward when they fall or are released in the air or on ramps.

(3) Investigate and describe that objects may move in a variety of ways (e.g., straight lines or by rotating, rolling, or revolving).

(4) Classify objects by whether they sink or float in air or water.

(5) Investigate and describe the ways that magnets attract and repel each other and certain kinds of other materials.

(b) Structure and Properties of Matter-Students understand that materials have distinct properties which depend on the amount of matter present, its chemical composition, and structure.

(1) Separate mixtures based on their properties.

(2) Describe and classify matter in terms of elements, compounds, and mixtures.

(3) Investigate and describe the ways that solids remaining after a solvent has been evaporated may form distinctive patterns of crystals.

(4) Investigate and describe how materials can be broken down physically into smaller and smaller pieces, and that each piece may retain its same properties.

(5) Investigate and describe how the observable properties of a material depend on its composition.

(c) Energy and Matter: Interactions and Forms-Students understand that changes in temperature and pressure can alter states of matter. Energy exists in many forms, and one form can change into another.

(1) Investigate and describe how warm objects cool and cool objects warm when they are put together, until they reach the same temperature.

(2) Investigate and describe how energy can be used to bring about changes in matter (e.g., melting an ice cube).

(3) Investigate and describe how vibrations produce sound.

(4) Electrical components are utilized in the design of simple electrical circuits.

(d) Chemical Reaction-Students understand that chemical reactions change substances into different substances.

(1) Investigate and describe how observable changes in matter may occur when different materials are heated, mixed, or cooled.

(e) Nuclear and Electromagnetic Energy-Students understand that nuclear energy and electromagnetic energy are produced from both natural and human-made sources in many forms.

2. For the area of Life Science:

(a) Structure and Function-Students understand that all life forms, at all levels of organization, use specialized structures and similar processes to meet life's needs.

(1) Investigate, compare, and contrast the different life cycles of different living things.

(2) Investigate, compare, and contrast the different structures of organisms that serve different functions for growth, reproduction, and survival.

(3) Investigate and describe how plants and animals have features that help them live in various environments.

(b) Internal and External Influences on Organisms-Students understand that organisms respond to internal and external influences.

(1) Investigate and describe how clues for behavior may be detected by the senses in humans and other living things.

(2) Investigate and describe how some organisms can learn from their experiences.

(3) Investigate and describe how some environmental conditions are more favorable than others to living things.

(c) Heredity and Diversity-Students understand that life forms are diverse, and that they pass some characteristics to their offspring.

(1) Investigate and describe how some characteristics between offspring and parents are inherited, but other characteristics are learned.

(2) Living things may be classified on the basis of similar features, behaviors, and/or habits.

(3)There are variations among individuals within a population of a certain species.

(4) Reproduction is a characteristic essential to the continuation of every species.

(5) Explain how some patterns of inheritance can be explained by pairs of genes that separate when sex cells are formed.

(d) Evolution - The Process of Biological Change-Students understand that life forms change

over time.

(1) Classify animals and plants according to their physical characteristics.

(2) Investigate and describe how environmental changes allow some plants and animals to survive and reproduce, but others may die.

(3) Investigate and describe how individuals of the same kind differ in their characteristics and sometimes the differences give an advantage in surviving and reproducing.

3. For the areas of Earth and Space Sciences:

(a) Earth Structures and Composition-Students understand that the Earth is composed of interrelated systems of rocks, water, air, and life.

(1) Investigate and describe how rocks are composed of different combinations of minerals.

(2) Investigate and describe how erosion and deposition rates can be affected by the slope of the land and by human activities.

(3) Investigate and describe how the surface of the Earth, including the ocean floor has a varied topography.

(4) Investigate and describe how soil is made of many different biological and mineral materials, and varies from place to place.

(b) Earth Models-Students understand that the Earth may be represented by a variety of maps and models.

(1) Identify compass directions on a map.

(2) Explain how the Nevada state road map is a tool that can be used to navigate from one location to another.

(3) Explain how many things can be represented by two-dimensional maps and three-dimensional models.

(c) Earth History-Students understand that Earth systems (such as weather and mountain formation) change or vary.

(1) Explain that the surface of the Earth changes due to a variety of factors (e.g., some are abrupt volcanoes and earthquakes, and others happen very slowly, such as the wearing down of mountains).

(2) Investigate and describe how fossils are evidence of past life.

(d) Cycles of Matter and Energy-Students understand that Earth systems have a variety of cycles through which energy and matter continually flow.

(1) Explain that the sun is the main source of energy for people, which they use in many ways. (e.g., fossil fuels derive their energy indirectly from the sun).

(2) Investigate and describe various meteorological phenomena (e.g., flooding, thunderstorms, and drought).

(3) Investigate and describe the factors which affect the processes such as evaporation and condensation.

(4) Investigate and describe how change is an ongoing process that can be seen throughout the natural world.

(e) The Solar System and the Universe-Students understand that the Earth is part of a planetary system within the Milky Way Galaxy, which is part of the known universe.

(1) Investigate and describe the basic components of our solar system (e.g., planets, moons, asteroids, comets, and the sun).

(2) Describe the apparent motion of celestial objects across the sky.

(3) Describe how the stars in the sky are not scattered evenly, and they are not all the same in brightness or color.

4. For the area of Environmental Sciences

(a) Ecosystems-Students will demonstrate an understanding that ecosystems display patterns of organization, change, and stability as a result of the interactions and interdependencies among the life forms and the physical components of the Earth

(1) Investigate and describe how organisms interact with each other and with non-living parts of their habitats.

(2) Investigate and describe how, for any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

(3) Explain how the sun is the primary source of energy for nearly every ecosystem and that living things get what they need to survive from their environments.

(4) Investigate and describe how the local ecosystem has unique characteristics.

(b) Natural Resources-Students demonstrate and understand that natural resources include renewable and non-renewable materials and energy. All organisms, including human, use resources to maintain and improve their existence, and the use of resources can have positive and negative consequences.

(1) Investigate and describe how resources have distinct properties which determine their usefulness.

(2) Investigate and describe how technology can be used to extend resources (e.g., recycling).

(3) Explain how Earth materials, including those found in Nevada, provide many of the resources that humans use.

(4)Explain that humans tend to use resources to meet more than their minimal needs for food, shelter and warmth.

(c) Conservation-Students understand that humans have the unique ability to change personal and societal behavior based on ethical considerations regarding other organisms, the planet as a whole and future generations.

(1) Investigate and describe how consumptive patterns of people vary in different places.

(2) Investigate and describe that ecosystems have components that can be observed to change, while other components appear to stay the same.

(3) Explain that changes in environments can be natural events or influenced by human activities.

5. For the area of the Nature and History of Science

(a) Scientific, Historical, and Technological Perspectives-Students understand that humans have the unique ability to change personal and societal behavior based on ethical considerations regarding other organisms, the planet as a whole and future generations.

(1) Explain that science is a systematic way of exploring the world.

(2) Develop explanations using observations (evidence) from investigations.

(3) Describe key scientists, classical experiments in science, and technological inventions that lead to a better understanding of the impact of science on society.

(4) Recognize that science is an activity done by more than one person working together.

(5) Explain that technology enables scientists and others to study the motion of objects

that are moving rapidly or that are hardly moving at all.

(6)Explain that science is an ongoing process of investigation (inquiry).

(b) Reasoning and Critical Response Skills-Students understand that many decisions require critical consideration of scientific evidence.

(1) Explain that claims must be supported by evidence and logical argument.

(c) Systems, Models, Risk, and Predictions--Students understand that a variety of models can be used to describe or predict things and events.

(1) Develop a physical model to explain how something works or how something is constructed.

(2) Predict that some events are more likely to happen than others.

(3) Describe and compare the components and interrelationships of a simple system (e.g., trace the flow of water through an aquarium, a filter, and a pump).

(d) Scientific Values and Attitudes-Students understand that science is an active process of systematically examining the natural world.

(1) Keep records of investigations and observations, without changing those records later.

(2) Make careful observations and test things more than once.

(3) Offer reasons for findings and consider the reasons suggested by others.

(e) Communication Skills-Students understand that a variety of communication methods can be used to share scientific information.

(1) Give written or oral instructions that others are able to follow.

(2) Organize information into charts, tables, and graphs.

(3) Collaborate on a group project.

6. For the area of Scientific Inquiry: Processes and Skills

(a) Scientific Applications of Mathematics-Students understand that scientific inquiry is enhanced and often communicated by using mathematics.

(1) Explain that sometimes changing one thing causes changes in another.

(2) Explain to other students how to go about solving numerical problems

(3) Make quantitative estimates of familiar lengths, weights, and time intervals, and check them by measurements.

(4) Recognize the appropriate SI unit for a particular measurement (e.g., meters for length, seconds for time, and kilograms for mass). (aligns with grade 3 math standard)

(5) Recognize that repeated measurements of the same thing are likely to vary slightly.

(b) Laboratory Skills and Safety-Students can appropriately and safely apply the tools and techniques of scientific inquiry.

(1) Use safety equipment and attire.

(2) Measure and mix dry and liquid materials safely in prescribed amounts.

(3) Use provided materials to construct objects for a particular task.

(4) Label measurements and diagrams properly.

(5) Use appropriate technology in lab procedures for measuring and recording.

(6) Manipulate objects and observe events in an experiment.

Instruction Through Eighth Grade

By the end of the eighth grade, students know and are able to do everything required in the previous grades for courses in Science offered in public elementary schools and must include instruction designed to teach the following content standards to the pupil by the completion of eighth grade:

1. For the areas of Physical Science:

(a) Forces and Motion-Students understand that forces such as gravitational, electrical, and magnetic influence the motion of objects.

(1) Investigate and describe that multiple forces acting on an object along a straight line affect the motion of an object.

(2) Describe the force (gravity) which makes objects fall and planets move in their orbits.

(3) Investigate and describe that certain physical principles are used in the design and

function of simple machines.

(4) Investigate and describe that buoyancy changes the apparent weight of an object immersed in a fluid.

(5) Investigate and explain that electric current produces magnetic forces, and moving magnets produce electric forces in conductors.

(b) Structure and Properties of Matter-Students understand that materials have distinct properties which depend on the amount of matter present, its chemical composition, and structure.

(1) Use simple models to explain observed properties of matter (e.g., use a particle model to account for the states of matter).

(2) Separate substances based on their physical and chemical properties (e.g., color, solubility, chemical reactivity, melting point, boiling point).

(3) Use models or drawings to explain how atoms may join together to form molecules or large groups of molecules.

(4) Explain that all atoms are made up of protons, neutrons, and electrons.

(5) Explain that liquids, solids, and gases are systems of particles.

(6) Explain that various elements combine in a multitude of ways to produce all known living and non-living substances.

(c) Energy and Matter: Interactions and Forms-Students understand that changes in temperature and pressure can alter states of matter. Energy exists in many forms, and one form can change into another.

(1) Investigate and describe how heat moves from one object to another at different rates, depending on what the objects are made of and whether they are touching each other.

(2) Investigate and describe how all phase changes are accompanied by changes in energy.

(3) Investigate and describe how waves transfer energy and move at different speeds in different materials.

(4) Investigate, create, and describe parallel, series, and combination circuits.

(5) Investigate and describe how energy may be transferred into or out of a system or object in many ways and readily changes forms.

(6) Identify the energy involved in a particular process as potential (energy of position and stored chemical energy) or kinetic (energy of motion).

(d) Chemical Reaction-Students understand that chemical reactions change substances into different substances.

(1) Investigate and describe how in chemical reactions, the total mass is conserved and the elements involved do not change into other elements.

(2) Investigate and describe how the rate of a chemical reaction can be influenced by variables such as temperature, pH, and light.

(3) Investigate and describe how materials may give off heat or light when they react chemically with each other.

(4)Predict common properties of elements using the Periodic Table.

(e) Nuclear and Electromagnetic Energy-Students understand that nuclear energy and electromagnetic energy are produced from both natural and human-made sources in many forms.

(1) Investigate and describe how light interacts with matter by moving through the matter, being absorbed by matter, or being scattered by the matter.

(2) Describe some applications of radioactive isotopes including using nuclear energy to produce heat.

(3) Compare and contrast between high and low level nuclear wastes and their associated hazards.

(4) Investigate and describe how the sun produces energy in a range of wavelengths within the electromagnetic spectrum.

(5) Compare and contrast the nuclear processes that occur in the sun and stars as well as in nuclear reactors.

(6) Explain how nuclear reactions convert small amounts of matter into a relatively large amount of energy.

2. For the area of Life Science:

(a) Structure and Function-Students understand that all life forms, at all levels of organization, use specialized structures and similar processes to meet life's needs.

(1) Explain how disease is a breakdown in structures or functions of an organism due to

intrinsic system failures or damage caused by infection.

(2) Investigate and describe how multicellular living things have tissues, organs, and organ systems that are specialized to perform life functions.

(3) Investigate and describe how cells, grow, divide, and take in nutrients, which they use to provide energy for cellular functions.

(4) Investigate and describe how most organisms are comprised of a single cell and others are multicellular.

(5) Investigate and describe how plants have specialized structures and systems for a variety of functions.

(6) Explain how information used to guide cellular functions is stored in DNA.

(b) Internal and External Influences on Organisms-Students understand that organisms respond to internal and external influences.

(1) Explain how behavior may be innate or learned.

(2) Explain how an organism's behavior is based on experience and on the species' evolutionary history.

(3) Investigate and describe how behavior is one kind of response an organism can make to an internal or environmental stimulus.

(4) Explain how various viruses, bacteria, fungi, and parasites may infect the human body and interfere with normal body functions.

(c) Heredity and Diversity-Students understand that life forms are diverse, and that they pass some characteristics to their offspring.

(1) Explain how heredity is the passage of genetic instructions from one generation to another.

(2) Classify organisms on the basis of similar characteristics, and explain the basis for such a classification system.

(3) Explain how new varieties of cultivated plants and domestic animals have resulted from selective breeding for particular traits.

(4)Explain how genetic information coded in DNA is passed through sexual or asexual reproduction.

(5) Explain how some patterns of inheritance can be explained by pairs of genes that separate when sex cells are formed.

(6) Identify that the basic level of biological classification is the species, which comprises all organisms that can mate with each other and produce fertile offspring.

(7) Explain how changes in the genes of sex cells can affect offspring.

(d) Evolution - The Process of Biological Change-Students understand that life forms change over time.

(1) Explain that millions of species of animals, plants, and microorganisms are alive today.

(2) Investigate and describe how biological evolution provides a scientific explanation for the differences and many similarities between species.

(3) Investigate and describe how biological adaptations include changes that enhance survival and reproductive success in a particular environment.

(4) Investigate and describe how unity among organisms is found in similarities of internal structures, chemical processes, and modern evidence of common ancestry.

(5) Extinction of a species occurs when the adaptive characteristics of a species are insufficient to allow it to survive environmental change.

3. For the areas of Earth and Space Sciences:

(a) Earth Structures and Composition-Students understand that the Earth is composed of interrelated systems of rocks, water, air, and life.

(1) Investigate how rocks and minerals have different properties and characteristics.

(2) Investigate and describe how the combination of constructive and destructive forces result in the formation of landforms.

(3) Explain, using models, how the Earth is layered with a crust, both continental and oceanic, hot, convecting mantle, and dense, metallic core.

(4) Investigate and describe how soils have properties of color, texture, and capacity to retain water and provide nutrients for life.

(5) Explain how the atmosphere is a mixture of particular gases, whose properties vary with elevation.

(6)Explain that earthquakes, landslides, volcanoes, and floods are geologic phenomena.

(b) Earth Models-Students understand that the Earth may be represented by a variety of maps and models.

(1) Describe how positions on the Earth's surface can be located using latitude and longitude.

(2) Compare a variety of map types, and locate Nevada and Nevada features on each.

(3) Use a color-coded map to compare and contrast various geological features such as temperature, population density, geology, or precipitation.

(4) Identify the time of day in various places throughout the world, given the local time of day.

(c) Earth History-Students understand that Earth systems (such as weather and mountain formation) change or vary.

(1) Explain how some changes on the Earth's surface are due to slow processes, and others due to rapid processes.

(2) Investigate and describe how fossils provide important evidence of how life and environmental conditions have changed throughout geologic time.

(3) Explain how the Earth's processes we observe today are similar to those that occurred in the past.

(d) Cycles of Matter and Energy-Students understand that Earth systems have a variety of cycles through which energy and matter continually flow.

(1) Investigate and describe how the sun is the major source of energy for phenomena on Earth's surface (e.g., growth of plants, winds, ocean currents, and the water cycle).

(2) Explain how global patterns of atmospheric movement, topography, and proximity to bodies of water influence local weather, and seasons are caused by variations in the amount of the sun's energy hitting the surface due to the tilt of the Earth's axis.

(3) Explain how water, which covers the majority of the Earth's surface, circulates through the crust, oceans, and atmosphere.

(4) Simulate and describe how clouds, latitude, altitude, topographical features, and proximity to large bodies of water affect weather and climate.

(5) Investigate and describe some changes that are reversible and others that are not.

(6) Explain that the energy that the Earth receives over geologic time approximately equals the energy that it loses.

(7)Describe the relationships among geothermal and tectonic processes.

(e) The Solar System and the Universe-Students understand that the Earth is part of a planetary system within the Milky Way Galaxy, which is part of the known universe.

(1) Investigate and describe the size, composition, and surface features of the planets in our solar system.

(2) Investigate and describe how seasons, eclipses, moon phases, and tides are caused by the effects of relative motion and positions of the sun, Earth, and moon.

(3) Explain that billions of galaxies form most of the visible mass in the universe.

(4) Explain how various tools (e.g., optical and radio telescopes, unmanned robotic spacecraft) allow us to investigate objects in the sky that are too distant, faint, or bright to observe directly from Earth.

(5) Investigate and describe the laws of motion and gravity and their development.

4. For the area of Environmental Sciences

(a) Ecosystems-Students will demonstrate an understanding that ecosystems display patterns of organization, change, and stability as a result of the interactions and interdependencies among the life forms and the physical components of the Earth

(1) Investigate how living and non-living components of ecosystems interact in various ways.

(2) Characterize organisms in any ecosystems by their function.

(3) Investigate and describe how the major energy source in most ecosystems is sunlight which is converted by producers into chemical energy.

(4) Describe how geographically distinct ecosystems on the Earth have similarities and differences.

(b) Natural Resources-Students demonstrate and understand that natural resources include renewable and non-renewable materials and energy. All organisms, including human, use resources to maintain and improve their existence, and the use of resources can have positive and negative consequences.

(1) Investigate and describe the identifying characteristics of renewable and non-renewable resources.

(2) Explain how some natural resources are limited in their abundance and/or accessible location (e.g. water in the desert).

(3) Investigate and describe the location and distribution of various natural resources.

(4) Investigate and describe how organisms alter their local environment through their use of natural resources.

(5)Describe how unintended consequences of technologies can cause resource depletion and environmental degradation, but technology can also increase resource availability, mitigate environmental degradation, and make new resources economical.

(c) Conservation-Students understand that humans have the unique ability to change personal and societal behavior based on ethical considerations regarding other organisms, the planet as a whole and future generations.

(1) Analyze different conservation options for Nevada's resources.

(2) Investigate and describe how in some ecosystems, populations of organisms are in dynamic equilibrium, and in other ecosystems they are not.

(3) Evaluate how changes in environments can be beneficial or harmful.

(4) Investigate and describe how actions which might affect Nevada's environment can be evaluated in terms of trade-offs that may have regional, national, or global effects.

5. For the area of the Nature and History of Science

(a) Scientific, Historical, and Technological Perspectives-Students understand that humans have the unique ability to change personal and societal behavior based on ethical considerations regarding other organisms, the planet as a whole and future generations.

(1) Explain that scientific investigations involve the use of logic, respect for the rules of evidence, openness to criticism, and public reporting of methods and procedures.

(2) Explain that scientific inquiry done in a school setting is similar to what scientists do.

(3) Explain, using examples, that ancient peoples provided knowledge about the natural world that is still regarded as valid today, even though that knowledge may not have originated by scientific methods.

(4) Explain that scientists may work in teams and some may work alone, but all

communicate extensively with each other.

(5)Explain that scientific inquiry and technological design have similarities and differences. Scientists propose explanations for questions about the natural world and engineers propose solutions relating to human problems, needs, and aspirations.

(6) Explain that scientific knowledge is revised through a process of incorporating new evidence gained through continual investigation.

(7) Identify and describe how science is subject to strengths and limitations related to other human social and intellectual activities.

(b) Reasoning and Critical Response Skills-Students understand that many decisions require critical consideration of scientific evidence.

(1) Identify and evaluate critically the use of statistics, data, and graphs.

(2) Give examples of human activities with their associated benefits, costs and risks.

(3) Analyze a system for efficiency, optimal function, and possible sources of malfunction.

(4) Critically evaluate information to distinguish between fact and opinion when responding to information.

(c) Systems, Models, Risk, and Predictions--Students understand that a variety of models can be used to describe or predict things and events.

(1) Investigate and describe how different models can be used to demonstrate the same thing.

(2) Use a model to predict change (e.g., stream table).

(3) Identify and illustrate natural cycles within systems (e.g., water, planetary motion, climate, geological changes).

(4) Analyze data from two groups, comparing both their middles and ranges.

(5) Use a systematic approach to thinking critically about risks and benefits.

(d) Scientific Values and Attitudes-Students understand that science is an active process of systematically examining the natural world.

(1) Explain why it is important to keep honest, clear, and accurate records.

(2) Explain that hypotheses are valuable even if they turn out to be incorrect, if they lead

to fruitful investigations.

(3) Describe how different explanations can often be given for the same evidence, and it is not always possible to tell which one is correct.

(e) Communication Skills-Students understand that a variety of communication methods can be used to share scientific information.

(1) Write clear, step-by-step instructions for a procedure.

(2) Organize information in tables and graphs and describe the relationships they reveal.

(3) Discuss scientific topics by paraphrasing, asking for clarification or elaboration, and expressing alternative positions using available multimedia resources.

6. For the area of Scientific Inquiry: Processes and Skills

(a) Scientific Applications of Mathematics-Students understand that scientific inquiry is enhanced and often communicated by using mathematics.

(1) Explain that quantities can vary in proportion to one another. (e.g., the ratio of mass to volume in the calculation of density).

(2) State the purpose of each step in a calculation.

(3) Estimate probabilities of outcomes in familiar situations.

(4) Select and use the appropriate SI unit for a particular measurement (e.g., meters for length, seconds for time, and kilograms for mass).

(5) Judge whether repeated measurements and computations of quantities are reasonably precise and accurate.

(6) Make predictions based on all known data from similar conditions.

(b) Laboratory Skills and Safety-Students can appropriately and safely apply the tools and techniques of scientific inquiry.

(1) Use instruments and laboratory safety equipment properly.

(2) Handle and dispose of chemicals according to established standards.

(3) Choose appropriate common materials for making and repairing simple mechanical constructions.

(4) Keep an organized record of scientific investigations.

(5) Use appropriate technology in laboratory procedures for measuring, recording, and analyzing data (e.g., computers, graphing calculators, and probes).

(6) Design a controlled experiment.

HIGH SCHOOL

Required Course of Study

By the end of the grade twelve, students know and are able to do everything required in the previous grades for courses in Science offered in public schools and must include instruction designed to teach the following content standards to the pupil by the completion of grade twelve:

1. For the areas of Physical Science:

(a) Forces and Motion-Students understand that forces such as gravitational, electrical, and magnetic influence the motion of objects.

(1) Investigate and describe how changes in motion are based on the laws of motion

(2) Explain that the force of attraction that exists between two masses is inversely proportional to the square of the distance between them.

(3) Investigate and describe that the usefulness of a simple machine such as a wheel or axle is based on its function, mechanical advantage, and efficiency.

(4) Investigate and describe the relationship that exists between force, pressure, and area in general, and between pressure and depth in liquids.

(5) Investigate and explain that magnetic forces are related to electric forces and can be thought of as different aspects of a single electromagnetic force. (e.g., electric motors, generators, radios).

(b) Structure and Properties of Matter-Students understand that materials have distinct properties which depend on the amount of matter present, its chemical composition, and structure.

(1) Investigate and describe intrinsic (color, odor, density) and extrinsic (e.g., size, mass, volume) physical properties of matter.

(2) Explain that substances can be identified on the basis of specific energies given off or

taken in by that substance.

(3) Explain how atoms may bond with one another by transferring or sharing electrons that are farthest from the nucleus.

(4) Explain that the electromagnetic force between the nucleus and electrons holds the atom together.

(5) Explain the properties of phases of matter in terms of the kinetic molecular theory and forces of attraction between particles.

(6) Explain that carbon atoms can bond to one another to form a large variety of structures, including the molecules essential to life.

(c) Energy and Matter: Interactions and Forms-Students understand that changes in temperature and pressure can alter states of matter. Energy exists in many forms, and one form can change into another.

(1) Explain that the transformation of energy usually results in some energy in the form of heat, which spreads by radiation, conduction, and sometimes convection into cooler places.

(2) Investigate and describe how pressure may affect changes of state.

(3) Investigate and describe how waves can superimpose on one another, bend around corners, reflect off surfaces, be absorbed by materials they enter, and change direction when entering a new material.

(4) Describe the properties of electrical circuits in terms of moving electrons, conductivity, resistance, and electrical potential energy.

(5) Investigate and describe how matter and energy may be changed and energy can be transferred in many ways, but the entire mass-energy budget of the universe remains constant.

(6)Investigate and describe how systems tend to become less ordered over time.

(d) Chemical Reaction-Students understand that chemical reactions change substances into different substances.

(1) Investigate and describe how, in chemical reactions, elements combine in predictable ratios, and the numbers of atoms of each element do not change.

(2) Investigate and describe how chemical reaction rates depend on conditions in the reacting system, the properties of reacting materials, and the presence of certain rate-regulating chemicals.

(3) Investigate and describe how chemical reactions may release or consume energy.

(4) Relate the chemical properties of an element to the outermost electrons of an element.

(e) Nuclear and Electromagnetic Energy-Students understand that nuclear energy and electromagnetic energy are produced from both natural and human-made sources in many forms.

(1) Predict how light interacts with matter (e.g., reflection and refraction).

(2) Simulate how the predictable rates of nuclear reactions can be used to estimate the age of some materials.

(3) Describe the different disposal techniques used for high and low level nuclear wastes.

(4) Describe electromagnetic waves including a wide range of forms and varying wavelengths.

(5) Explain how the forces that hold the nucleus of an atom together are usually stronger than other forces that could make the nucleus fly apart.

(6) Explain how energy is released when the nuclei of very heavy atoms (e.g., uranium or plutonium), split into middleweight ones, or when very light nuclei (e.g., hydrogen and helium), combine into heavier ones.

2. For the area of Life Science:

(a) Structure and Function-Students understand that all life forms, at all levels of organization, use specialized structures and similar processes to meet life's needs.

(1) Explain how disease disrupts the equilibrium that exists in a healthy organism.

(2) Explain how the human body has a specialized anatomy and physiology composed of an hierarchical arrangement of differentiated cells.

(3) Investigate and describe how food molecules are broken down through a series of chemical reactions to provide energy and the material to make new molecules.

(4) Investigate and describe how every cell is covered by a cell membrane and most cells also have specialized parts for the transport of materials, energy, transfer, protein building, waste disposal, information feedback, and movement.

(5) In photosynthesis, plants and many microorganisms use solar energy to combine molecules of carbon dioxide and water to form energy rich compounds and oxygen.

(b) Internal and External Influences on Organisms-Students understand that organisms respond to internal and external influences.

(1) Investigate and describe how some broad patterns of behavior exhibited by animals have evolved to ensure survival of the species.

(2) Investigate and describe how plant and animals have mechanisms that allow them to respond to changes in their environment.

(3) Investigate and describe how multicellular animals have nervous systems that receive input through sensory organs and generate behavioral responses.

(4) Explain how certain viral diseases make the body vulnerable to multiple infectious agents and cancerous cells by destroying critical cells of the immune system.

(c) Heredity and Diversity-Students understand that life forms are diverse, and that they pass some characteristics to their offspring.

(1) Explain how all body cells in an organism are developed from a single cell and contain essentially identical genetic instructions. Explain how different parts of the instruction are used in different kinds of cells.

(2) Explain how relatedness among organisms can be estimated from the similarity of their DNA sequences.

(3) Investigate and describe how sorting and recombination of genes in sexual reproduction results in a great variety of possible gene combinations.

(4) Explain how genetic information from parents is encoded in DNA molecules and provides instruction for assembling protein molecules.

(5) Investigate and describe how patterns of inheritance are described by laws of segregation and independent assortment.

(6) Explain how diversity of species and variation among organisms within a species increase the chances for survival of life when large changes occur in the environment.

(7) Explain how gene mutations may be caused by a variety of influences, when mutations occur in sex cells, they can be passed on to offspring.

(d) Evolution - The Process of Biological Change-Students understand that life forms change over time.

(1) Investigate and describe the basic idea of the theory of biological evolution is that through genetic and/or environmental influences the Earth's present-day species developed

from earlier, distinctly different, but common ancestors.

(2) Explain the fossil record of ancient life forms by applying the idea of natural selection and its evolutionary consequences.

(3) Simulate and explain how the adaptation of a species can occur over many generations because of the unique characteristics that favor those individuals in an environment.

(4) Explain how the classification of species is based on similarities (e.g., structural, genetic, molecular) which indicate evolutionary relationships.

(5) Explain how the extinction of species is a common occurrence and fossil records indicate that most species that have lived on the earth no longer exist.

(6) Investigate and describe how the process of evolution is driven by genetic and environmental influences.

(7) Explain how there is evidence that at least a billion years ago, cells with nuclei existed allowing the evolution of increasingly complex multicellular organisms.

3. For the areas of Earth and Space Sciences:

(a) Earth Structures and Composition-Students understand that the Earth is composed of interrelated systems of rocks, water, air, and life.

(1) Investigate how rocks and minerals have different characteristics that reflect their origins and use.

(2) Investigate and describe how landforms are the result of a combination of constructive and destructive forces resulting from weathering, erosion, and the movement of lithosphere plates.

(3) Explain how there is a relationship between the relative densities and states (phases) of Earth materials and the layering on, in, and above the Earth.

(4) Investigate and describe how soil is derived from weathered rocks and decomposed organic material, and is found in layers.

(5) Explain how the composition of the Earth's atmosphere has changed in the past and continues to change.

(6) Compare and contrast the geologic features of Nevada and local geological features.

(b) Earth Models-Students understand that the Earth may be represented by a variety of maps and models.

(1) Investigate, design, and use contour maps.

(2) Define location on the Earth in terms of latitude, longitude, and time zones.

(c) Earth History-Students understand that Earth systems (such as weather and mountain formation) change or vary.

(1) Explain how catastrophic events have occurred and greatly influenced Earth's history.

(2) Simulate and explain how relative geologic time can be estimated by observing rock sequences and using fossils to correlate the sequences at various locations.

(3) Compare and contrast the variety of methods by which geologic time is determined, including radioactive dating.

(d) Cycles of Matter and Energy-Students understand that Earth systems have a variety of cycles through which energy and matter continually flow.

(1) Explain how Earth systems have two major internal sources of energy (decay of radioactive isotopes and the gravitational energy from Earth's original formation) and one major external sources (the sun), all of which create heat.

(2) Explain how uneven heating of the Earth's surface by the sun forms convection currents within the atmosphere and ocean, producing wind and ocean currents that are modified by the Earth's rotation.

(3) Investigate and describe how water is a solvent(e.g., how it dissolves minerals and gases as it passes through the water cycle and carries them to oceons and lakes).

(4)Simulate and describe how global climate is determined primarily by energy transfer from the sun at and near the Earth's surface, and fluctuations in solar output may have contributed to large changes in the Earth's climate in the past.

(5) Explain how large-scale, long-term equilibrium can accommodate small-scale changes.

(6) Investigate and describe how elements necessary for life on Earth pass through both living and non-living cycles in a series of changes that form a global system.

(7) Compare and contrast the relationships among the greenhouse effect and the idea of global warming.

(8) Model and explain how the energy that propels the Earth's lithosphere plates is

dominantly a result of nuclear processes deep in the Earth.

(e) The Solar System and the Universe-Students understand that the Earth is part of a planetary system within the Milky Way Galaxy, which is part of the known universe.

(1) Investigate and describe how the Earth's atmosphere, water, temperature, and composition compare with conditions on other planets.

(2) Explain how most objects in the solar system are in regular and predictable motion which explains such phenomena as the day, the year, phases of the moon, and eclipses.

(3) Explain how stars produce energy and elements heavier than hydrogen from nuclear reactions.

(4) Explain that on the basis of scientific evidence, the universe is estimated to be about ten billion years old.

(5) Describe how increasingly sophisticated technology (e.g., mathematical models and computer simulations) is used to learn about the universe.

(6) Explain that the physical laws, such as laws of Newton, Kepler, thermodynamics, relativity, and quantum physics, appear to apply to all bodies in the universe.

4. For the area of Environmental Sciences

(a) Ecosystems-Students will demonstrate an understanding that ecosystems display patterns of organization, change, and stability as a result of the interactions and interdependencies among the life forms and the physical components of the Earth.

(1) Investigate and describe how changes in an ecosystem can affect bio-diversity and bio-diversity contributes to an ecosystem's stability.

(2) Investigate and describe how ecosystems change or remain the same in response to different kinds of influences.

(3) Investigate and describe how materials and energy are cycled and recycled through ecosystems via pathways known as food webs.

(4) Describe the unique geologic, hydrologic, climatic, and biological characteristics of Nevada's bioregions. (e.g. Northern NV cold desert, Southern low warm desert, Mountain).

(b) Natural Resources-Students demonstrate and understand that natural resources include renewable and non-renewable materials and energy. All organisms, including human, use resources to maintain and improve their existence, and the use of resources can have positive and negative consequences.

(1) Evaluate the consequences of changing patterns of resources use.

(2) Investigate and describe the various processes involved in obtaining, using, and recycling materials such as wood products, minerals, food, and manufactured objects.

(3) Investigate and describe the career opportunities associated with the study, exploration, extraction, utilization, protection, and restoration of natural resources.

(4) Analyze and describe the limitations of the Earth's ability to respond to stresses produced by human or natural activities.

(5) Analyze and evaluate the effects of increases in human populations can cause resource depletion and environmental degradation.

(c) Conservation-Students understand that humans have the unique ability to change personal and societal behavior based on ethical considerations regarding other organisms, the planet as a whole and future generations.

(1) Analyze and evaluate how consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts.

(2) Investigate and describe how human actions may impact the dynamic equilibrium of global systems (e.g., global warming, ozone depletion).

(3) Explain that there is scientific uncertainty regarding many environmental issues.

(4) Evaluate actions which affect the global environment in terms of trade-offs that may have effects on local environments or economics.

5. For the area of the Nature and History of Science

(a) Scientific, Historical, and Technological Perspectives-Students understand that humans have the unique ability to change personal and societal behavior based on ethical considerations regarding other organisms, the planet as a whole and future generations.

(1) Explain that the scientific way of knowing uses a critique and consensus process (e.g., peer review, openness to criticism, logical argument, skepticism).

(2) Investigate and explain how research emphasis is influenced by economic and public policy.

(3) Investigate and explain how scientific innovations that were originally challenged are now widely accepted.

(4) Explain that scientists work with others to resolve differences in interpretation of

observations.

(5) Explain that technological problems create a demand for new scientific knowledge and new technologies which make it possible for scientists to extend their research in new ways or to undertake entirely new lines of research.

(6) Explain that scientific knowledge builds on previous information, and rarely are entire theories completely discarded in favor of new ones.

(7) Explain that scientists have ethical procedures, violations of which have consequences.

(b) Reasoning and Critical Response Skills-Students understand that many decisions require critical consideration of scientific evidence.

(1) Identify and determine the credibility of sources of information based on the techniques used to gather that information.

(2) Apply cost benefit and risk analyses in decision-making processes.

(3) Recognize situations in which a system is qualitatively different from the parts which comprise it (e.g., how a population differs from an individual).

(4) Distinguish between hypotheses, laws, theories and rules, and explain the level of their limitations.

(5) Determine the limits of generalizations, assumptions, analogies, and models.

(c) Systems, Models, Risk, and Predictions--Students understand that a variety of models can be used to describe or predict things and events.

(1) Use mathematical symbols and formulas to express relationships that behave in the same ways as the objects or processes under investigation.

(2) Use models to identify and predict cause-effect relationships (e.g., effect of temperature on gas volume, effect of carbon dioxide level on the greenhouse effect).

(3) Identify and describe how systems are often different from their components. (e.g., aquaria or automobiles)

(4) Compare groups of data, taking into account both percentages and actual numbers.

(5) Identify the type of hazard, estimate the extent and consequences of exposure, and determine the options for reducing or eliminating risks.

(d) Scientific Values and Attitudes-Students understand that science is an active process of systematically examining the natural world.

(1) Demonstrate curiosity, honesty, and skepticism in doing science.

(2) Repeat experimentation for statistical analysis and to produce conclusions that are without bias.

(3) Evaluate multiple explanations for the same evidence.

(e) Communication Skills-Students understand that a variety of communication methods can be used to share scientific information.

(1) Analyze experimental procedures and suggest appropriate revisions for improvement.

(2) Use tables, charts, and graphs in making arguments and claims in oral and written presentations.

(3) Discuss scientific topics by restating or summarizing accurately what others have said; ask for clarifications or elaborations, and express alternative positions using available multimedia resources.

6. For the area of Scientific Inquiry: Processes and Skills

(a) Scientific Applications of Mathematics-Students understand that scientific inquiry is enhanced and often communicated by using mathematics.

(1) Determine if the correlation between variables is high or low.

(2) Use algebraic equations when appropriate.

(3) Estimate answers to the correct order of magnitude.

(4) Use derived SI quantities, ratios, proportions, and constants.

(5) Select samples by some random system to avoid bias.

(6) Trace the source of differences between an estimate and the calculated answer that exceeds agreed-upon standards for precision.

(b) Laboratory Skills and Safety-Students can appropriately and safely apply the tools and techniques of scientific inquiry.

(1) Demonstrate personal responsibility for using safety equipment and observing all safety standards.

(2) Use the information found in materials safety data sheets to handle, store, and dispose of chemicals properly.

(3) Inspect, manipulate, and describe the functions of various parts of technical and scientific equipment.

(4) Maintain a permanent record of procedures, data, analyses, decisions, and understandings of scientific investigations.

(5) Write procedures for the investigation of delegated or original scientific problems.

(6) Carry out an independent scientific investigation.

The following regulations in Chapter 389 of NAC are hereby amended:

389.395 Required courses. The following courses of study are required for the seventh and eighth grades where the subjects offered by the school are taught by different teachers:

1. Mathematics[, as described in NAC 389.400].

2. Science[, which must include instruction in at least two of the following areas by the completion of the eighth grade:

(a) Life science, as described in NAC 389.405.

(b) Earth science, as described in NAC 389.410.

(c) Physical science, as described in NAC 389.415.]

3. Social studies, which must include instruction in at least three of the following areas by completion of the eighth grade:

(a) Civics, as described in NAC 389.420.

(b) Economics, as described in NAC 389.425.

(c) The history of Nevada, as described in NAC 389.430.

(d) The history of the United States, as described in NAC 389.440.

(e) The geography of the world, as described in NAC 389.435.

4. *English* Language *Arts*[, which must include instruction as described in NAC 389.345 and 389.350.]

389.450 Prescribed courses of study for graduation. In addition to the courses of study required in chapter 389 of NRS, the state board of education prescribes the following courses of study for graduation from a public high school:

1. Arts and Humanities;

2. Health education;

3. English *Language Arts*;

4. Mathematics[, which may include the following courses of study:

(a) Basic mathematics;

(b) Mathematics for everyday living;

(c) Prealgebra;

(d) Algebra I;

(e) Geometry;

(f) Algebra II;

(g) Trigonometry;

(h) Analytic geometry;

(i) Precalculus;

(j) Calculus; and

(k) Probability and statistics;]

5. Physical education or personal fitness;

6. Science[, which may include the following courses of study:

(a) Life science;

(b) Earth science;

(c) Physical science;

(d) Environmental science; and

(e) General science;]

7. Use of computers, which may include the following courses of study:

(a) Accounting and computing;

(b) Processing business information;

(c) Word processing;

(d) Introduction to computers;

(e) Application of computers; and

(f) Science of computers; and

8. Career and occupational guidance and counseling.

The following Science regulations are hereby repealed effective July 1, 1999:

NAC 389.265, NAC 389.315, NAC 389.365, NAC 389.405, NAC 389.410, NAC 389.415, NAC 389.491, NAC 389.492, NAC 389.494, NAC 389.496, NAC 389.498, NAC 389.4985

TEXT OF REPEALED SECTIONS

[389.265 Science. The courses in science offered in public schools must include instruction designed to teach the pupil by completion of the third grade to:

1. Use skills related to the scientific method of study, including observation, communication, classification, inference and prediction.

2. Demonstrate curiosity in the study of science, individually and as a member of a group, using a variety of materials.

3. Show respect for the natural world.

4. Understand the value of science in daily living.

5. Understand that there are many forms of living things.

6. Identify the resources that are needed for living things to grow.

7. Recognize how the environment affects living things.

8. Describe how living things change.

9. Understand that all living things have a life cycle.

10. Understand that all things are composed of matter.

11. Identify various forms of energy.

12. Explain how energy is used in doing work.

13. Observe and explain changes in the earth.

14. Identify predictable patterns in the universe.

15. Value the principles of conservation of natural resources and of preservation of the environment and understand how those principles directly affect human life.

16. Demonstrate an awareness of the interrelationship among and the integration of science, technology, society and the environment.]

[389.315 Science. The courses in science offered in public elementary schools must include instruction designed to teach the pupil by completion of the sixth grade to:

1. Use each step of the scientific method of study.

2. Use written, oral and pictorial methods of communication.

3. Measure length, mass and volume using the metric and English (standard) systems.

4. Demonstrate the ability to think critically.

5. Use a variety of scientific tools.

6. Show an interest in science through the meaningful application of scientific concepts.

7. Demonstrate respect for the environment through the pupil's attitude and actions.

8. Express confidence in the use of scientific concepts, individually and as a member of a group.

9. Use and care for scientific equipment, including microscopes, computers and other scientific tools.

10. Understand the cyclical and systemic nature of the world.

11. Recognize the sequential nature of natural processes.

12. Delineate and classify groups of things having similar characteristics.

13. Understand that the natural environment is constantly changing.

14. Recognize that interactions of matter and energy determine the nature of the environment.

15. Understand that natural phenomena are limited by the nature of matter and energy.

16. Recognize the broad range of occupations and professions that require scientific knowledge.

17. Demonstrate an awareness of the historical impact of persons who have contributed to modern advances in technology.

18. Recognize how science is related to the community and society.

19. Understand the interrelationship of science with other educational disciplines, including languages, music, art, mathematics and social studies.

20. Understand the importance of science in all aspects of life and its significance to every person, regardless of race, sex or level of ability.

21. Explain how technology and human activities have affected the environment and the future of life on earth.**]**

[389.365 Science. The courses in science offered in public elementary schools must include instruction designed to teach the pupil by completion of the eighth grade to:

1. Recognize problems in the study of science.

2. Formulate questions related to the study of science.

3. Collect and analyze data related to the solution of scientific problems.

4. Draw conclusions based on scientific data.

5. Use diagrams and appropriate oral and written forms of communication to report the results obtained from solving a scientific problem.

6. Demonstrate an open mind in the study of science.

7. Make judgments or withhold judgment based on available evidence.

8. Show a willingness to change judgments as new evidence becomes available.

9. Demonstrate curiosity and persistence in the solution of scientific problems.

10. Show an interest in pursuing science as a lifelong endeavor.

11. Recognize the misuse and limitations of science.

12. Demonstrate a sense of responsibility for the environment.

13. Recognize the contributions of science and technology to daily living.

14. Recognize the obligation of each person to have a basic understanding of the principles of science.

15. Demonstrate the ability to solve problems in cooperation with other persons.

16. Recognize that science can aid in understanding local, state, national and international problems and issues.

17. Exhibit the ability to assess, evaluate and make responsible decisions concerning the solution of local, state, national and international problems and issues.

18. Understand the opportunities for involvement in the community and employment in fields relating to science, technology and the environment.

19. Recognize that mathematics is used to communicate scientific principles and understand that mathematics is a necessary component of scientific knowledge.

20. Recognize technology as the application of science and understand that technology is a necessary component of scientific knowledge.

21. Understand that natural phenomena have many similarities and differences.

22. Understand that the natural environment is constantly changing.

23. Understand that rules of cause and effect make it possible to explain change.

24. Explain how the interaction of matter and energy determines the nature of the environment.

25. Recognize that the universe is comprised of systems within systems.

26. Understand that natural phenomena are limited by the nature of matter and energy.]

[389.405 Life science. A course of study in life science in the seventh or eighth grade must include instruction designed to teach the pupil to do the following:

1. Recognize and demonstrate a knowledge of the functions and cycles of life.

2. Organize and classify living organisms and understand general principles of taxonomy.

3. Identify the structure of cells and the function of tissues, organisms and higher levels of organization.

4. Understand photosynthesis and respiration.

5. Observe and differentiate between the anatomy of plants and animals.

6. Understand basic principles of genetics.

7. Understand environmental concepts and their relationship to the continuing existence of life.

8. Recognize, interpret or distinguish theories of the origin and development of life.]

[389.410 Earth science. A course of study in the seventh or eighth grade on earth science must include instruction designed to teach the pupil to do the following:

1. Demonstrate knowledge of the relationship between the boundaries of plates, zones of earthquakes and volcanic activity.

2. Explain the topography of the floor of the ocean, the sources of natural resources and the factors that influence physical cycles, such as water and climate.

3. Demonstrate a knowledge of global and local patterns of weather and related phenomena.

4. Describe the technological events leading to travel in space.

5. Understand the solar system and its place in the universe.

6. Use the principles of classification to identify common types of rock.

7. Describe the methods by which sedimentary, igneous and metamorphic rocks are formed.

8. Explain the forces that build up and wear down formations of the earth.

9. Demonstrate an awareness of the importance of mining to the history and economy of Nevada.

10. Demonstrate a general awareness of geologic history.

11. Distinguish between renewable and nonrenewable resources.

12. Demonstrate skill in reading and interpreting maps.

13. Develop an understanding of the chemical nature of matter.]

[389.415 Physical science. A course of study in physical science in the seventh or eighth grade must include instruction designed to teach the pupil to do the following:

1. Differentiate among the characteristics of matter.

2. Demonstrate a knowledge of the structure of matter.

3. Recognize patterns in the periodic chart of elements.

4. Define and distinguish the various forms of energy.

5. Describe how energy may be transformed from one form to another.

6. Recognize the scientific principles and the technological applications of motion, force, work and power.

7. Demonstrate a knowledge of the basic characteristics and technological applications of motion, electromagnetism and molecular energy.]

[389.491 Science in all grades. A course of study in science in all grades of high school must include instruction designed to teach the pupil to:

1. Evaluate quantitative information using the scientific method.

2. Develop and enhance skills in observation, communication, classification, inference and prediction.

3. Use critical and creative thinking in solving scientific problems.

4. Demonstrate confidence and excitement in learning science through relevant experiences, innovative instruction, discrepant events and activities in which pupils are

required to participate.

5. Develop a positive feeling for science through an understanding of the history of science, opportunities for careers in science and the relationship of science to daily living.

6. Explore the relationship between science and technology and the effects of that relationship on society and the environment.

7. Explore the relationships between science and other courses of study.

8. Recognize that science is an ongoing process, rather than merely a body of knowledge.]

[389.492 Life science. In addition to the course of study in science required for all grades of high school, a course of study in life science must include instruction designed to teach the pupil to do the following, as appropriate to the specific course in life science:

1. Demonstrate the active use of critical thinking and logical reasoning.

2. Identify relationships between matter and energy.

3. Analyze the characteristics and organization of the processes that cause diversity and change in the universe.

4. Recognize the interdependence of organisms and their environment.

5. Understand that mathematics is used to communicate scientific principles.

6. Use mathematics in collecting and interpreting scientific data.

7. Explain the relationship among scientific disciplines and their relationship to choosing a career, industry and daily living.

8. Understand environmental concepts as they relate to life science.

9. Demonstrate an understanding of the continuity and development of life forms.

10. Demonstrate an understanding of the structure and interdependence of living systems.

11. Demonstrate an understanding of metabolic processes.]

[389.494 Earth science. In addition to the course of study in science required for all grades of high school, a course of study in earth science must include instruction designed to teach the pupil to do the following, as appropriate to the specific course in earth science:

1. Demonstrate the active use of critical thinking and logical reasoning.

2. Identify relationships between matter and energy.

3. Analyze the characteristics and organization of the processes that cause diversity and change in the universe.

4. Recognize the interdependence of organisms and their environment.

5. Understand that mathematics is used to communicate scientific principles.

6. Use mathematics in collecting and interpreting scientific data.

7. Explain the relationship among scientific disciplines and their relationship to choosing a career, industry and daily living.

8. Understand environmental concepts as they relate to earth science.

9. Demonstrate an understanding of geology, oceanography, meteorology and other phenomena related to earth science.

10. Demonstrate an understanding of the solar system and the universe.]

[389.496 Physical science. In addition to the course of study in science required for all grades of high school, a course of study in physical science must include instruction designed to teach the pupil to do the following, as appropriate to the specific course in physical science:

1. Demonstrate the active use of critical thinking and logical reasoning.

2. Identify relationships between matter and energy.

3. Analyze the characteristics and organization of the processes that cause diversity and change in the universe.

4. Recognize the interdependence of organisms and their environment.

5. Understand that mathematics is used to communicate scientific principles.

6. Use mathematics to quantify science and in collecting and interpreting scientific data.

7. Explain the relationship among scientific disciplines and their relationship to choosing a career, industry and daily living.

8. Understand environmental concepts as they relate to physical science.

9. Explain the relationship between the structure and properties of matter.

10. Demonstrate an understanding of the transformation of energy, the forces of nature, motion and the relationship of cause and effect in those contexts.

[389.498 Environmental science. In addition to the course of study in science required for all grades of high school, a course of study in environmental science must include instruction designed to teach the pupil to do the following:

1. Demonstrate the active use of critical thinking and logical reasoning.

2. Identify relationships between matter and energy.

3. Analyze the characteristics and organization of the processes that cause diversity and change in the universe.

4. Recognize the interdependence of organisms and their environment.

5. Understand that mathematics is used to communicate scientific principles.

6. Use mathematics to quantify science in collecting and interpreting scientific data.

7. Explain the relationship among scientific disciplines and their relationship to choosing a career, industry and daily living.

8. Understand environmental concepts as they relate to human activities.

9. Demonstrate an understanding of the interrelationship among components of the biosphere.

10. Demonstrate an understanding of succession.

11. Demonstrate an understanding of the effect of technology on the environment.

12. Demonstrate an understanding of the environmental effects of change in the biosphere.]

[389.4985 General science. A course of study in general science must allow the pupil, as appropriate to the course, to do the following upon completion of the course:

1. Demonstrate critical thinking and reasoning skills.

2. Identify the relationship between matter and energy.

3. Analyze the characteristics of the processes responsible for diversity and change in the universe.

4. Demonstrate an understanding of how to use mathematics as a method of communicating scientific results and to quantify and interpret data collected.

5. Explain the relationship among sciences and their use in various professions and industries and in everyday life.

6. Recognize the interdependence between organisms and their environment.

7. Understand the relationship between human activity and the environment.

8. Demonstrate an understanding of the structure and interdependence of living systems.

9. Demonstrate an understanding of metabolic processes.

10. Demonstrate an understanding of the forces and phenomena which affect the earth.

11. Explain the relationship between the structure and properties of matter.

12. Demonstrate an understanding of the transformation of energy and the laws of motion.]

NEVADA DEPARTMENT OF EDUCATION

NEVADA STATE BOARD OF EDUCATION
NEVADA STATE BOARD FOR OCCUPATIONAL EDUCATION

LEGISLATIVE REVIEW OF ADOPTED REGULATIONS AS REQUIRED BY ADMINISTRATIVE PROCEDURES ACT, NRS 233B.066
NAC 389, English Language Arts Course of Study, Science Course of Study and Mathematics Course of Study

IMPACT STATEMENT

The following statement is submitted for adopted amendments to Nevada Administrative Code (NAC) 389, English Language Arts Course of Study, Science Course of Study, and Mathematics Course of Study:

1. A description of how public comment was solicited, a summary of public response, and explanation how other interested persons may obtain a copy of the summary.

Notice of Workshop to Solicit Comments on Proposed Regulations was sent to approximately one-hundred twenty-five individuals and educational organizations. One workshop was held July 14, 1998. There were no comments from the public.

The Notice of Intent to Act Upon a Regulation for public hearing on the proposed revisions to NAC 389 was sent to approximately one-hundred twenty-five individuals and educational organizations. One public hearing was conducted on August 20, 1998 to provide the opportunity for comments by affected parties and the public. Public response focused on proposed revisions to English Language Arts Course of Study, Science Course of Study and Mathematics Course of Study. There were comments from the public.

2. The Number of Persons Who:

a) Attended Each Hearing: Workshop: 1 First Hearing: 59 Second Hearing: n/a

b) Testified at Each Hearing; Workshop: 0 First Hearing: 4 Second Hearing: n/a

and,

c) Submitted Written Statements: Workshop: 0 First Hearing: 0 Second Hearing: n/a

No written comments were submitted.

A copy of any written comments may be obtained by calling LaDonna Byrd, Board Secretary, at the Department of Education (702) 687-9225, or by writing to the Department of Education, 700 East Fifth Street, Carson City, Nevada 89701-5096.

3. A description of how comment was solicited from affected businesses, a summary of the response and an explanation how other interested parties may obtain a copy of the summary.

Comment was solicited through the workshop notice of June 10, 1998, and public hearing notice of July 15, 1998.

At the public hearing, comments from interested parties were as follows: Elaine Lancaster, President, Nevada State Education Association stated that the association supports new standards and assessments. She had three questions that she felt needed to be addressed: 1) how will every classroom teacher get the new standards?; 2) who is responsible for the training needed for implementation and how will that be accomplished?; and, 3) if the materials, supplies or equipment are not available to meet the new standards, who pays to obtain the needed materials? Anne Loring, Member, Washoe County School District Board of Trustees, and member of the Math Writing Team, thanked the members of the Council to Establish Academic Standard for Public Schools for their hard work and for producing the documents to be adopted by the State Board of Education. She hoped that the Council would consider revisiting the reading list. Eric Anderson, Consultant, Standards, Curricula and Assessment Team, Department of Education, urged the adoption of the new standards for science. He had a concern that the regulation language does not identify that a student will know and be able to do all that was learned from previous years, and urged recognition of the individuals who were involved in the standards development process. Dr. Richard Vineyard, Reno, stated that, as the incoming science consultant for the Department of Education, he is prepared to implement the new science content standards in the schools.

A copy of the summary and/or minutes of the public hearing may be obtained by calling LaDonna Byrd, Board Secretary, at the Department of Education (702) 687-9225, or by writing to the Department of Education at 700 East Fifth Street, Carson City, Nevada 89701-5096.

4. If the regulation was adopted with or without change to any part of the proposed regulation, a summary of the reasons for adopting.

The temporary regulation was adopted by the Nevada State Board of Education at the public hearing held August 20, 1998, with revisions to the content standards for mathematics, English Language Arts and science, and incorporated into the regulation language as approved by the Council to Establish Academic Standards for Public Schools (per Senate Bill 482, enacted by the 1997 Legislature) to become effective July

1, 1999. The board also moved to not repeal current language until further review on the advanced courses in mathematics, English Language Arts and science.

5. The estimated economic effect of the adopted regulation on the business which it is to regulate and on the public. These must be stated separately, and each case must include:

The possible economic effect on the local school districts will in the purchase of new textbooks, manipulatives and calculators to meet the new standards. There is no estimated economic effect on the public, either adversely or beneficially, nor immediate or long term.

6. The estimated cost to the agency for enforcement of the adopted regulation.

There is no additional cost to the agency for enforcement of this regulation.

7. A description of any regulations of other state or government agencies which the proposed regulation overlaps or duplicates and a statement explaining why the duplication or overlapping is necessary. If the regulation overlaps or duplicates a federal regulation, the name of the regulating federal agency.

No other state or government agency regulations will be overlapped or duplicated by the above noted regulations. There is no duplication or overlap of federal regulations.

8. If the regulation includes provisions which are more stringent than a federal regulation which regulates the same activity, a summary of such provisions.

There are none.

9. If the regulation provides a new fee or increases an existing fee, the total annual amount the agency expects to collect and the manner in which the money will be used.

This regulation does not provide or involve a new fee.