ADOPTED REGULATION OF THE

STATE BOARD OF EDUCATION

LCB File No. R041-05

Effective October 31, 2005

EXPLANATION – Matter in ***italics*** is new; matter in brackets **[**~~omitted material~~**]** is material to be omitted.

AUTHORITY: §§1, 3, 5 and 6, NRS 385.080 and 389.520; §4, NRS 385.080, 389.019 and 389.520.

A REGULATION relating to education; revising provisions governing academic standards for courses in science; and providing other matters properly relating thereto.

Section 1. NAC 389.244 is hereby amended to read as follows:

389.244 **[**~~By the end of the second grade, pupils must know and be able to do everything required in the previous grades for courses in science offered in public schools.~~**]** Instruction in ***kindergarten through*** the second grade in science must be designed so that pupils meet the following **[**~~performance~~**]** standards by the completion of the second grade:

1. For the area of **[**~~physical science:~~**]** ***science inquiry:***

(a) Understand that **[**~~gravitational, electrical and magnetic forces have an effect on the motion of objects, as demonstrated by the pupil's ability to:~~

~~(1) Show that objects move at different speeds, for example, a car speeds up or slows down or one person runs faster than another; and~~

~~(2) Use a model or pattern to demonstrate how to assemble or disassemble a structure, for example, by using an interlocking block tower, erector set crane or pattern block picture.~~

~~(b) Understand that materials have distinct properties which depend on the amount of matter present, its chemical composition and structure, as demonstrated by the pupil's ability to:~~

~~(1) Sort and describe objects in terms of some observable properties, for example, color, shape, size or texture; and~~

~~(2) Independently form large objects from smaller objects, for example, by putting together a puzzle or quilt.~~

~~(c) Understand that changes in temperature and pressure can alter states of matter and that energy exists in many forms and one form can change into another, as demonstrated by the pupil's ability to:~~

~~(1) Describe a variety of objects as being cold, cool, warm or hot;~~

~~(2) Describe the temperatures of similar objects in different outdoor locations and explain that heat from the sun warms the objects;~~

~~(3) Describe an object before and after a change in the state of the object occurs by using terms of observable properties; and~~

~~(4) Independently manipulate appropriate objects to produce various sounds by vibrating the objects and classify the sounds produced in terms of properties of pitch and tone.~~

~~(d) Understand that chemical reactions change substances into different substances.~~

~~(e) Understand that nuclear energy and electromagnetic energy are produced in many forms from natural and man-made sources.~~~~]~~ ***science is an active process of systematically examining the natural world;***

(b) Know how to make observations and provide descriptions of such observations using words, numbers and drawings;

(c) Know that tools can be used safely to gather data and to extend the senses; and

(d) Know that observable patterns can be used to predict future events or sort items.

2. For the ~~[area of life science:]~~ ***areas of science, technology and society:***

(a) Understand that ~~[all life forms, at all levels of organization, use specialized structures and similar processes to meet the basic needs of life, as demonstrated by the pupil's ability to:~~

~~(1) Provide examples of how living things grow and change, with some minor errors in detail; and~~

~~(2) Classify living and nonliving things according to established criteria, with few errors.~~

~~(b) Understand that organisms respond to internal and external influences, as demonstrated by the pupil's ability to:~~

~~(1) Explain that germs cause some diseases and may be spread by people who have them; and~~

~~(2) Explain that washing hands thoroughly with soap and water reduces the number of germs and the spread of germs.~~

~~(c) Understand that life forms are diverse and that, through heredity, they pass some characteristics to their offspring, as demonstrated by the pupil's ability to:~~

~~(1) Describe, using common examples, that animals produce offspring that are like themselves, for example, dogs produce puppies and not kittens; and~~

~~(2) Sort a group of living things and describe how some living things have similar observable characteristics.~~

~~(d) Understand that life forms change over time through evolution and the process of biological change.]~~ ***many people contribute to the field of science, including, without limitation, men and women of all ages and backgrounds; and***

(b) Know that teamwork is beneficial to the study of science, including, without limitation, working and sharing findings with others.

3. For the ~~[areas of earth and space sciences:]~~ ***area of matter:***

(a) Understand ~~[the structures of the earth and that the earth is composed of interrelated systems of rocks, water, air and life, as demonstrated by the pupil's ability to:~~

~~(1) Group rock samples according to a single attribute of shape, size, color, texture, or patterns of color or shading; and~~

~~(2) Provide justification for their grouping.~~

~~(b) Understand that the earth may be represented by a variety of maps and models.~~

~~(c) Understand the history of the earth and that the systems of the earth such as weather and the formation of mountains change or vary.~~

~~(d) Observe and describe changes that take place in nature, for example, weather, seasons, day and night.~~

~~(e) Understand that the systems of the earth have a variety of cycles through which energy and matter continually flow, as demonstrated by the pupil's ability to:~~

~~(1) Observe and describe the way the ground, water and air feel in the shade versus the sunlight; and~~

~~(2) Observe and describe how weather such as temperature, cloudiness and precipitation change from day to day and throughout the year.~~

~~(f) Understand the solar system and the universe and that the earth is part of a planetary system within the Milky Way Galaxy, which is part of the known universe, as demonstrated by the pupil's ability to:~~

~~(1) Identify from drawings or photographs the sun, moon and stars;~~

~~(2) Identify from drawings, photographs or verbal prompts that the earth is a planet; and~~

~~(3) Describe the movement of the sun across the sky and explain that the moon appears in different places at different times.]~~ ***that matter has observable properties;***

(b) Know that matter can exist in a solid form or liquid form;

(c) Know that certain properties of materials can be changed by heating, freezing, mixing, cutting or bending the material;

(d) Know that matter can be categorized by observable properties, including, without limitation, color, size, shape and weight; and

(e) Know that different objects can be made of many different types of materials.

4. For the ~~[area of environmental sciences:]~~ ***areas of force and motion:***

(a) Understand 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, as demonstrated by the pupil's ability to:~~

~~(1) Investigate, observe and discuss the interactions between plants as producers and animals as consumers; and~~

~~(2) Provide examples of interdependence between plants and animals.~~

~~(b) Understand that natural resources include renewable and nonrenewable materials and energy, that all organisms, including humans, use resources to maintain and improve their existence and that the use of resources can have positive and negative consequences, as demonstrated by the pupil's ability to:~~

~~(1) Demonstrate how some resources can be used and reused, for example, wastepaper and glass are recyclable; and~~

~~(2) Describe the various resources that provide the basic necessities used by people in their daily lives.~~

~~(c) Understand conservation and 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, as demonstrated by the pupil's ability to:~~

~~(1) Illustrate how people live in different places in different ways; and~~

~~(2) Illustrate how some things change in daily life and some things stay the same.~~**~~]~~** ***the position and motion of an object can be described;***

(b) Know that the position and motion of an object can be changed by pushing or pulling the object;

(c) Know that an object can move:

(1) In various manners and directions, including, without limitation, straight lines, zigzags, vibrations and circular motions; and

(2) At various speeds, including, without limitation, fast and slow;

(d) Know that magnets can be used to make certain objects move without being touched; and

(e) Know that an object will fall to the ground unless something holds the object off of the ground.

5. For the area of ~~[the nature and history of science:]~~ ***energy:***

(a) 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, as demonstrated by the pupil's ability to:~~

~~(1) Generate an idea or invention with assistance from the teacher; and~~

~~(2) Provide examples of thinkers and inventors from around the world.~~

~~(b) Understand skills of reasoning and critical response and that many decisions require critical consideration of scientific evidence.~~

~~(c) Understand systems, models, risk and predictions and that a variety of models can be used to describe or predict occurrences and events.~~

~~(d) Understand scientific values and attitudes and that science is an active process of systematically examining the natural world, as demonstrated by the pupil's ability to:~~

~~(1) Make qualitative observations and provide pictorial or word descriptions of objects or phenomena; and~~

~~(2) Record in a notebook or journal, with minimal assistance from the teacher, observations of investigations over a period of time, for example, the growth of a plant, changes in weather or the growth and development of insects.~~

~~(e) Understand that a variety of methods of communication may be used to share scientific information, as demonstrated by the pupil's ability to:~~

~~(1) Generally follow verbal and written instructions accurately;~~

~~(2) Generally produce simple pictographs to describe observations; and~~

~~(3) Cooperate and contribute ideas within a group.~~**]** ***heat, light and sound can be produced;***

(b) Know that the sun is a source of heat and light;

(c) Know that sound is produced through the vibration of one or more objects; and

(d) Know that an object can be described as hot or cold in relation to another object.

6. For the area of **[**~~scientific inquiry, processes and skills:~~**]** ***heredity:***

(a) Understand that **[**~~scientific inquiry is enhanced and often communicated through mathematics, as demonstrated by the pupil's ability to:~~

~~(1) Generally use mental computation to make rough estimates, for example, simple addition and subtraction problems; and~~

~~(2) Adequately identify unexpected or unusual results when counting or measuring using units of measurement that are not standard.~~

~~(b) Demonstrate laboratory skills and the appropriate and safe application of the tools and techniques of scientific inquiry by generally keeping accurate records of observations and measurements taken over time, such as plant growth, metamorphosis, evaporation and weather conditions.~~] ***living things, including, without limitation, plants and animals, pass certain characteristics to their offspring that makes them resemble each other; and***

(b) Know that differences exist among individuals of the same kind of plant or animal.

7. For the area of the structure of life:

(a) Understand that living things have identifiable characteristics; and

(b) Know that humans and other animals use their senses to understand and adapt to their environment.

8. For the area of organisms and their environment:

(a) Understand that living things live in different places and environments;

(b) Know that plants and animals need certain resources for energy and growth;

(c) Know that a habitat includes, without limitation, food, water, shelter and space; and

(d) Know that living things exist almost everywhere on the earth.

9. For the area of the diversity of life:

(a) Understand that there are many kinds of living things on the earth;

(b) Know that plants and animals can be distinguished by observable characteristics and behaviors; and

(c) Know that certain plants and animals are extinct.

10. For the areas of the atmospheric processes and the cycle of water:

(a) Understand that changes in the weather can transform the state of water from a liquid form to a solid form or a solid form to a liquid form;

(b) Know that the sun is a source of heat and light;

(c) Know that the water on the earth exists in a liquid form or solid form and can transform from one form to the other form;

(d) Know that the weather changes from day to day and from season to season; and

(e) Know that the weather can be described in terms of certain measurements, including, without limitation, the degree of the temperature, the direction and speed of the wind, and the amount of precipitation.

11. For the areas of the solar system and the universe:

(a) Understand that there are objects in the sky which display patterns, including, without limitation, how they look, where they are located and how they move;

(b) Know that the sun rises every day and the moon can rise during the day and night;

(c) Know that the sun and moon appear to move across the sky; and

(d) Know that the shape of the moon appears to change over the course of a month.

12. For the area of the structure and composition of the earth:

(a) Understand that the earth is composed of various materials, including, without limitation, rock, soil and water;

(b) Know that rocks exist in various sizes, shapes, textures and colors;

(c) Know that different objects are made of different types of materials; and

(d) Know that the color and texture of soil depends upon the composition of the soil.

Sec. 2. NAC 389.2947 is hereby amended to read as follows:

389.2947 By the end of the fifth grade, pupils must ***understand,*** know and be able to do everything required in the previous grades for courses in science offered in public schools. Instruction in the ***third grade through the*** fifth grade in science must be designed so that pupils meet the following ~~[performance]~~ standards by the completion of the fifth grade:

1. For the ~~[areas of physical science:]~~ ***area of science inquiry:***

(a) Understand that ~~[gravitational, electrical and magnetic forces have an effect on the motion of objects, as demonstrated by the pupil's ability to:~~

~~(1) Demonstrate and describe that the greater the push or pull on an object, the greater the change in motion of that object;~~

~~(2) Give examples of falling objects and explain that a gravitational force is pulling them down;~~

~~(3) Categorize objects that move in different directions, such as forward, back and sideways, in a variety of ways, for example, rotating, rolling or revolving, and with varying ease of movement and friction;~~

~~(4) Accurately predict which objects will sink or float in air or water and classify those objects accordingly; and~~

~~(5) Predict, sort and classify objects and materials that magnets attract and describe and demonstrate that like magnetic poles repel.~~

~~(b) Understand that materials have distinct properties which depend on the amount of matter present, its chemical composition and structure, as demonstrated by the pupil's ability to:~~

~~(1) Separate the components of a mixture based on their properties, for example, separating sand and sugar from a mixture of sand and sugar or separating sugar from a solution of water and sugar, and describe why the technique worked;~~

~~(2) Compare and contrast elements, compounds and mixtures and give common examples of elements, compounds and mixtures;~~

~~(3) Investigate and describe how patterns of crystals are formed after water has evaporated from a solution;~~

~~(4) Describe the properties of large and small pieces of a material and explain that the properties are the same, such as a sheet of paper versus pieces of paper, a chunk of rock and fragments of rock or a cinnamon stick and powdered cinnamon;~~

~~(5) Describe observable properties such as the state of matter, ductility, malleability, color, strength and shape of various materials and suggest uses for these materials based on their properties; and~~

~~(6) Compare and contrast the properties and composition of various materials.~~

~~(c) Understand that changes in temperature and pressure can alter states of matter and that energy exists in many forms, as demonstrated by the pupil's ability to:~~

~~(1) Gather data to describe the cooling of warm objects and the warming of cool objects when brought together and make accurate observations;~~

~~(2) Investigate how energy and matter interact when water changes phases from solid to liquid to gas and vice versa, explain these interactions and diagram the water cycle, indicating whether energy is absorbed or released in each change;~~

~~(3) Demonstrate how changes in sound can be made given appropriate supplies such as a uniform set of eight glasses or test tubes, a metal spoon, a chopstick and a container of water, and record and summarize the findings; and~~

~~(4) Follow instructions to build a simple series electrical circuit and describe the use of various components such as switches, wires, batteries, sockets, motor and lights.~~

~~(d) Understand that chemical reactions change substances into different substances, as demonstrated by the pupil's ability to:~~

~~(1) Observe and record the effects of common physical and chemical changes, for example, melting and burning candle wax, dissolving sugar in water and heating sugar and mixing baking soda with vinegar to bake a cake; and~~

~~(2) Distinguish between a phase and a chemical change.~~

~~(e) Understand that nuclear energy and electromagnetic energy are produced in many forms from both natural and man-made sources.~~~~]~~ ***the study of science involves asking and answering questions and comparing the answers to what scientists already know about the world;***

(b) Know that scientific progress is made by conducting careful investigations, recording data and communicating the results of investigations and data in an accurate manner;

(c) Know how to compare the results of a scientific experiment to what scientists already know about the world;

(d) Know how to draw conclusions from scientific evidence;

(e) Know that graphic representations of recorded data can be used to make predictions;

(f) Know how to plan and conduct a safe and simple investigation; and

(g) Know that a model is a tool which can be used to learn about the object or properties the model is designed to resemble.

2. For the ~~[area of life science:]~~ ***areas of science, technology and society:***

(a) Understand that ~~[all life forms, at all levels of organization, use specialized structures and similar processes to meet the basic needs of life, as demonstrated by the pupil's ability to:~~

~~(1) Observe, draw, label, compare and contrast, with minor errors or omissions, the essential features of the life cycles of representative plants and animals, including birth or germination, the development of plants such as seeds to roots, stems and leaves to flowers to seeds, and the development of animals such as the frog, silk moth or cricket;~~

~~(2) Classify, with minor errors, structures of various organisms according to their functions; and~~

~~(3) Give examples of specific features that enable a wide variety of plants and animals to live in their environments.~~

~~(b) Understand that organisms respond to internal and external influences, as demonstrated by the pupil's ability to:~~

~~(1) With reasonable assistance from the teacher, relate sensory input to behavioral response, for example, plants turn toward the sun and animals turn toward sound;~~

~~(2) Develop a reasonable plan to teach an organism a learned behavior; and~~

~~(3) Make reasonable predictions that some environmental conditions are more favorable than others to living things, for example, that there is a far greater diversity of life in a rain forest than in a desert or tundra.~~

~~(c) Understand that life forms are diverse and that they pass some characteristics to their offspring, as demonstrated by the pupil's ability to:~~

~~(1) Differentiate inherited traits from learned traits and illustrate with appropriate examples;~~

~~(2) Explain that living things are classified by similar features, behaviors and habits and provide some examples;~~

~~(3) Illustrate, by providing several examples, that there are variations among individuals within a population of certain species; and~~

~~(4) Relate reproduction to the continuation of a species.~~

~~(d) Understand that life forms change over time through evolution and the process of biological change, as demonstrated by the pupil's ability to:~~

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

~~(2) Identify examples of environmental changes that have allowed some species to survive and caused others to become extinct; and~~

~~(3) Identify examples of how differences in individual characteristics may give an advantage for survival.~~~~]~~ ***people from all cultures and levels of education, experience and ability contribute to the fields of science and technology;***

(b) Know that people of diverse cultures have contributed to scientific knowledge and technology throughout history;

(c) Know that technology has positive and negative impacts on society; and

(d) Know that there are benefits to working with others in a team and sharing findings.

3. For the ~~[areas of earth and space sciences:]~~ ***area of matter:***

(a) Understand ~~[that the earth is composed of interrelated systems of rocks, water, air and life, as demonstrated by the pupil's ability to:~~

~~(1) Describe the mineral content of a rock sample in terms of easily observed properties of the minerals it contains, for example, the color and darkness of minerals and the size of crystals;~~

~~(2) Describe relationships, using models and firsthand observations, between:~~

~~(I) Increase in slope and increase in the rate of erosion;~~

~~(II) Increase in slope and decrease in the rate of deposition; and~~

~~(III) Ways in which the activities of humans can increase the rate of erosion, for example, through deforestation and removal of the soil, or decrease the rate of erosion, for example, through reforestation or construction that has a minimum impact on the environment;~~

~~(3) Describe, using models or maps, the flat, protruding and depressed features of the surface of the earth, including features of the ocean floor; and~~

~~(4) Describe the composition of samples of soil in terms of constituents such as rock and mineral fragments, organic material, moisture content and organisms, and compare and contrast soil samples from different places.~~

~~(b) Understand that the earth may be represented by a variety of maps and models, as demonstrated by the pupil's ability to:~~

~~(1) Identify, given a map, the directions northeast, northwest, southeast and southwest;~~

~~(2) With minimal assistance from the teacher, use a road map of the State of Nevada to plan a route between various points of interest in this State, for example, from the residence of the pupil to a point of interest such as the Berlin Ichthyosaur or Lehman Caves; and~~

~~(3) With minimal assistance from the teacher, construct a map of a local or regional feature such as the classroom, school grounds or neighborhood.~~

~~(c) Understand that the systems of the earth, such as weather and the formation of mountains, change or vary, as demonstrated by the pupil's ability to:~~

~~(1) Compare and contrast, using various laboratory, print, multimedia and Internet resources, the amount of time required to cause various changes on the surface of the earth, for example, weathering, erosion, earthquakes and volcanic eruptions; and~~

~~(2) With minimal assistance from the teacher, simulate and describe, by using hands-on materials, the various ways that fossils form, such as cast and mold formation and imprints.~~

~~(d) Understand that the systems of the earth have a variety of cycles through which energy and matter continually flow, as demonstrated by the pupil's ability to:~~

~~(1) Investigate and explain, with examples, how the sun is the main source of energy for people;~~

~~(2) Analyze, using print, maps, models, multimedia resources and the Internet, various meteorological events, such as storms, flooding and drought, including their causes and effects;~~

~~(3) Conduct investigations that demonstrate relationships among temperature, relative humidity, air movement, and rates of evaporation and condensation; and~~

~~(4) Observe natural outdoor and artificial systems, for example, terraria, decomposition columns, aquariums, stream tables, gardens and school environments, and describe the physical changes, such as pH, temperature, relative humidity, changes in state of water, weathering and erosion, and biological changes, such as patterns of behavior and seasonal changes in form, that take place in those systems.~~

~~(e) Understand that the earth is part of a planetary system within the Milky Way Galaxy, which is part of the known universe, as demonstrated by the pupil's ability to:~~

~~(1) Compare and contrast, citing print, multimedia or Internet resources, the general features of planets and their moons, asteroids, comets and the sun; and~~

~~(2) Describe, using daily and nightly observations or simulations, such as a classroom ceiling star projector or college planetarium, the:~~

~~(I) Motion of the sun, moon, stars and some planets across the sky; and~~

~~(II) Distribution, brightness and color of some major stars and constellations.]~~ ***the properties of objects and materials;***

(b) Know that matter exists in different states which have distinct physical properties, including, without limitation, solids, liquids and gases;

(c) Know that heating and cooling can change some common materials from one state to another, including, without limitation, water;

(d) Know that materials can be classified by their observable physical and chemical properties, including, without limitation, magnetism, conductivity, density and solubility;

(e) Know that a material can be created by combining two or more different materials and that the properties of the newly created material may be different from the properties of the original materials;

(f) Know that the mass of a material remains constant whether the material is together, separated into parts or changed to a different state or form; and

(g) Know that materials are composed of certain elements that are too small to be seen without magnification.

4. For the ~~[area of environmental sciences:~~

~~(a) 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 physical components of the earth, as demonstrated by the pupil's ability to:~~

~~(1) Describe, using examples, several ways organisms interact with each other and with their nonliving habitat, including dead plants and animals;~~

~~(2) Match plants and animals that will survive well, less well, or will not survive in particular environments;~~

~~(3) Explain why energy is required in an ecosystem, identify the sun as the energy source and identify other requirements for life that are met by the environment; and~~

~~(4) List and describe unique characteristics of representative local ecosystems.~~

~~(b)~~] ***areas of force and motion:***

(a) Understand that ~~[natural resources include renewable and nonrenewable materials and energy, and that all organisms, including humans, use resources to maintain and improve their existence, and that the use of resources can have positive and negative consequences, as demonstrated by the pupil's ability to:~~

~~(1) Observe samples of various materials, such as wood, cloth, paper, metal, plastic and composites, and describe their properties, for example, how they respond to various stresses, how they react with other materials and chemicals, what happens in the presence of heat and fire, and their electrical and magnetic properties;~~

~~(2) Identify ways that observed properties of samples of materials make them useful for various activities of humans;~~

~~(3) Investigate and describe the extent to which samples of man-made items, such as objects made of cloth, glass, paper, metal, plastic, composites or ceramics, may be used over and over;~~

~~(4) Describe how a device can be made to operate with less energy, for example, reducing friction by applying a lubricant such as graphite or using more aerodynamic and lightweight materials;~~

~~(5) Describe, using information from state and federal agencies, the kinds and uses of natural resources found in the State of Nevada, for example, water, gold, gypsum, petroleum, wildlife and ranch, farm and recreation land;~~

~~(6) Describe, using print, multimedia or Internet resources, the kinds and uses of natural resources acquired nationally or globally, such as lumber, grain, fish and coal; and~~

~~(7) Contrast the basic needs of humans for resources, such as food, water, shelter and warmth, to the actual use of resources by humans and suggest ways in which personal use of limited resources may be reduced.~~

~~(c) Understand that through conservation 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, as demonstrated by the pupil's ability to:~~

~~(1) Describe how the patterns of consumption of people living in the same period of time vary from place to place;~~

~~(2) Describe the components of an ecosystem that have changes which can be observed and the components of an ecosystem that do not change; and~~

~~(3) Identify changes in environments as being natural events or influenced by the activities of humans.]~~ ***certain forces applied to an object can change the position or motion of the object, including, without limitation, gravitational, electrical and magnetic forces;***

(b) Know that an object will speed up, slow down or move in a different direction if an unbalanced force is applied to the object;

(c) Know that the strength of a force which is applied to an object and the mass of the object will influence the amount of change in the motion of the object;

(d) Know that a magnetic force can cause certain objects to attract or repel each other;

(e) Know that an electrically charged particle can attract or repel another electrically charged particle or material; and

(f) Know that the gravity of the earth can pull any object toward the surface of the earth without touching the object.

5. For the area of ~~[the nature and history of science:]~~ ***energy:***

(a) 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, as demonstrated by the pupil's ability to:~~

~~(1) Develop a systematic approach to solving a problem;~~

~~(2) Use actual observations and results of scientific investigation to form a possible explanation;~~

~~(3) Research and use biographical information to make a written or oral report that describes past discoveries and inventions;~~

~~(4) Explain, with multiple examples, that working on a team brings greater results than working alone, for example, Apollo 13 and Thomas Edison's work on the light bulb;~~

~~(5) Use technological devices that may be used to determine motion, such as stopwatches and radar guns; and~~

~~(6) Identify a question for further study while doing a scientific investigation, for example, factors affecting plant growth.~~

~~(b) Understand that many decisions require critical consideration of scientific evidence, as demonstrated by the pupil's ability to:~~

~~(1) Justify conclusions or explanations using data and logical argument; and~~

~~(2) Recognize the limits of generalizations, assumptions, analogies and models, for example, the solar system, evolution or model of atoms.~~

~~(c) Understand that a variety of models can be used to describe or predict things and events, as demonstrated by the pupil's ability to:~~

~~(1) Use a physical model to explain how something works or is constructed;~~

~~(2) Explain, with examples, that the probability of an event happening depends on how closely current conditions correspond with previous conditions, for example, weather and accidents; and~~

~~(3) Describe and compare the components and interrelationships of a simple system, for example, tracing the flow of water through an aquarium, a filter and a pump.~~

~~(d) Understand that science is an active process of systematically examining the natural world, as demonstrated by the pupil's ability to:~~

~~(1) Keep accurate records of investigations and observations without changing those records later so that the records will fit the norm;~~

~~(2) Make conscientious observations, test things more than once and use repeated observations or trials to verify results; and~~

~~(3) Offer reasons for the findings and consider the suggestions of others.~~

~~(e) Understand that a variety of methods of communication may be used to share scientific information, as demonstrated by the pupil's ability to:~~

~~(1) Provide written or oral instructions that others are able to follow;~~

~~(2) Organize information into charts, tables and graphs according to established criteria; and~~

~~(3) Collaborate on a group project.~~] ***energy exists in different forms;***

(b) Know that light can be described in terms of simple properties, including, without limitation, color, brightness and reflection;

(c) Know the wave characteristics of sound;

(d) Know that heat can be produced as a by-product when one form of energy converts to another form of energy, including, without limitation, the conversion of stored energy to motion through the use of a machine or a living organism;

(e) Know that heat can transfer from one object to another by conduction and that certain materials conduct heat better than other materials; and

(f) Know the organization of a simple electrical circuit, including, without limitation, a battery, generator or a wire through which an electrical current can pass.

6. For the area of ~~[scientific inquiry, processes and skills:]~~ ***heredity:***

(a) Understand that ~~[scientific inquiry is enhanced and often communicated by using mathematics, as demonstrated by the pupil's ability to:~~

~~(1) Investigate the change in the result of a simple experiment when one of the experimental conditions is altered, for example, how the length of the string affects the swing of a pendulum;~~

~~(2) Explain the strategy and thinking used to solve a particular problem;~~

~~(3) Make acceptable quantitative estimates of familiar lengths, weights and intervals of time and check the estimates by accurate measurements;~~

~~(4) Select the appropriate types of units for a particular measurement, such as meters for length, seconds for time and kilograms for mass, and the appropriate magnitude of units for a particular measurement, such as meters, not centimeters, for measuring swimming pools; and~~

~~(5) Recognize that there may be inconsistent results if everyone in the class makes a particular measurement.~~

~~(b) Appropriately and safely apply the tools and techniques of scientific inquiry, as demonstrated by the pupil's ability to:~~

~~(1) Consistently use safety equipment and attire;~~

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

~~(3) Properly use materials that are provided to construct objects for a particular task;~~

~~(4) Label measurements, graphs and diagrams correctly;~~

~~(5) Select and use a range of instruments to measure physical quantities, for example, length, volume, weight, time and temperature, and record data using traditional lab equipment as well as computers; and~~

~~(6) Given a set procedure, manipulate objects and observe events in an experiment.]~~ ***certain characteristics in living things are inherited and certain characteristics are not inherited;***

(b) Know certain physical characteristics and behaviors that are inherited in animals and plants;

(c) Know that reproduction is an essential characteristic for the continuation of every species;

(d) Know that the offspring of an animal or plant can:

(1) Resemble the animal or plant from which the offspring was generated;

(2) Resemble other offspring of the animal or plant from which the offspring was generated; and

(3) Exhibit differences in characteristics from the animal or plant from which the offspring was generated;

(e) Know how to observe and describe differences between different persons of the human population; and

(f) Know that certain behaviors of animals are learned behaviors.

7. For the area of the structure of life:

(a) Understand that living things have specialized structures that perform a variety of life functions;

(b) Know that plants and animals have structures that enable them to grow, reproduce and survive; and

(c) Know that living things have predictable life cycles.

8. For the area of organisms and their environment:

(a) Understand that there are a variety of ecosystems on the earth and that different organisms interact with one another within their ecosystems;

(b) Know the organization of simple food webs;

(c) Know that organisms interact with one another and with the nonliving elements of their ecosystem;

(d) Know that changes to an environment can be beneficial or detrimental to certain organisms;

(e) Know that all organisms, including, without limitation, human beings, can cause changes to their environment; and

(f) Know that plants and animals can adapt in certain ways to survive in certain ecosystems.

9. For the area of the diversity of life:

(a) Understand that living things can be classified according to physical characteristics, behaviors and habitats;

(b) Know that animals and plants can be classified according to their observable characteristics;

(c) Know that fossils are evidence of past life on the earth; and

(d) Know that certain differences among each animal or plant within a species can provide the animal or plant with advantages or disadvantages for survival and reproduction.

10. For the areas of the atmospheric processes and the cycle of water:

(a) Understand the relationship between the weather and the cycle of water;

(b) Know that the sun is the main source of energy for the earth;

(c) Know the processes of the cycle of water and the role of the sun in the cycle of water;

(d) Know that most of the surface of the earth is covered with fresh water or salt water;

(e) Know the role of water in various phenomena involving the weather, including, without limitation, the role of water in thunderstorms, snowstorms, floods and droughts; and

(f) Know that air is a substance that surrounds the earth, takes up space and moves around the earth in the form of wind.

11. For the areas of the solar system and the universe:

(a) Understand that there are many components in the solar system, including, without limitation, the earth;

(b) Know that there are more stars than can easily be counted by the human eye;

(c) Know that stars are not the same color or brightness and are not scattered evenly throughout the solar system;

(d) Know that the solar system includes, without limitation, the sun, planets and moons;

(e) Know that the sun is a star;

(f) Know that stars other than the sun are so far away from the earth that they look like points of light;

(g) Know that there are cyclical patterns of observable objects in the solar system; and

(h) Know that the patterns of stars in the sky stay the same, except that the patterns of stars appear to move across the sky each night and that different stars can be seen in different seasons.

12. For the area of the composition and structure of the earth:

(a) Understand that features on the surface of the earth are constantly changed by a combination of slow and rapid processes;

(b) Know that fossils are evidence of past life;

(c) Know that water, wind and ice constantly change the surface of the land on the earth through erosion of rock and soil in some geographic locations and the deposit of rock and soil in other geographic locations;

(d) Know that landforms can be created from:

(1) Slow processes, including, without limitation, erosion and deposition of rock and soil; and

(2) Fast processes, including, without limitation, volcanoes, earthquakes, landslides, floods and human activity;

(e) Know that rock is composed of various combinations of minerals; and

(f) Know that soil varies from place to place and contains biological and mineral components.

Sec. 3. NAC 389.411 is hereby amended to read as follows:

389.411 By the end of the eighth grade, pupils must ***understand,*** know and be able to do everything required in the previous grades for courses in science offered in public schools. Instruction in the ***sixth grade through the*** eighth grade in science must be designed so that pupils meet the following ~~[performance]~~ standards by the completion of the eighth grade:

1. For the area of ~~[physical science:]~~ ***science inquiry:***

(a) Understand that ~~[gravitational, electrical and magnetic forces have an effect on the motion of objects, as demonstrated by the pupil's ability to:~~

~~(1) Explain how multiple forces acting on an object along a straight line will affect the motion of the object, for example, the forces may be acting in the same direction or in opposite directions, the forces may be of equal magnitude or different magnitudes, or the object may be in motion or at rest;~~

~~(2) Explain that every object in the universe is attracted to every other object in the universe and that the larger the masses, the greater the force of attraction, and that the greater the distance between the objects, the weaker the force of attraction;~~

~~(3) Use a simple machine to solve a problem, such as moving an object from one place to another, and describe how simple machines change force and distance to accomplish a task;~~

~~(4) Describe the relationship between buoyancy and the apparent weight of an object in liquid; and~~

~~(5) Investigate the use of direct observations, and describe that electric current produces magnetic forces and moving magnets produce electric forces in conductors.~~

~~(b) Understand that materials have distinct properties which depend on the amount of matter present, its chemical composition and structure, as demonstrated by the pupil's ability to:~~

~~(1) Use simple models, such as particle models, and measurements to explain observed properties of matter;~~

~~(2) Separate substances based on their physical and chemical properties, for example, color, solubility, chemical reactivity, melting point and boiling point;~~

~~(3) Use models or diagrams to describe how atoms form molecules;~~

~~(4) Explain that all atoms consist of protons, electrons and neutrons;~~

~~(5) Explain the three states of matter, solid, liquid and gas, as systems of particles of varying densities and degrees of organization; and~~

~~(6) Explain, with examples, how atoms of different elements can combine to form all known substances.~~

~~(c) Understand that changes in temperature and pressure can alter states of matter and that energy exists in many forms and one form can change into another, as demonstrated by the pupil's ability to:~~

~~(1) Describe the movement of heat from object to object and incorporate the concepts of composition and proximity of the objects;~~

~~(2) Identify in general terms which kinds of substances will conduct heat most readily;~~

~~(3) Describe, using such terms as "melting point" and "boiling point," the specific changes in energy that must occur for a substance to change states, for example, by diagramming a heating or cooling curve that identifies the changes which are taking place;~~

~~(4) Investigate and describe the characteristics of waves using such things as ropes, water tables and springs;~~

~~(5) Describe that waves move at different speeds if traveling in different materials, for example, sound waves traveling in air as opposed to water;~~

~~(6) Describe:~~

~~(I) The electromagnetic spectrum and how wavelength changes from one end to the other; and~~

~~(II) That the energy of waves can be changed into other forms of energy;~~

~~(7) Create parallel, series and combination circuits and describe:~~

~~(I) Very simple properties of parallel and combination circuits, for example, current is distributed among the branches of the circuits; and~~

~~(II) More sophisticated properties of series circuits, for example, voltage, resistance and current;~~

~~(8) Describe various ways energy can be transferred between systems or objects and the different forms of energy, such as radiant, chemical, electrical, nuclear and mechanical; and~~

~~(9) Distinguish between potential and kinetic energy and give specific examples of each.~~

~~(d) Understand that chemical reactions change substances into different substances, as demonstrated by the pupil's ability to:~~

~~(1) Apply the concept of the conservation of mass to a given chemical reaction specifying the total mass of reactants and products and confirm that the same elements are present in the products as were present in the reactants;~~

~~(2) Carry out simple investigations and describe how the rate of a reaction can be changed when variables such as temperature, pH and light are changed, and give examples of applications of this concept such as storing certain substances in brown bottles, refrigeration or the effect of acid rain;~~

~~(3) Observe and describe, using commonplace examples, chemical reactions that either require or release energy; and~~

~~(4) Describe the basic organization of the periodic table, patterns, such as location of metals, nonmetals, metalloids and noble gases, and chemical reactivity.~~

~~(e) Understand that nuclear energy and electromagnetic energy are produced in many forms from both natural and man-made sources, as demonstrated by the pupil's ability to:~~

~~(1) Investigate and describe the interaction of light with matter, for example, the transmission, absorption and scattering of light;~~

~~(2) Explain radioactive isotopes and describe their application to medicine, age dating and nuclear power plants;~~

~~(3) Define high-level and low-level nuclear wastes and describe their associated hazards;~~

~~(4) Describe the electromagnetic spectrum and qualitatively identify the waves produced by the sun within the electromagnetic spectrum;~~

~~(5) Compare and contrast the nuclear processes that occur in the sun and other stars with fusion, nuclear reactors and fission; and~~

~~(6) Explain, with examples, how nuclear reactions convert small amounts of matter into a relatively large amount of energy.]~~ ***scientific knowledge requires critical consideration of verifiable evidence which is obtained from scientific inquiry and appropriate investigation;***

(b) Know how to identify and critically evaluate information in data, tables and graphs;

(c) Know how to critically evaluate information to distinguish between scientific fact and opinion;

(d) Know that various explanations can be made for the same evidence;

(e) Know how to design and conduct a controlled experiment;

(f) Know how to use appropriate technology and laboratory procedures safely to observe, measure, record and analyze data; and

(g) Know that scientific inquiry includes, without limitation, evaluation of the results of scientific investigations, experiments, observations, theoretical and mathematical models and explanations proposed by other scientists.

2. For the ~~[area of life science:]~~ ***areas of science, technology and society:***

(a) Understand ~~[that all life forms, at all levels of organization, use specialized structures and similar processes to meet the basic needs of life, as demonstrated by the pupil's ability to:~~

~~(1) With minimal assistance from the teacher, explain that diseases result from breakdowns in the structures or functions of an organism;~~

~~(2) Explain, with an example, that life functions may occur at different levels of organization through specialized tissues, organs and systems, for example, oxygen is exchanged at the lungs, transported in the blood and used by the cells of the body;~~

~~(3) Identify various plant structures and systems and give the function of each with minimal errors; and~~

~~(4) Explain, in general terms, that cellular functions are guided by information stored in DNA.]~~ ***the interactions and relationships between science and society in a world which is constantly changing;***

(b) Understand that ~~[organisms respond to internal and external influences, as demonstrated by the pupil's ability to:~~

~~(1) Identify a given behavior as innate or learned and provide multiple, accurate examples of innate and learned behavior;~~

~~(2) Explain that behavior may be based on experience and evolutionary history;~~

~~(3) Accurately relate a given behavior to the stimulus that prompted the behavior; and~~

(4) Explain that various viruses, bacteria, fungi and parasites may infect the human body and interfere with its functions and give an example of each.

(c) Understand that life forms are diverse and that through heredity they pass some characteristics to their offspring, as demonstrated by the pupil's ability to:

(1) Adequately explain how Mendel's model of heredity predicts the passage of genetic instructions from one generation to another;

(2) Classify living things on the basis of similar characteristics and explain why certain organisms are grouped together;

(3) Explain that selective breeding has resulted in new varieties of domestic animals and plants, giving examples of both plants and animals;

(4) Distinguish between processes involved in sexual and asexual reproduction;

(5) Demonstrate that pairs of genes may control patterns of inheritance, using, for example, Punnett squares;

(6) Describe species as organisms that can mate with each other and produce fertile offspring; and

(7) Explain that changes in the genes of sex cells may affect offspring.

(d) Understand that life forms change over time through evolution and the process of biological change, as demonstrated by the pupil's ability to:

(1) Investigate and provide an estimate of the number of species of animals, plants and microorganisms that are alive today;

(2) Explain differences and similarities between species in terms of biological evolution;

(3) Give multiple examples of how organisms have adaptive characteristics that have allowed them to survive and therefore reproduce;

~~(4) Explain that all organisms show general similarities of internal structures and chemical processes; and~~

~~(5) Outline by using drawings, diagrams or charts major lines of evidence that support evolutionary relationships among species, for example, fossil record, DNA sequences or anatomical similarities.~~**]** ***technology can cause various consequences to the environment, including, without limitation:***

(1) The depletion of environmental resources and degradation to the environment; and

(2) An increase in the availability of environmental resources, the mitigation of degradation to the environment and the use of new resources in a more economical manner; and

(c) Know that scientific knowledge is revised through a process of incorporating new evidence which is obtained through on-going scientific research, investigation and collaborative discussion.

3. For the **[**~~areas of earth and space sciences:~~**]** ***area of matter:***

(a) Understand **[**~~that the earth is composed of interrelated systems of rocks, water, air and life, as demonstrated by the pupil's ability to:~~

~~(1) Describe mineral samples on the basis of physical properties, such as hardness, luster, color, streak, cleavage and crystal shape;~~

~~(2) Describe rock samples on the basis of obvious physical features, for example, sedimentary structures such as ripple marks, metamorphic structures such as foliation and igneous structures such as interlocking crystals;~~

~~(3) Explain, using models such as stream tables and clay layers, how erosion, deposition, and pushing and pulling forces inside the earth create landforms like mountains and valleys;~~

~~(4) Describe, using three-dimensional models or drawings, the internal layers of the earth, for example:~~

~~(I) Continental and oceanic crust;~~

~~(II) A hot, convecting mantle; and~~

~~(III) A dense, metallic core;~~

~~(5) Compare and contrast the properties of various soil samples, such as color, texture and capacity to retain water;~~

~~(6) Explain by using observations of actual soil samples that soil contains materials that are required for things that live in the soil;~~

~~(7) List the major components of the atmosphere at the surface of the earth and their relative abundance, such as nitrogen is the largest component, followed by oxygen, with other gases like carbon dioxide and water vapor in smaller amounts;~~

~~(8) Describe how temperature, density, pressure and the composition of the atmosphere vary with elevation; and~~

~~(9) Describe the causes and effects of geologic events, such as earthquakes, landslides, volcanoes and floods.~~

~~(b) Understand that the earth may be represented by a variety of maps and models, as demonstrated by the pupil's ability to:~~

~~(1) Locate positions on the surface of the earth using degrees of latitude and longitude coordinates;~~

~~(2) Compare and contrast the kinds of features found on various kinds of maps, including, without limitation, contour, physical, political and geological maps;~~

(3) Find the State of Nevada or identifiable features of the State of Nevada, depending on the map scale, on various kinds of maps, including contour, physical, political and geological maps;

(4) Use a color-coded map to compare and contrast various features such as temperature, density of population, geology and precipitation; and

(5) Determine the time of day in various places throughout the world, but not across the International Date Line, given the local time of day.

(c) Understand that the systems of the earth such as weather and formation of the mountains can change or vary, as demonstrated by the pupil's ability to:

(1) Identify the key processes and rates of change that occurred in the formation of a landform, for example, the slow processes of weathering, erosion and deposition, and the relatively fast processes of volcanism and mass wasting;

(2) Apply, using actual, replica or graphic reproductions of fossils, the following evidence to show that life forms and environmental conditions change over time:

(I) The fossil record reflects a pattern of change in organisms over time; and

(II) Many fossils are similar to organisms that are alive today, allowing logical comparisons of past and present environments;

(3) Describe reasons that fossil evidence may not form or may be destroyed, for example, scavenger and decomposer activity, and the effects of weathering and erosion; and

(4) Provide a reasonable description of how weathering, erosion, deposition, radioactive decay, volcanic activity, plate tectonics and many other natural processes that occur in the present day are the same as those that occurred in the past.

(d) Understand that the systems of the earth have a variety of cycles through which energy and matter continually flow, as demonstrated by the pupil's ability to:

(1) Explain, using diagrams and words, that the sun is the ultimate source of energy for the major processes of the earth, for example:

(I) From the sun to plant to fossil fuel; and

(II) From the sun to evaporation to precipitation to weathering and erosion caused by water;

(2) Explain, citing direct observations of the high specific heat of water, the moderating effect that large bodies of water have on the weather and climate because of the relatively high capacity of water to absorb heat and release heat slowly;

(3) Explain, using weather maps, the weather that occurs near boundaries between air masses;

(4) Describe the formation and types of clouds and how these types of clouds are associated with particular patterns of weather, for example, particular clouds often precede particular kinds of fronts between air masses, and that cumulonimbus clouds are typically associated with thunderstorms;

(5) Explain the relationship between temperature, moisture and origin of air masses, for example, air masses that form over land tend to be dry and air masses that form in polar regions tend to be cold;

(6) Explain, citing firsthand observations such as radiation striking a surface from a light bulb at various angles of incidence, the relationship between changes in the aspect of the earth's axis relative to the sun and the incidence of solar radiation;

~~(7) Explain, using climate and weather data, diagrams, maps and models, how long-term patterns of air movement combined with regional topography affect regional climate, for example, rain-shadow deserts caused by coastal mountain ranges;~~

~~(8) Explain, using a model or a diagram, how water circulates through the earth, oceans and atmosphere through interlinked cycles of evaporation, condensation, transpiration, runoff and ground water percolation;~~

~~(9) Describe, using climate and weather data, drawings and maps, how climate is affected by proximity to large bodies of water, patterns of atmospheric movement, latitude and altitude;~~

~~(10) Observe and describe some processes that are reversible, such as pH indicator changes or stretching a spring within its elastic limit, and others that are practically irreversible, such as burning, stretching a spring beyond its elastic limit and extinction of a species;~~

~~(11) Explain, citing firsthand observations such as the conservation of energy in calorimeter experiments, that the energy the earth receives over geologic time approximately equals the energy that the earth loses; and~~

~~(12) Describe, using diagrams and models, the relationships among geothermal and tectonic processes, for example, geothermal processes occur near lithosphere plate boundaries or where lithosphere plates are fractured or relatively thin.~~

~~(e) Understand that the earth is part of a planetary system within the Milky Way Galaxy, which is part of the known universe, as demonstrated by the pupil's ability to:~~

~~(1) Investigate and describe the principle characteristics of the planets in the solar system, using print, multimedia or Internet resources and drawings or models;~~

~~(2) Investigate, using print, multimedia or Internet resources, and describe, using drawings or models, 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 and compare the chemical composition of galaxies to that of the earth;~~

~~(4) Explain how various tools, such as optical and radio telescopes and unmanned robotic spacecraft, allow us to investigate objects in the sky that are too distant, faint or bright to observe directly from the earth; and~~

~~(5) Describe the historical development of some of the laws of motion, for example, the laws of Kepler and Newton, that apply to the motion of objects in the solar system.]~~ ***the properties of matter and the changes that can occur to the properties of matter;***

(b) Know that matter is made up of tiny particles called atoms;

(c) Know that a substance which contains only one kind of atom is an element that cannot be broken into smaller pieces by normal laboratory processes;

(d) Know that atoms combine to form molecules;

(e) Know that a compound is formed when two or more different kinds of atoms are chemically bonded together;

(f) Know that the particles of the same matter are arranged differently based upon whether the matter is a solid, liquid or gas;

(g) Know that elements can be arranged in the periodic table in a manner which shows repeating patterns that group certain elements with similar properties;

(h) Know the characteristics of electrons, protons and neutrons;

(i) Know methods for separating mixtures based on the properties of the components; and

(j) Know that mass is conserved in physical and chemical changes.

4. For the ~~[area of environmental sciences:]~~ ***areas of force and motion:***

(a) Understand 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, as demonstrated by the pupil's ability to:~~

~~(1) Develop a presentation to represent visually and explain how organisms interact with the living and nonliving components of their ecosystems, including food chains and food webs;~~

~~(2) Characterize organisms in a variety of ecosystems by their function, for example, producer, consumer, predator, prey, parasite, host, scavenger or decomposer;~~

~~(3) Analyze, citing specific examples, the role of predators as a stabilizing factor in an ecosystem and explain how they can prevent habitat destruction or extinction of a species;~~

~~(4) Trace the flow of energy in an ecosystem, noting the dissipation of heat at each energy transfer point, and describe the impact on the ecosystem, for example, by comparing the implications on resources of a vegetarian diet to one with high meat consumption; and~~

~~(5) Identify similarities and differences found in geographically distinct ecosystems.~~

~~(b) Understand that natural resources include renewable and nonrenewable materials and energy and that all organisms, including humans, use resources to maintain and improve their existence, and that the use of resources can have positive and negative consequences, as demonstrated by the pupil's ability to:~~

~~(1) Observe and describe the identifying characteristics of renewable and nonrenewable resources;~~

~~(2) Explain how some natural resources are limited in their abundance or accessible location, for example, water in the desert;~~

~~(3) Investigate and describe the location and distribution of nonrenewable energy resources by using print, multimedia or Internet resources;~~

~~(4) Observe directly and use print, multimedia and Internet resources to describe how organisms alter their local environment through their use of natural resources;~~

~~(5) Describe how the unintended consequences of technology can cause:~~

~~(I) The depletion of resources, such as internal combustion engines burning fossil fuels that are nonrenewable; and~~

~~(II) Environmental degradation, such as internal combustion engines causing air pollution; and~~

~~(6) Describe how technology can increase the availability of resources, for example:~~

~~(I) Internal combustion engines allow the harvest and transport of resources more efficiently and mitigate environmental degradation;~~

~~(II) Improvements in design and fuel of internal combustion engines can lower rates of air pollution; and~~

~~(III) Improvements in mining technology make it financially feasible to mine ores previously considered too low-grade to be profitable.~~

~~(c) Understand that through conservation 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.]~~ ***the position and motion of an object depend on the forces acting on the object;***

(b) Know the effect that balanced and unbalanced forces have on the motion of an object;

(c) Know that electric currents can produce magnetic forces and that magnets can cause electric currents; and

(d) Know that every object exerts a gravitational force on every other object and that the magnitude of the gravitational force depends on the mass of the objects and the distance between the objects.

5. For the area of ~~[the nature and history of science:]~~ ***energy:***

(a) 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, as demonstrated by the pupil's ability to:~~

~~(1) Demonstrate that scientific investigations involve:~~

~~(I) The use of logic, for example, step-by-step thinking;~~

~~(II) Respect for the rules of evidence, such as generally using a truthful, careful and accurate collection of evidence and information in a scientific investigation;~~

~~(III) Adherence to the standards for keeping a science notebook;~~

~~(IV) Openness to criticism, for example, respectfully considering constructive criticism and review by peers;~~

~~(V) Respectfully offering constructive criticism and review of peers; and~~

~~(VI) Public reporting of methods and procedures;~~

~~(2) Successfully carry out at least one of the following kinds of investigations:~~

~~(I) A controlled experiment;~~

~~(II) A field study; or~~

~~(III) A research report using multiple sources;~~

~~(3) Explain, using examples, that people from ancient times have 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) Understand that scientists may work in teams or scientists may work alone, but scientists should communicate extensively with each other, for example, by conducting investigations and sharing results with other scientists conducting similar work;

(5) Compare and contrast scientific inquiry and technological design using multiple and related examples of research and the application of the research to technology, for example, fish ladders, habitats and walkways for tortoises, access for the handicapped and pacemakers for the heart;

(6) Critique the results, techniques and processes used in a scientific investigation; and

(7) Compare and contrast the strengths and limitations of science as related to other social and intellectual activities of humans.

(b) Understand that many decisions require critical consideration of scientific evidence, as demonstrated by the pupil's ability to:

(1) Identify and evaluate the use of statistics, data and graphs in a variety of scientific work;

(2) Give examples of human activities with their associated benefits, costs and risks, for example, cloning, electric automobiles and pest control;

(3) Analyze and describe a simple system, such as a pendulum, aquarium or toilet, in terms of its efficiency, optimal function and possible sources of malfunction; and

(4) Evaluate information to distinguish between fact and opinion when solving problems, for example, product advertising and early theories concerning flat earth versus round earth.

(c) Understand that a variety of models can be used to describe or predict things and events, as demonstrated by the pupil's ability to:

(1) Use two different models to demonstrate the same thing, such as a map and a globe;

~~(2) Use models to predict change, as in a stream table;~~

~~(3) Identify and illustrate natural cycles within systems, for example, water, planetary motion, climate and geological changes;~~

~~(4) Analyze data from two groups, comparing their means, medians, modes and ranges, and explain why these statistics are important; and~~

~~(5) Use a systematic approach to describe the risks and benefits of a situation.~~

~~(d) Understand that science is an active process of systematically examining the natural world, as demonstrated by the pupil's ability to:~~

~~(1) Clearly state reasons for keeping honest, clear and accurate records, for example, to maintain the integrity of the scientific process and to mitigate possible injury to persons, property or the environment;~~

~~(2) Explain that hypotheses are valuable even if they turn out to be incorrect; and~~

~~(3) Compare varying explanations given for a particular phenomenon, event or result.~~

~~(e) Understand that a variety of methods of communication may be used to share scientific information, as demonstrated by the pupil's ability to:~~

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

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

~~(3) Discuss scientific topics by paraphrasing, asking for clarification or elaboration, and expressing alternative positions using print, Internet and multimedia resources.]~~ ***how energy is transferred;***

(b) Know that light which is visible is a narrow band within the electromagnetic spectrum;

(c) Know that vibrations, including, without limitation, sound and earthquakes:

(1) Move at various speeds in different materials;

(2) Have different wavelengths; and

(3) Create disturbances in a wavy pattern that spread away from the source of the vibration in a uniform manner;

(d) Know that physical, chemical and nuclear changes involve a transfer of energy;

(e) Know that energy can only be changed from one form to another and cannot be created or destroyed through a chemical or physical reaction;

(f) Know that energy which is produced from heat flows from warmer materials or regions to cooler materials or regions through the process of conduction, convection or radiation; and

(g) Know that heat, light, sound and other chemical changes can be produced by transferring electrical energy through electrical circuits.

6. For the area of ~~[scientific inquiry, processes and skills:]~~ ***heredity:***

(a) Understand ~~[that scientific inquiry is enhanced and often communicated through the use of mathematics, as demonstrated by the pupil's ability to:~~

~~(1) Explain that quantities can vary in proportion to one another, such as the mass of a substance is directly proportional to its volume or the time it takes for a vehicle to travel is directly proportional to the distance that it travels;~~

~~(2) Explain in general terms the steps required to solve a given problem and why the steps are necessary;~~

~~(3) Explain, using examples, that probabilities are ratios and can be expressed as fractions, percentages or odds;~~

~~(4) Make reasonable estimates of outcomes in familiar situations, for example, the probability of being born a boy or girl, of being struck by lightening or of being involved in an automobile accident;~~

~~(5) Explain that, with very few exceptions, numbers in science are expressed with units;~~

~~(6) Consistently select and use the appropriate System International unit for a particular measurement, such as meters for length, seconds for time or kilograms for mass;~~

~~(7) Define accuracy and precision and determine if repeated measurements and computations of quantities are reasonably precise and accurate; and~~

~~(8) Make reasonable predictions on the basis of all known data from related studies carried out under similar conditions.~~

~~(b) Appropriately and safely apply the tools and techniques of scientific inquiry, as demonstrated by the pupil's ability to:~~

~~(1) Consistently use instruments and laboratory safety equipment properly;~~

~~(2) Consistently handle and dispose of chemicals according to established standards;~~

~~(3) Choose appropriate, available materials for making or repairing simple mechanical constructions, for example, designing an apparatus using simple machines;~~

~~(4) Keep accurate and organized records of scientific investigations;~~

~~(5) Use appropriate technology in laboratory procedures for measuring, recording, storing and analyzing data, such as computers, graphing calculators and probes; and~~

~~(6) Design and carry out a controlled experiment working in a small group.~~~~]~~ ***the role of genetic information in the continuation of a species;***

(b) Know that heredity is the passage of genetic instructions from one generation to the next generation;

(c) Know that changes in the genes of an egg or sperm can cause changes in the characteristics which are inherited;

(d) Know that specific organisms can be bred to produce specific characteristics; and

(e) Know that certain characteristics of an organism are caused by interaction with the environment and genetic information.

7. For the area of the structure of life:

(a) Understand that all living things are composed of cells, which are the fundamental units of life;

(b) Understand that multicellular organisms have specialized cells which perform a variety of life functions;

(c) Know that a cell can grow, divide and take in nutrients which are used to provide energy for the cell to function;

(d) Know that certain organisms are composed of only one cell and that multicellular organisms can consist of millions of cells which work together to allow the organism to function;

(e) Know that tissues, organs and organ systems work together to perform the functions of life and that:

(1) Tissue can be formed when cells combine; and

(2) Organs and systems of organs can be formed when tissues combine; and

(f) Know that disease can result from defects in certain systems of the body or from damage caused by certain infections.

8. For the area of organisms and their environment:

(a) Understand various interactions between living and nonliving components of various ecosystems;

(b) Know how matter and energy are transferred through food webs in an ecosystem;

(c) Know how to characterize an organism in an ecosystem based on the functions of the organism;

(d) Know how to evaluate whether changes in the environment of an organism can be beneficial or harmful; and

(e) Know that interrelated factors affect the number and type of organisms an ecosystem can support.

9. For the area of the diversity of life:

(a) Understand that living things change over time and contribute to the variety of organisms existing on the earth;

(b) Know that a species can be identified and classified based upon its characteristics;

(c) Know that fossils provide evidence of how life and environmental conditions have changed throughout geological time; and

(d) Know that the behavior of an organism is based on experience and the evolutionary history of the species of the organism.

10. For the areas of the atmospheric processes and the cycle of water:

(a) Understand the relationship between the atmosphere, topography, weather and climate of the earth;

(b) Know that seasons are caused by variations in the amounts of the energy transferred from the sun to the surface of the earth based on the axial tilt of the earth;

(c) Know how the processes involved in the cycle of water affect patterns in the climate;

(d) Know the properties that make water an essential component of various systems of the earth;

(e) Understand the composition of the atmosphere of the earth, with an emphasis on the role of the atmosphere in the weather and climate of the earth;

(f) Know the difference between local weather and regional climates; and

(g) Know the topography of the earth and the patterns of global and local atmospheric movement which influence local weather and which occur primarily in the lower atmosphere.

11. For the area of the solar system and the universe:

(a) Understand the characteristics of the solar system which is part of the Milky Way Galaxy, including, without limitation, the characteristics of the planets in the solar system;

(b) Know that the universe contains many billions of galaxies and each galaxy contains many billions of stars;

(c) Know that the solar system includes, without limitation, a great variety of planetary moons, asteroids and comets;

(d) Know that the earth is part of the solar system located within the Milky Way Galaxy;

(e) Know that the sun is many thousands of times closer to the earth than any other star and billions of times closer to the earth than the farthest end of the Milky Way Galaxy;

(f) Know that the sun is a star in the Milky Way Galaxy which is medium in size in relation to other stars in the Milky Way Galaxy, part of which can be seen as a glowing band of light which spans across the sky; and

(g) Know that regular and predictable patterns of movement by the earth around the sun and by the moon around the earth explain certain phenomena, including, without limitation, the day, the year, phases of the moon and eclipses.

12. For the area of the composition and structure of the earth:

(a) Understand that landforms result from a combination of constructive and destructive processes;

(b) Know that sedimentary rocks and fossils provide evidence of changing environments and the constancy of geological processes;

(c) Know that rocks at the surface of the earth can weather and form sediments that are buried, compacted, heated and recrystallized into new rock;

(d) Know that the earth is composed of:

(1) A continental and oceanic crust;

(2) A mantle which contains hot convection currents; and

(3) A dense metallic core;

(e) Know that the very slow movement of large crustal plates result in geological events;

(f) Know that geological processes produce state and regional topography;

(g) Know that minerals have different properties and different distributions according to how they form;

(h) Know the characteristics, amounts and locations of renewable and nonrenewable resources found in Nevada; and

(i) Know that soil:

(1) Has various properties, including, without limitation, color, texture and the amount of water the soil can retain; and

(2) Provides nutrients for life in accordance with the manner in which the living thing is formed.

Sec. 4. NAC 389.491 is hereby amended to read as follows:

389.491 1. A local school district shall ensure that pupils, by the completion of the 12th grade, are able to comply with ~~[content and performance]~~ ***the*** standards required for science ***which are*** adopted by the State Board of Education ~~[.]~~ ***pursuant to NAC 389.244, 389.2947, 389.411 and 389.4915.*** In carrying out this requirement, the district shall:

(a) Develop courses which must encompass all of the ~~[content and performance]~~ standards required for science by the completion of the 12th grade; and

(b) Provide to each pupil, upon enrollment in high school, a listing of the courses that encompass all of the ~~[content and performance]~~ standards required for science by the completion of the 12th grade.

2. If a pupil enrolls in a science course listed under NAC 389.492 to 389.498, inclusive, the school district shall notify the pupil in writing at the time of enrollment in the course that:

(a) The objectives of the science course may include standards for science in addition to the standards that are required to be completed by the end of ***the*** 12th grade; and

(b) The science courses listed under NAC 389.492 to 389.498, inclusive, are not designed to ensure that the ~~[content and performance]~~ standards for science that are required to be completed by the end of 12th grade will be met by completion of a course listed under NAC 389.492 to 389.498, inclusive, unless that course is included in the listing provided pursuant to paragraph (b) of subsection 1.

Sec. 5. NAC 389.4915 is hereby amended to read as follows:

389.4915 By the end of the 12th grade, pupils must know ***, understand*** and be able to do everything required in the previous grades for courses in science offered in public schools. Instruction in the ~~[12th]~~ ***9th*** grade ***through the 12th grade*** must be designed so that pupils meet the following ~~[performance]~~ standards by the completion of the 12th grade:

1. For the area of ~~[physical science:]~~ ***science inquiry:***

(a) Understand that ~~[gravitational, electrical and magnetic forces have an effect on the motion of objects, as demonstrated by the pupil's ability to:~~

~~(1) Use the laws of motion to correctly predict the motion of an object;~~

~~(2) Describe changes in the force of gravity based on different masses and distances and apply the principle of gravity to the motion of falling objects, for example, objects accelerate as they fall;~~

~~(3) Determine the mechanical advantage and efficiency of various simple machines, such as a screw, lever, pulley, wheel, axle and wedge, and evaluate the usefulness of various machines according to their function, efficiency and mechanical advantage;~~

~~(4) Explain and apply the relationship between force, pressure and area, P=F÷A, to common phenomena, for example, the change in gas pressure in an expanding container or the differences in pressure between sharp and dull objects;~~

~~(5) Investigate and describe the relationship between pressure and depth in a liquid;~~

~~(6) Describe or explain the relationship between electromagnetic forces and electromagnetic systems, such as generators, circuits and electric motors;~~

~~(7) Calculate variables for simple electromagnetic systems, such as current, resistance, wattage and voltage; and~~

~~(8) Investigate and describe that the electromagnetic spectrum, including radio waves, light and infrared, is a form of energy consisting of both electrical and magnetic energy.~~

~~(b) Understand that materials have distinct properties which depend on the amount of matter present, its chemical composition and structure, as demonstrated by the pupil's ability to:~~

~~(1) Investigate and describe the intrinsic physical properties of matter, such as color, odor and density, and the extrinsic physical properties of matter, such as mass and volume;~~

~~(2) Apply techniques of spectral analysis, such as flame tests and colorimetry, to the identification of elements and compounds;~~

~~(3) Distinguish among and describe various types of chemical bonds, such as covalent, ionic and metallic;~~

~~(4) Describe the major features of the quantum-mechanical model of atomic structure including the concepts of the probable locations of electrons, discrete energy levels, quantum numbers and electron configurations;~~

~~(5) Apply the Kinetic Molecular Theory and the concept of forces between particles to explain phase changes and the properties of the states of matter; and~~

~~(6) Explain how carbon atoms uniquely bond to one another to form a large variety of molecules including those necessary for life.~~

~~(c) Understand that changes in temperature and pressure can alter states of matter and that energy exists in many forms and one form can change into another, as demonstrated by the pupil's ability to:~~

~~(1) Explain, using multiple examples, that any transfer or transformation of energy results in some "loss" of energy in the form of heat which may spread by radiation, conduction or convection;~~

~~(2) Investigate, using firsthand observations, and explain that pressure may affect changes of state;~~

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

~~(4) Investigate and describe, using firsthand observations, the properties of electrical circuits in terms of moving electrons, conductivity, resistance and electrical potential energy;~~

~~(5) Investigate how matter and energy may be changed and energy may be transferred in many ways by using firsthand observations such as data on conservation of momentum, predictions of projectile motion, careful measurements and calculations of transfer between potential and kinetic energy;~~

~~(6) Describe the conservation of mass-energy as it applies to a closed system, such as $E=mc^2$; and~~

~~(7) Describe the concept of entropy as it applies to a closed system, identify the tendency for disorder to increase, and, if given examples of chemical and physical changes, state which is favored by entropy.~~

~~(d) Understand that chemical reactions change substances into different substances, as demonstrated by the pupil's ability to:~~

~~(1) Write a balanced equation to describe a given chemical reaction and describe the information it conveys;~~

~~(2) Describe qualitatively the way in which various factors affect the rate of a chemical reaction, such as the temperature, particle size, pressure, presence of a catalyst, pH and concentration of reactants;~~

~~(3) Distinguish between endothermic and exothermic reactions, for example, redox reactions, burning fuel, photosynthesis, respiration and electrochemical reactions in batteries; and~~

~~(4) Relate the chemical reactivity of an element to its electron configuration and illustrate it with appropriate diagrams and examples.~~

~~(e) Understand that nuclear energy and electromagnetic energy are produced from both natural and man-made sources in many forms, as demonstrated by the pupil's ability to:~~

~~(1) Use lenses to demonstrate the interaction of light with matter, such as reflection and refraction;~~

~~(2) Diagram the converging and diverging lenses and describe their major applications;~~

~~(3) Estimate the age of some materials using predictable rates of nuclear reaction, for example, half-lives;~~

~~(4) Describe the differences in disposal techniques that are required for high-level and low-level nuclear wastes;~~

~~(5) Describe electromagnetic spectrum labeling, such as gamma rays, X rays, visible light, ultraviolet, infrared and radio waves;~~

~~(6) Communicate that the strong nuclear force that holds the nucleus together is greater than the weak forces that would tend to break it apart;~~

~~(7) Describe the release of energy during the nuclear processes of fission and fusion and give examples of elements that undergo fission and fusion respectively; and~~

~~(8) Compare the amount of energy in fission and fusion with that in chemical and phase changes.~~~~]~~ ***various methods of communication can be used to share scientific information;***

(b) Know that tables, charts, illustrations and graphs can be used to make scientific arguments or claims and can be used as visual aids for oral and written presentations regarding such scientific arguments or claims;

(c) Know that scientists maintain a permanent record of procedures, data, analyses, decisions and understandings of scientific investigations;

(d) Know that experiments which are repeated allow scientists to prepare statistical analyses and make unbiased conclusions;

(e) Know how safely to conduct an original scientific investigation using the appropriate tools and technology; and

(f) Know that models and modeling can be used to identify and predict certain cause-and-effect relationships.

2. For the ~~[area of life science:]~~ ***areas of science, technology and society:***

(a) Understand ~~[that all life forms, at all levels of organization, use specialized structures and similar processes to meet the basic needs of life, as demonstrated by the pupil's ability to:~~

~~(1) Explain, with minor errors, the concept of equilibrium in organisms as related to disease processes;~~

~~(2) With minimal assistance from the teacher, distinguish among the systems of the human body, for example, the skeletal, nervous and digestive systems, and describe the different cells of each;~~

~~(3) With assistance from the teacher, trace the digestion, absorption and use of a food or group of foods through an organism; and~~

~~(4) Reasonably explain the process of photosynthesis.~~

(b) Understand that organisms respond to internal and external influences, as demonstrated by the pupil's ability to:

(1) Relate patterns of behavior to survival of a species and provide some examples;

(2) Give examples of a response in a plant and an animal to an environmental change that enhances its chance of survival;

(3) Describe the role of the nervous system in receiving input and generating responses in multicellular animals; and

(4) Develop a presentation suitable for pupils who are enrolled in junior high school and middle school that explains how the immune system works and how acquired immune deficiency syndrome (AIDS), a viral disease, destroys critical cells, thereby making the body vulnerable to infectious agents and cancerous cells.

(c) Understand that life forms are diverse and that through heredity they pass some characteristics to their offspring, as demonstrated by the pupil's ability to:

(1) Explain, in general terms, that all cells in the body of an organism are developed from a single set of genetic information and that different parts of the information are used in different kinds of cells;

(2) Explain, using diagrams or charts, how similarity among sequences of DNA may be used to estimate the degree of relatedness among organisms;

(3) Relate the great variety of possible gene combinations to sexual reproduction;

(4) Explain how DNA provides instructions for assembling proteins;

(5) Demonstrate, with minor errors, how multiple pairs of genes may control patterns of inheritance;

~~(6) Point out, with examples, how the diversity and variation of organisms increases the chance of survival when changes in the conditions of the environment occur; and~~

~~(7) Describe how a variety of influences may cause mutations of genes.~~

~~(d) Understand that life forms change over time through evolution and the process of biological change, as demonstrated by the pupil's ability to:~~

~~(1) Explain the basic concepts underlying the theory of evolution;~~

~~(2) Investigate and apply the concept of natural selection to explain incremental changes in the fossil record, using an example such as Eohippus;~~

~~(3) Relate adaptations of a species to the unique characteristics that favor an organism in a particular environment and use Kettlewell's study of England's peppered moths as an example of natural selection;~~

~~(4) Recognize that there are various lines of evidence which are used to establish an evolutionary relationship among species;~~

~~(5) Explain why most species that ever lived are extinct and why many human beings are concerned that endangered species be preserved;~~

~~(6) Provide examples of genetic and environmental influences that drive the process of evolution; and~~

~~(7) Cite evidence that cells with nuclei existed over 1 billion years ago and that these cells were the precursors to increasingly more complex organisms.]~~ ***the impact of science and technology as it relates to the costs and benefits to society;***

(b) Know that science, technology and society have positive and negative influences on one another;

(c) Know that patterns of consumption, efforts at conservation, and cultural and social practices in various countries have different impacts on the environment;

(d) Know the influence of ethics on scientific enterprise; and

(e) Know that scientific knowledge is built on previous scientific information.

3. For the ~~[areas of earth and space sciences:]~~ ***area of matter:***

(a) Understand that ~~[the earth is composed of interrelated systems of rocks, water, air and life, as demonstrated by the pupil's ability to:~~

~~(1) Describe the general processes of formation of a given sample of rock, such as weathering, erosion, deposition, melting, heat and pressure;~~

~~(2) List uses for at least five common materials of the earth, such as gypsum in drywall and metals in electrical devices;~~

~~(3) Explain the formation of some topographical features, for example, volcanoes, rift valleys, ocean trenches and fault-block mountains, in terms of moving lithosphere plates;~~

~~(4) Explain how the earth is generally layered from the most dense material, such as solids like rocks, outward to less dense materials, such as liquids like oceans, lakes, and streams, with the outermost layer being the least dense with gases such as the atmosphere;~~

~~(5) Describe the origin of constituents in various samples of soil, for example, organic materials that come from decomposed plants and animals and mineral materials that come from weathered rock;~~

~~(6) Compare and contrast the composition and properties of different soil horizons;~~

~~(7) Describe, citing print, multimedia or Internet resources, some historical changes in the atmosphere of the earth, such as the change from a predominantly methane and ammonia atmosphere to its composition today;~~

(8) Describe, citing print, multimedia or Internet resources, present-day changes in the atmosphere of the earth, for example, the increase in carbon dioxide, ozone depletion and air pollution;

(9) Compare and contrast, using maps, models, photographs or field observations, large geologic features throughout the State of Nevada, such as basin and range fault-block mountains and Sierra batholiths; and

(10) Compare and contrast, using maps, models, photographs or field observations, specific local geologic features, such as the glacial features in Lamoille Canyon, the local beach benchmarks from ancient lakes and the thrust faults in the Spring Mountains.

(b) Understand that the earth may be represented by a variety of maps and models, as demonstrated by the pupil's ability to:

(1) Construct a contour map of a simple model landform and then build a model landform from a simple contour map;

(2) Define a location on the earth in terms of latitude and longitude to the precision of degrees, minutes and seconds; and

(3) Determine the time in any time zone given the time of day.

(c) Understand that the systems of the earth, such as weather and the formation of mountains, change or vary, as demonstrated by the pupil's ability to:

(1) Describe two ancient and two recent examples of catastrophic geologic events and analyze the causes of those events by using Internet, print or audiovisual materials;

(2) Create a representation of a stratigraphic column based on actual or photographic data that represent rock sequences and nonconformities, such as erosion surfaces; and

~~(3) Compare and contrast the variety of methods by which geologic time is determined, for example, radioactive dating, dendrochronology, stratigraphy and faunal succession.~~

~~(d) Understand that the systems of the earth have a variety of cycles through which energy and matter continually flow, as demonstrated by the pupil's ability to:~~

~~(1) Explain that the systems of the earth have two major internal sources of energy, decay of radioactive isotopes and gravitational energy, and one major external source, the sun, all of which create heat, and link these respectively to their major effect;~~

~~(2) Observe and describe convection currents formed by heating water in a container;~~

~~(3) Explain, using diagrams and citing firsthand observations, how uneven heating of the surface of the earth from the sun forms convection currents within the atmosphere and ocean, producing wind and ocean currents that are modified by the rotation of the earth;~~

~~(4) Investigate the unusual ability of water to dissolve a wide range of substances and explain, using diagrams and citing firsthand observations, how water dissolves minerals and gases as it passes through the water cycle and carries them to oceans and lakes;~~

~~(5) Describe, using diagrams or multimedia presentations, how global climate is determined primarily by the conversion of light and ultraviolet energy to infrared radiation at and near the surface of the earth;~~

~~(6) Describe how relatively small changes in solar output may have contributed to large changes in the climate of the earth in the past, for example, ice ages and interglacial periods;~~

~~(7) Explain how large-scale, long-term equilibrium can accommodate small-scale changes, for example:~~

~~(I) A relatively small disruption such as a fire, landslide or flood of a large ecosystem may disturb patterns such as food webs and cycles of matter found in that ecosystem, but over time new patterns may form or old patterns may reestablish; and~~

~~(II) A regional disruption of climate, for example, El Niño, may cause global changes in weather, but it may not have a significant impact on climate over long periods of time;~~

~~(8) Explain, using diagrams or animated multimedia presentations, the global system of the cycles of rocks, carbon and nitrogen, including living and nonliving components of these cycles as appropriate;~~

~~(9) Describe the model of the greenhouse effect, including a list of the various gases, which impede the transfer of long-wave radiation from the earth into space;~~

~~(10) Explain that the theory of global warming is based on observations subject to multiple interpretations and predictions and that the theory is less certain than the model of the greenhouse effect, which is one component of the theory of global warming, but which is based on reproducible laboratory data; and~~

~~(11) Model, using multimedia software or other methods, and explain how the energy that propels the lithosphere plates of the earth is predominantly a result of nuclear processes deep in the earth.~~

~~(e) Understand that the earth is part of a planetary system within the Milky Way Galaxy, which is part of the known universe, as demonstrated by the pupil's ability to:~~

~~(1) Investigate, using print, multimedia or Internet resources, and compare and contrast the earth's atmosphere, water, temperature and composition with those conditions on other planets;~~

~~(2) Explain, using print or multimedia software, how most objects in the solar system are in regular and predictable motion, and relate that motion to such phenomena as the day, the year, phases of the moon and eclipses;~~

~~(3) Explain that stars produce energy and elements heavier than hydrogen from nuclear reactions;~~

~~(4) Estimate the age of the universe as 10 billion years and cite supporting scientific evidence;~~

~~(5) Describe how increasingly sophisticated technology, such as mathematical models and computer simulations, is used to learn about the universe; and~~

~~(6) Explain that the physical laws, such as the laws of Newton, Kepler, thermodynamics, relativity and quantum physics, appear to apply to all bodies in the universe.~~~~]~~ ***atomic structure explains the properties and behavior of matter;***

(b) Know that different molecular arrangements and motions account for the different physical properties of solids, liquids and gases;

(c) Know that elements in the periodic table are arranged into groups and periods by repeating patterns and relationships;

(d) Know that identifiable properties can be used to separate mixtures;

(e) Know that atoms bond with one another by transferring or sharing electrons;

(f) Know that chemical reactions can take place at different rates depending on a variety of factors which include, without limitation, temperature, concentration, surface area and agitation;

(g) Know that chemical reactions release energy or absorb energy;

(h) Know that during a chemical reaction, elements combine in predictable ratios and the numbers of atoms of each element do not change;

(i) Know that most elements have two or more isotopes, some of which have certain practical applications; and

(j) Know that the number of electrons in an atom determines whether the atom is:

(1) An electrically neutral atom; or

(2) An ion.

4. For the ~~[area of environmental sciences:]~~ ***areas of force and motion:***

(a) Understand ~~[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, as demonstrated by the pupil's ability to:~~

~~(1) Investigate and describe, using specific examples, how changes in an ecosystem may affect biodiversity and contribute to an ecosystem's stability or instability;~~

~~(2) Explain how an ecosystem may change or remain the same in response to different kinds of influences;~~

~~(3) Contrast the immediate and long-term effects of a disaster, such as a flood or fire, with those produced by a change in climate or introduction of a new species;~~

~~(4) Interpret a food web showing how materials and energy are cycled through ecosystems; and~~

~~(5) Compare and contrast the geologic, hydrologic, climatic and biological characteristics of the principal bioregions of the State of Nevada, for example, northern Nevada's cold desert and southern Nevada's warm desert.~~

~~(b) Understand that natural resources include renewable and nonrenewable materials and energy, that all organisms, including humans, use resources to maintain and improve their existence and that the use of resources can have positive and negative consequences, as demonstrated by the pupil's ability to:~~

~~(1) Investigate, using print, multimedia or the Internet, the positive and negative consequences of changing the way in which the nation as a whole and individuals use a natural resource, for example:~~

~~(I) Switching from the use of fossil fuels to the use of solar power may reduce air pollution, but would likely involve the extraction and use of materials from the earth to make solar apparatus; and~~

~~(II) Recycling aluminum cans reduces the energy involved in extracting aluminum ore, but requires changing personal habits and creating new systems for recycling;~~

~~(2) Investigate and describe the various processes involved in obtaining, using and recycling a specific class of materials such as wood products, minerals or plastics and explain the environmental implications;~~

~~(3) Investigate, using print, multimedia or Internet resources, and describe the career opportunities associated with the study, exploration, extraction, use, protection and restoration of natural resources;~~

~~(4) Analyze and describe the limitations of the ability of the earth to respond to several different kinds of stresses produced by human or natural activities, for example:~~

~~(I) Excessive rates of removal of ground water may destroy an aquifer's ability to recharge;~~

~~(II) Channelization of mature rivers can change capacity for bioremediation by reducing the amount of wetland or marsh area the water normally passes through; and~~

~~(III) Forest fires in marginally arable areas can, over the short or long term, reduce soil stability and increase erosion; and~~

~~(5) Analyze and evaluate, with specific examples, the effects that changes in human populations have caused, such as:~~

~~(I) The depletion of resources and environmental degradation when a population increases; and~~

~~(II) The positive and negative changes in ecosystems when populations migrate.~~

~~(c) 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, as demonstrated by the pupil's ability to:~~

~~(1) Analyze the energy condition, conservation efforts and societal behavior patterns of the United States;~~

~~(2) Discuss how human actions may impact the equilibrium of global systems;~~

~~(3) Select a representative example and show how there can be scientific uncertainty regarding an environmental issue due to its complexity or the length of time required to ascertain effects; and~~

~~(4) Provide examples of global actions that may affect the environment or economy of the State of Nevada and the impact of related trade-offs.]~~ ***the interactions between force and motion;***

(b) Know that the laws of motion can be used to determine the effects of certain forces on the motion of an object;

(c) Know that an electromagnetic force can be established by magnetic forces and electric forces;

(d) Know that the strength of the electric force between two objects:

(1) Increases with an increase in the charge of the force; and

(2) Decreases with an increase in the distance between the objects; and

(e) Know that the strength of the gravitational force between two objects:

(1) Increases with an increase in the mass of the objects; and

(2) Decreases rapidly with an increase in the distance between the objects.

5. For the area of ~~[the nature and history of science:]~~ ***energy:***

(a) 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, as demonstrated by the pupil's ability to:~~

~~(1) Demonstrate that scientific knowledge uses a process of critique and consensus, for example, communicating methods and procedures used in scientific investigations to peers and teachers;~~

~~(2) Investigate and explain that public policy impacts the allocation of money available for research, for example, nuclear research, cancer research and acquired immune deficiency syndrome (AIDS) research;~~

~~(3) Research and explain how a scientific innovation that was originally challenged is now widely accepted, such as the sun-centered model of the solar system;~~

~~(4) Explain, with an appropriate example, that scientists work with others to resolve differences in interpretation of observations;~~

~~(5) Provide examples of technological problems that 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;~~

~~(6) Provide examples of scientific knowledge that is built on previous information to explain that entire theories are rarely completely discarded in favor of new ones, for example, the Greek view of the atom versus the quantum mechanical view; and~~

~~(7) Provide examples of ethical scientific policies and the reasons for those policies.~~

~~(b) Understand that many decisions require reasoning and critical consideration of scientific evidence, as demonstrated by the pupil's ability to:~~

~~(1) Evaluate how the validity of the scientific techniques used, for example, sampling procedures, affect the credibility of the information obtained in a specific kind of scientific investigation such as a controlled experiment, field work or secondary research;~~

~~(2) Develop and present an analysis of costs, benefits and risks that includes all major factors in a decision-making situation, for example, creating a man-made lake to enhance a new subdivision;~~

~~(3) Identify and accurately describe examples of systems that are quantitatively different from the components which comprise them, such as:~~

~~(I) How populations differ from individuals;~~

~~(II) How a cardiac system differs from its individual cells;~~

~~(III) How the features of a carburetor are unique, yet the carburetor functions in an engine system; or~~

~~(IV) The role of a raindrop in the water cycle; and~~

~~(4) Compare and contrast a scientific law, theory, rule and hypothesis and explain the limits of generalizations, assumptions, analogies and models by relating and applying each term to a specific concept in science.~~

~~(c) Understand that a variety of models can be used to describe or predict things and events, as demonstrated by the pupil's ability to:~~

~~(1) Use mathematical symbols and formulas for expression, for example, the universal gas law or Newton's Laws of Motion;~~

~~(2) Use models to identify and predict relationships of cause and effect, for example, the effect of temperature on the volume of a gas or the effect of the level of carbon dioxide on the greenhouse effect;~~

~~(3) Identify and describe how systems are often different from their components, using an example such as an aquarium or automobiles;~~

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

~~(5) Identify types of hazards, such as transportation of chemicals on highways or railways, earthquakes or drought, and choose one example to estimate impacts such as fire or explosion or to estimate consequences of exposure to a hazard such as illness, death, economic loss of property, or loss of livelihood; and~~

~~(6) Provide examples of ways to reduce or eliminate risks, such as laws, planning and zoning, or safety precautions.~~

~~(d) Understand that science is an active process of systematically examining the natural world, as demonstrated by the pupil's ability to:~~

~~(1) Clearly demonstrate, through written or oral work, curiosity, honesty and skepticism by asking questions, not changing data, reasonably accounting for discrepant data and critically evaluating false or controversial findings;~~

~~(2) Repeat experiments for statistical analysis to produce conclusions that are well supported; and~~

~~(3) Given a common phenomenon, generate multiple explanations and describe which explanation is the most logical.~~

~~(c) Understand that a variety of methods of communication may be used to share scientific information, as demonstrated by the pupil's ability to:~~

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

~~(2) Incorporate the use of tables, charts and graphs to effectively make arguments and claims in oral and written presentations; and~~

~~(3) Discuss scientific topics by restating or summarizing accurately what others have said, asking for clarification or elaboration, expressing alternative positions and making use of available print, Internet and multimedia resources.]~~ ***there are interactions between matter and energy;***

(b) Know that certain waves, including, without limitation, sound waves, seismic waves and electromagnetic waves, have energy that can be transferred when the waves interact with matter;

(c) Know that forms of energy can be converted;

(d) Know that nuclear reactions can convert a relatively small amount of material into a large amount of energy;

(e) Know the characteristics, applications and impacts of radioactivity;

(f) Know the relationship between heat and temperature; and

(g) Know that electricity is transferred from sources which generate electricity for consumption and practical uses.

6. For the area of ~~[scientific inquiry, processes and skills:]~~ ***heredity:***

(a) Understand ~~[that scientific inquiry is enhanced by and often communicated through the use of mathematics, as demonstrated by the pupil's ability to:~~

~~(1) Determine the relationship between variables in an investigation, for example, direct, inverse or square;~~

~~(2) Use a preselected algebraic relationship to calculate the answer to a problem, for example, given density = mass ÷ volume, calculate one of the three variables given the values of the other two;~~

~~(3) Identify what the correct order of magnitude would be for an answer to a specific problem;~~

~~(4) Use derived quantities, ratios, proportions and constants to solve appropriate problems;~~

~~(5) Provide an explanation or analysis of why a calculation does not agree with the expected result, such as the calculation of percent accuracy and class precision; and~~

~~(6) Select samples by a random system to avoid bias.~~

~~(b) Appropriately and safely apply the tools and techniques of scientific inquiry, as demonstrated by the pupil's ability to:~~

~~(1) Consistently demonstrate personal responsibility for using safety equipment and observing all safety standards;~~

~~(2) Consistently follow the instructions given by the teacher on the proper handling, storage and disposal of chemicals;~~

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

~~(4) Maintain a satisfactory record of procedures, data analyses, decisions and conclusions drawn from scientific investigations;~~

~~(5) Write procedures for the investigation of delegated or original scientific problems that are comprehensible; and~~

~~(6) Design, carry out and report on a scientific investigation.]~~ ***how genetic information is passed from one generation to the next generation;***

(b) Know that genetic information which is passed from a parent to an offspring is coded in the DNA molecule;

(c) Know that DNA molecules provide instructions for assembling protein molecules;

(d) Know that all cells in the body of an organism develop from a single cell and contain essentially identical genetic instructions;

(e) Know several causes and effects of somatic mutations versus sex-cell mutations; and

(f) Know how to predict patterns of inherited characteristics.

7. For the area of the structure of life:

(a) Understand that all life forms at every level of organization have specialized structures and use similar processes to satisfy the needs of life;

(b) Know the structure and function of cells;

(c) Know that the human body has a specialized anatomy and physiology composed of a hierarchical arrangement of differentiated cells; and

(d) Know that disease disrupts the equilibrium that exists in a healthy organism.

8. For the area of organisms and their environment:

(a) Understand that ecosystems display patterns of organization, stability and change which result from the interactions and interdependencies between the living and nonliving components of the earth;

(b) Know the relationship between various organisms and their physical environments;

(c) Know how changes in an ecosystem can affect the biodiversity in the ecosystem and the contribution of the biodiversity to the stability of an ecosystem;

(d) Know that the amount of living matter that an environment can support is limited by the availability of matter and energy and the ability of the ecosystem to recycle certain materials; and

(e) Know the unique geological, hydrological, climatic and biological characteristics of the bioregions of the State of Nevada.

9. For the area of the diversity of life:

(a) Understand biological evolution and the diversity of life;

(b) Know that organisms can be classified based on evolutionary relationships;

(c) Know that the similarity of sequences of DNA provide evidence of relationships between certain organisms;

(d) Know that records of fossils provide evidence of natural selection and the evolutionary consequences of natural selection;

(e) Know that the extinction of a species can be a natural process;

(f) Know that biological evolution explains the diversity of life; and

(g) Know the concepts of natural and artificial selection.

10. For the areas of the atmospheric processes and the cycle of water:

(a) Understand that heat and energy transfer in and out of the atmosphere and influence the weather and the climate of the earth;

(b) Know that the sun is a major source of the energy for the earth and provides the energy that establishes the weather and the climate of the earth;

(c) Know that the composition of the atmosphere of the earth has changed in the past and continues to change;

(d) Understand the role of the atmosphere in the greenhouse effect of the earth;

(e) Know that convection and radiation play important roles in moving heat energy throughout the earth; and

(f) Know that the rotation of the earth affects wind currents and ocean currents.

11. For the area of the solar system and the universe:

(a) Know the scientific theories of the origins and evolution of the universe;

(b) Know the common characteristics of stars;

(c) Know that stars are powered by the nuclear fusion of lighter elements into heavier elements, which results in the release of large amounts of energy;

(d) Know the ways in which technology has increased the understanding of the universe;

(e) Know the continuing processes involved in the formation and destruction of stars; and

(f) Know that scientific evidence suggests that the universe is expanding.

12. For the area of the structure and composition of the earth:

(a) Understand scientific evidence concerning processes that take place on a geological time scale;

(b) Know how successive rock strata and fossils can be used to confirm the age, history and changing life forms of the earth, including, without limitation, the manner in which this evidence is affected by the folding, breaking and uplifting of layers of the earth;

(c) Understand the concept of and evidence supporting plate tectonics, including, without limitation, structural, geophysical and paleontological evidence;

(d) Know that elements exist in fixed amounts and move through solid earth, oceans, the atmosphere and living things as part of biogeochemical cycles;

(e) Know the processes of obtaining, using and recycling renewable and nonrenewable resources; and

(f) Know that soil, which is derived from weathered rocks and decomposed organic material, is found in layers of the earth.

Sec. 6. NAC 389.256 is hereby repealed.

TEXT OF REPEALED SECTION

NAC 389.256 Science. By the end of the third grade, pupils must know and be able to do everything required in the previous grades for courses in science offered in public schools. Instruction in the third grade must be designed so that pupils meet the following performance standards by the completion of the third grade:

1. For the area of physical science:

(a) Understand that gravitational, electrical and magnetic forces have an effect on the motion of objects, as demonstrated by the pupil's ability to:

(1) Demonstrate that a given push or pull, whether hard or soft, causes an object to change its speed or direction, or both;

(2) Predict whether or not an object will topple or balance; and

(3) Effectively manipulate simple tools such as hammer and nails, screwdriver and screws, and nuts and bolts, and demonstrate when to use specific tools.

(b) Understand that materials have distinct properties which depend on the amount of matter present, its chemical composition and structure, as demonstrated by the pupil's ability to:

(1) Describe objects in terms of observable properties such as color, texture, size, state of matter and symmetry;

(2) Sort objects on the basis of two or more observable characteristics or attributes such as dimensions, coloration, symmetry, parts and state of matter by using Venn diagrams or other schemes; and

(3) Identify or create a system of classification by observing objects that are grouped.

(c) Understand that changes in temperature and pressure can alter states of matter and that energy exists in many forms and one form can change into another, as demonstrated by the pupil's ability to:

(1) Use a thermometer to measure and record a range of temperatures and label each as hot, warm, cool or cold; and

(2) Investigate, using direct observations, and describe in detail how a solid changes into a liquid and water evaporates in an open container.

(d) Understand that chemical reactions change substances into different substances.

(e) Understand that nuclear energy and electromagnetic energy are produced in many forms from both natural and man-made sources.

2. For the area of life science:

(a) Understand that all life forms, at all levels of organization, use specialized structures and similar processes to meet the basic needs of life, as demonstrated by the pupil's ability to:

(1) Observe and describe the growth of a plant, such as a bean plant, over time and identify growth patterns, for example, the sprouting of seeds, the formation of roots, leaves and stems, and the development of flowers and seeds;

(2) Observe and describe the life cycle of a domestic animal and an animal that undergoes metamorphosis, such as a frog, butterfly or mealworm, and describe the needs of living organisms; and

(3) Classify, with few errors, plants and animals representative of major groups such as the evergreen versus deciduous trees, or animals with an external or internal skeleton or no skeleton.

(b) Understand that organisms respond to internal and external influences, as demonstrated by the pupil's ability to:

(1) Describe, using examples with minimal errors, how various living things behave differently under differing conditions such as migration, coloration and hibernation; and

(2) Explain that germs affect the functions of the body and identify the defenses that the human body has against germs, such as saliva, skin and special blood cells.

(c) Understand that life forms are diverse and that through heredity they pass some characteristics to their offspring, as demonstrated by the pupil's ability to:

(1) Give examples of how offspring may resemble parents and other siblings; and

(2) With minimal assistance from the teacher, sort a group of living things by appearance and behavior and give rational justification for the sorting.

(d) Understand evolution and that life forms change over time, as demonstrated by the pupil's ability to:

(1) Illustrate with diverse examples the many different kinds of living things that exist on the earth; and

(2) Provide general examples of how particular features of plants and animals help them live in different kinds of environments, for example, the thickened stems of cacti enable them to store water and live in the desert.

3. For the areas of earth and space sciences:

(a) Understand that the earth is composed of interrelated systems of rocks, water, air and life, as demonstrated by the pupil's ability to:

(1) Identify, with few or no errors, various samples of the materials of the earth, such as rocks, minerals, soil, sand, gravel, water, ice and air;

(2) Identify landforms such as mountains and valleys;

(3) Describe the shape of the earth as "round like a ball" or as a sphere; and

(4) Compare, using maps and models, relative areas of ocean and land on the surface of the earth.

(b) Understand that the earth may be represented by a variety of maps and models, as demonstrated by the pupil's ability to:

(1) Indicate any one of three directions on a map, as requested by the teacher, when given the fourth direction by the teacher; and

(2) Locate the State of Nevada on a national map and the city or town in which the pupil resides on a map of the State of Nevada.

(c) Understand that the systems of the earth such as weather and the formation of mountains change or vary, as demonstrated by the pupil's ability to observe and describe, with examples, how some changes are hard to see while they happen because they are:

(1) Slow, such as the growth of a plant and the movement of an hour hand on a clock; or

(2) Fast, such as lightning strikes, eye blinks and the change from dark to light when a light is turned on.

(d) Understand that the systems of the earth have a variety of cycles through which energy and matter continually flow, as demonstrated by the pupil's ability to:

(1) Observe and describe that some objects that give off light, such as light bulbs or the sun, also give off heat;

(2) With minimal assistance from the teacher, observe, record and describe by using words, numbers and drawings, the seasonal differences, for example, changes in the weather and the leaves of deciduous trees; and

(3) Observe and describe that water can be a liquid or a solid, and explain that changes in temperature can cause water to go back and forth from one form to the other.

(e) Understand that the earth is part of a planetary system within the Milky Way Galaxy, which is part of the known universe, as demonstrated by the pupil's ability to:

(1) Identify the sun, the moon and the earth as components of our solar system; and

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

4. For the area of environmental sciences:

(a) Understand 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, as demonstrated by the pupil's ability to:

(1) Identify, with appropriate examples, similarities and differences found in animals and plants that help them live in their unique habitats; and

(2) Describe, with the use of diagrams or illustrations, ways in which organisms interact with each other.

(b) Understand that natural resources include renewable and nonrenewable materials and energy, and that all organisms, including humans, use resources to maintain and improve their existence, and the use of resources can have positive and negative consequences, as demonstrated by the pupil's ability to:

(1) Explain, with multiple examples, that natural resources are used for many purposes, for example, trees are used for construction, paper and fuel; and

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

(c) Understand conservation and 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, as demonstrated by the pupil's ability to:

(1) Provide examples of materials that can be recycled and used again, including materials that may be used in different forms; and

(2) Make a reasonable prediction of the continuation of a pattern based on a given pattern of observable change.

5. For the area of the nature and history of science:

(a) 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, as demonstrated by the pupil's ability to:

(1) With the assistance of the teacher, make observations, ask questions and seek answers;

(2) Generally observe and record accurately to compare findings with others;

(3) Identify women and men of different ages and backgrounds who have made contributions to science;

(4) Identify the benefits of working with a team and sharing findings; and

(5) Competently use tools such as hammers, screwdrivers, balances, hand lens, pencil sharpeners and levers to make a task easier.

(b) Understand that many decisions require critical consideration of scientific evidence.

(c) Understand that a variety of models can be used to describe or predict things and events, as demonstrated by the pupil's ability to:

(1) Compare and contrast a model with what it represents;

(2) Identify and represent observable patterns and correctly predict the next likely event based on the pattern, for example, life cycles, seasonal changes in the weather or phases of the moon; and

(3) Demonstrate, with an example, that when parts or substances are joined or mixed they can do things together they could not have done by themselves, such as bread and its ingredients or a model car and its parts.

(d) Understand that science is an active process of systematically examining the natural world, as demonstrated by the pupil's ability to:

(1) Observe and raise questions about the world, for example, about the actions of toys or the development and characteristics of schoolyard plants, and seek answers through investigations; and

(2) Record in a notebook or journal observations of investigations over time, such as changes in a terrarium or changes in a tadpole as it matures.

(e) Understand that a variety of methods of communication may be used to share scientific information, as demonstrated by the pupil's ability to:

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

(2) Create adequate illustrations, graphs and charts that are easy to understand and that convey ideas and record observations; and

(3) Cooperate and contribute ideas within a group.

6. For the area of scientific inquiry, processes and skills:

(a) Understand that scientific inquiry is enhanced and often communicated through mathematics, as demonstrated by the pupil's ability to:

(1) Use mental computation to make rough estimates, such as using addition, subtraction, multiplication, division and measurement; and

(2) Determine whether measurements and descriptions are reasonably accurate, for example, comparing objects by measuring lengths, weights and capacities or verifying the reasonableness of results by checking the measurements against known values, such as the length of the classroom or the capacity of a quart of milk.

(b) Appropriately and safely apply the tools and techniques of scientific inquiry, as demonstrated by the pupil's ability to:

(1) Consistently use equipment properly and safely during all science activities; and

(2) Identify and gather tools and materials necessary for a scientific investigation.

NOTICE OF ADOPTION OF PROPOSED REGULATION
LCB File No. R041-05

The State Board of Education adopted regulations assigned LCB File No. R041-05 which pertain to chapter 389 of the Nevada Administrative Code on September 22, 2005.

Notice date: 8/30/2005 **Date of adoption by agency:** 9/22/2005
Hearing date: 10/7/2005 **Filing date:** 10/31/2005

INFORMATIONAL STATEMENT

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 150 individuals and educational organizations. A workshop was held on October 7, 2005. There was one comment from the public.

The Notice of Intent to Act Upon a Regulation for public hearing and adoption of the proposed revisions for amendments to NAC 389, Science Standards, were sent to approximately 150 individuals and educational organizations. A public hearing was conducted on October 7, 2005. There were no comments from the public. The State Board of Education adopted amendments to NAC 389.

2. The Number of Persons Who:

a) Attended Each Hearing: Workshop: 8 Hearing: 8
b) Testified at Each Hearing: Workshop: 1 Hearing: 0
c) Submitted Written Statements: Workshop: 0 Hearing: 0

A copy of any written comments may be obtained by contacting Nita Barnes, Secretary to the State Board of Education, Nevada Department of Education, (775) 687-9225, or by writing to the Nevada 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.

Comments were solicited through the workshop notice of August 30, 2005, and the public hearing notice of August 30, 2005. At the October 7, 2005 Workshop to Solicit Comments there was one public comment to the proposed language. At the October 7, 2005 Public Hearing there were no public comments.

Dr. Dotty Merrill, Assistant Superintendent, Washoe County School District, stated that George Oaks, Science Consultant for Washoe County School District, reviewed the standards very carefully. Mr. Oaks reported Science teachers in Washoe County had opportunities to make recommendations, and did so during the review process, and he encourages adoption as proposed.

A copy of the summary and/or minutes of the public hearing may be obtained by contacting Nita Barnes, Secretary to the State Board of Education, Nevada Department of Education, (775) 687-9225, or by writing to the Nevada 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 Nevada State Board of Education/Nevada State Board for Career and Technical Education adopted the regulation language from temporary to permanent at the public hearing held October 7, 2005. The reason for adopting the amendment to the regulation is NRS 389.520 requires that all state academic standards be periodically reviewed and revised.

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

There is no anticipated economic effect of the regulation changes on the business that the agency regulates and there are no known adverse effects. There are no beneficial, immediate or long term economic effects on the state, school districts, and schools.

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 governmental 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 governmental 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.