LCB File No. R075-99

PROPOSED REGULATION OF THE NEVADA STATE BOARD OF EDUCATION STATE BOARD FOR OCCUPATIONAL EDUCATION

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

PERFORMANCE STANDARDS FOR ENGLISH LANGUAGE ARTS

Statutory Authority: 385.080

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

KINDERGARTEN AND ELEMENTARY SCHOOL

Instruction Through Second Grade

By the end of the second grade, students know and are able to do everything required in the previous grades for courses in English Language Arts offered in public elementary schools and must include instruction designed to have students meet the following performance standards by the completion of second grade:

1. For the area of reading:

(a) Students know and use word analysis skills and strategies to comprehend new words encountered in text.

(1) Read familiar or independently chosen grade-level texts with fluency, accuracy, intonation, and expression.

(2) Read high-frequency words to build fluency.

(3) Use knowledge of phonics and structural elements, such as letter-sound relationships, affixes, and spelling patterns to understand words in context.

(4) Use knowledge of synonyms, antonyms, homophones, and homographs to understand text.

(b) Students use reading process skills and strategies to build comprehension.

(1) Apply pre-reading strategies, such as accessing prior knowledge, predicting, previewing, and setting a purpose.

(2) Use self-correcting strategies, such as self-questioning and rereading.

(3) Recall and retell the main idea of text.

(c) Students read to comprehend, interpret, and evaluate literature from a variety of authors, cultures, and times.

(1) Provide well-developed descriptions of simple story elements, such as setting, characters, character traits, and plot.

(2) Compare and contrast different versions of the same stories from different cultures and eras.
(3) Identify the main idea of text.

(4) Differentiate among rhythm, rhyme, and alliteration in poetry.

(5) Distinguish between poetry and prose.

(d) Students read to comprehend, interpret, and evaluate informational texts for specific purposes.

(1) Use the parts of a book to locate information, including table of contents, chapter headings, diagrams, charts, and graphs.

(2) Identify cause and effect relationships and the main idea of a passage.

(3) Formulate questions to gain understanding of important information in text.

(4) Read and follow simple directions to perform a task.

2. For the area of writing:

(a) Students write a variety of texts that inform, persuade, describe, evaluate, or tell a story and are appropriate to purpose and audience.

(1) Write informative papers using two sources.

(2) Write friendly letters using a standard format.

(3) Write a variety of literary forms, including stories, poems, and responses to literature.

(b) Students write with a clear focus and logical development, evaluating, revising, and editing for organization, style, tone, and word choice.

(1) Use, with teacher assistance, the steps of the writing process such as prewriting, drafting, revising, editing, and sharing.

(2) Generate and organize ideas for writing.

(3) Write stories and other compositions with ample detail for a specific audience.

(4) Revise and edit writing, with teacher assistance, for sufficient detail, ample clarity, and appropriate word usage.

(5) Share writing with others and use responses for some revision.

(c) Students write using standard English grammar, usage, punctuation, capitalization, and spelling.

(1) Identify and write complete sentences using nouns, verbs, pronouns, adjectives, and adverbs.

(2) Use correct punctuation, including end punctuation; commas in the greeting and closing of a letter, in dates, and between words in a series; and apostrophes in contractions and possessives.

(3) Capitalize proper nouns and initials correctly.

(4) Spell words correctly in writing, especially high-frequency irregular words and those with long and r-controlled vowels, blends, and digraphs.

(5) Write compositions that are readable and legible.

3. For the Areas of Listening & Speaking

(a) Students listen to and evaluate oral communications for content, style, speaker's purpose, and audience appropriateness.

(1) Determine the purpose(s) for listening, such as to obtain information, to solve problems, or to provide enjoyment.

(2) Listen and respond to public presentations and a variety of media.

(3) Generally distinguish among different dialects.

(4) Follow two-step oral directions to complete a task.

(b) Students speak using organization, style, tone, voice, and media aids appropriate to audience and purpose.

(1) Speak clearly, use an understandable pace, and select specific vocabulary to communicate ideas.

(2) Make oral presentations that maintain a clear focus.

(3) Recount experiences and tell stories that move through a logical sequence of events and include character and setting.

(4) Give clear directions to complete a simple task.

(c) Students participate in discussions to offer information, clarify ideas, and support a position.

(1) Demonstrate turn-taking and eye contact; present ideas and information in conversations and group discussions.

(2) Ask and answer questions to gather and provide information.

4. For the Area of Research

(a) Formulate research questions, use a variety of sources to obtain information, weigh the evidence, draw valid conclusions, and present findings.

(1) Formulate questions to explore areas of interest.

(2) Locate information from reference materials and available technology to answer questions.

(3) Present research findings, using available media.

Instruction Through Third Grade

By the end of the third grade, students know and are able to do everything required in the previous grades for courses in English Language Arts offered in public elementary schools and must include instruction designed to have students meet the following performance standards by the completion of third grade:

1. For the area of reading:

(a) Students know and use word analysis skills and strategies to comprehend new words encountered in text.

(1) Apply knowledge of word families, phonics, and structural elements to determine the meanings of unfamiliar words in context.

(2) Apply knowledge of prefixes, suffixes, and roots or base words with minimal assistance to determine the meanings of words in context.

(3) Use dictionaries, glossaries, and other resource materials adequately to determine the meanings of words.

(4) Develop and communicate an expanded vocabulary through the use of synonyms, antonyms, homophones, and homographs.

(b) Students use reading process skills and strategies to build comprehension.

(1) Apply pre-reading strategies with a variety of texts, such as stories, poems, and novels.

(2) Apply self-correcting strategies, such as self-questioning and rereading to understand text.

(3) Organize essential points of text; make revised predictions while reading.

(4) Restate facts and details of text to share information and organize ideas.

(5) Adjust reading rate to suit difficulty of text.

(c) Students read to comprehend, interpret, and evaluate literature from a variety of authors, cultures, and times.

(1) Compare one or more story elements and points of view in a variety of works by a variety of authors from different times and cultures.

(2) Make inferences about character traits and check text for verification with minimal assistance.

(3) Identify and compare themes or messages in text with minimal assistance.

(4) Identify simile, metaphor, onomatopoeia, and hyperbole in text.

(5) Read and identify stories, plays, poetry, and non-fiction selections.

(d) Students read to comprehend, interpret, and evaluate informational texts for specific purposes.

(1) Identify relevant information from text features for a specific purpose.

(2) Distinguish between cause/effect, fact/opinion, and main idea/supporting detail with minimal assistance.

(3) Ask questions and support answers by connecting prior knowledge with literal and inferential information in text with some assistance.

(4) Draw conclusions about text and support them with textual evidence and experience with minimal assistance.

(5) Read and follow three-and four-step directions to complete a simple task with minimal assistance.

2. For the area of writing:

(a) Students write a variety of texts that inform, persuade, describe, evaluate, or tell a story and are appropriate to purpose and audience.

(1) Use at least three sources to write informative papers.

(2) Write narratives, stories, responses to literature, and personal and business letters using appropriate organization and format.

(3) Write stories that develop sequentially and contain sufficient detail.

(4) Write compositions that retell the events in a story in sequence.

(b) Students write with a clear focus and logical development, evaluating, revising, and editing for organization, style, tone, and word choice.

(1) Use the steps of the writing process, such as prewriting, drafting, revising, editing, and sharing, with minimal teacher assistance.

(2) Write simple compositions that include a topic sentence, supporting sentences, details, and attention to audiences.

(3) Revise and edit written drafts for order of ideas and use of standard English.

(4) Demonstrate effective voice through appropriate word choice for given audiences.

(c) Students write using standard English grammar, usage, punctuation, capitalization, and spelling.

(1) Compose simple sentences using correct subject/verb agreement and correct use of past, present and future verb tenses.

(2) Write declarative, interrogative, imperative, and exclamatory sentences.

(3) Use quotation marks in dialogue; punctuate city and state, dates, and titles of books.

(4) Generally use correct capitalization and spelling.

(5) Create readable and legible compositions in a standard format.

3. For the Areas of Listening & Speaking

(a) Students listen to and evaluate oral communications for content, style, speaker's purpose, and audience appropriateness.

(1) Retell and explain what has been said by a speaker.

(2) Listen to make connections between prior experiences, insights, and ideas and the message of the speaker.

(3) Identify language, sayings, and dialects that reflect regions and cultures.

(4) Follow three-and four-step oral directions to complete a simple task.

(b) Students speak using organization, style, tone, voice, and media aids appropriate to audience and purpose.

(1) Use standard English to communicate ideas in a variety of tasks.

(2) Use appropriate public speaking techniques and give organized and sequential presentations.

(3) Read aloud and recite prose and poetry with fluency, rhythm, pace, appropriate intonation, and vocal patterns.

(4) Give clear three- and four-step directions to complete a simple task.

(c) Students participate in discussions to offer information, clarify ideas, and support a position.

(1) Speak, listen attentively, and respond to questions with relevant detail in conversations and group discussions.

(2) Share ideas and information to complete a task.

(3) Distinguish the difference between speaker's opinion and facts.

4. For the Area of Research

(a) Formulate research questions, use a variety of sources to obtain information, weigh the evidence, draw valid conclusions, and present findings.

(1) Formulate questions to investigate topics.

(2) Use a variety of resources, such as library, available technology, print, and non-print resources to find and record information on a topic.

(3) Give credit for others' ideas, images, and information, such as a list of sources.

(4) Present research findings using available, selected media for different purposes and audiences.

Instruction Through Fifth Grade

By the end of the fifth grade, students know and are able to do everything required in the previous grades for courses in English Language Arts offered in public elementary schools and must include instruction designed to have students meet the following performance standards by the completion of fifth grade:

1. For the area of reading:

(a) Students know and use word analysis skills and strategies to comprehend new words encountered in text.

(1) Competently apply word attack skills to comprehend unfamiliar words in text.

(2) Determine the meanings of words by applying knowledge of Greek and Latin roots and affixes, with or without dictionaries and glossaries.

(3) Recognize and apply context clues to identify unknown words in text.

(b) Students use reading process skills and strategies to build comprehension.

(1) Apply pre-reading strategies to aid comprehension.

(2) Use a variety of skills, strategies, and rates during reading to aid comprehension.

(3) Demonstrate comprehension of text through various activities such as note taking or writing reports.

(c) Students read to comprehend, interpret, and evaluate literature from a variety of authors, cultures, and times.

(1) Identify main plot elements, conflicts, and themes in a variety of texts.

(2) Identify figurative language in a variety of texts.

(3) Compare stated and implied themes in a variety of texts.

(4) Make and defend accurate inferences about character traits and motivations.

(5) Describe differences in purpose and structure among stories, plays, poetry, and non-fiction materials.

(6) Make reasonable connections between a piece of literature and the historical events and cultures portrayed.

(7) Describe how authors' writing styles influence reader response.

(d) Students read to comprehend, interpret, and evaluate informational texts for specific purposes.

(1) Clarify and connect main ideas and concepts and identify their relationship to other sources and topics.

(2) Read to evaluate new information and hypotheses by comparing them to known information and ideas.

(3) Draw conclusions and make inferences about text supported by textual evidence and experience.

(4) Identify authors' ideas and purposes in text, including advertisements and public documents.

(5) Read and follow multistep directions to complete a task.

2. For the area of writing:

(a) Students write a variety of texts that inform, persuade, describe, evaluate, or tell a story and are appropriate to purpose and audience.

(1) Write stories which develop a logical sequence of events and use sufficient descriptive details.

(2) Support reactions to, or positions on, literary selections with some evidence, details, or quotations.

(3) Write informative compositions that develop the topic with appropriate facts from a variety of sources.

(4) Write accurate summaries of oral and written stories.

(5) Write letters giving complete information in accurate format.

(6) Write short expository text that speculates on causes and effects and offers simple persuasive evidence.

(b) Students write with a clear focus and logical development, evaluating, revising, and editing for organization, style, tone, and word choice.

(1) Generate ideas for future writing using a variety of strategies with minimal assistance.

(2) Create written pieces with an organizational structure strong enough to move the reader from point to point without confusion.

(3) Write in a clear and focused way, developing the topic and providing general support.

(4) Use a variety of revising and editing strategies to refine meaning, such as adding words, deleting words, and clarifying and rearranging words and sentences.

(5) Effectively communicate voice appropriate to the intended audience using effective word choice.

(c) Students write using standard English grammar, usage, punctuation, capitalization, and spelling.

(1) Identify and correctly use pronoun case, comparative and superlative modifiers, and often-confusing verbs.

(2) Identify and use prepositional phrases, appositives, and independent clauses; use transitions and conjunctions to elaborate ideas in writing.

(3) Use colons to introduce a list; quotation marks around exact words of speakers and names of poems, songs, and short stories; and rules of capitalization.

(4) Spell frequently-used words correctly, paying special attention to roots, suffixes, and prefixes.

3. For the Areas of Listening & Speaking

(a) Students listen to and evaluate oral communications for content, style, speaker's purpose, and audience appropriateness.

(1) Identify, interpret, and evaluate a speaker’s verbal and nonverbal messages, intent, viewpoints, and techniques using given criteria; distinguish fact from opinion.

(2) Identify and describe language and dialect usage that vary in different contexts, regions, and cultures.

(3) Follow multistep oral directions to complete a task.

(b) Students speak using organization, style, tone, voice, and media aids appropriate to audience and purpose.

(1) Generally use specific vocabulary, standard English, and appropriate public speaking techniques to communicate ideas.

(2) Give organized oral reports that demonstrate clear point of view and incorporate multimedia aids as needed for enhancement.

(3) Give multistep oral directions to complete a task.

(c) Students participate in discussions to offer information, clarify ideas, and support a position.

(1) Participate in group discussions as a contributor and a leader.

(2) Ask and answer questions in group discussions to clarify or extend ideas.

(3) Share ideas, opinions, and information with a group, requiring minimal prompting or assistance; choose language that communicates messages clearly and effectively.

(4) Compare and contrast ideas and viewpoints of speakers.

4. For the Area of Research

(a) Formulate research questions, use a variety of sources to obtain information, weigh the evidence, draw valid conclusions, and present findings.

(1) Develop reasonable research questions that establish a focus and purpose for inquiry.

(2) Select sufficient information from multiple resources to answer the research question and list each source used.

(3) Take adequate notes to record information using given formats.

(4) Organize and communicate organized research findings using appropriate graphs, charts, or maps with written text.

Instruction Through Eighth Grade

By the end of the eighth grade, students know and are able to do everything required in the previous grades for courses in English Language Arts offered in public elementary schools and must include instruction designed to have students meet the following performance standards by the completion of eighth grade:

1. For the area of reading:

(a) Students know and use word analysis skills and strategies to comprehend new words encountered in text.

(1) Apply knowledge of Greek and Latin roots and affixes to comprehend new words.

(2) Use dictionaries and glossaries to determine meanings of new words encountered in text.

(3) Analyze figurative language to infer literal and figurative meaning from text.

(b) Students use reading process skills and strategies to build comprehension.

(1) Apply prereading strategies.

(2) Apply and analyze skills and strategies that enhance comprehension.

(3) Use outlines, maps, and graphic organizers to aid comprehension.

(4) Adjust reading rate to match purpose, task, and text difficulty.

(c) Students read to comprehend, interpret, and evaluate literature from a variety of authors, cultures, and times.

(1) Analyze and evaluate story elements to determine their importance to the story.

(2) Explain inferences regarding the motives of characters and consequences of action by citing the text.

(3) Identify examples of connections among an author, the cultural and historical context, and the work.

(4) Distinguish theme from topic and cite textual evidence to support claims.

(5) Identify, analyze, and compare techniques used by authors to elicit reader response.

(6) Compare characteristics and elements of various literary forms.

(d) Students read to comprehend, interpret, and evaluate informational texts for specific purposes.

(1) Use knowledge of text features and common expository structures to comprehend text.
(2) Locate, interpret, organize, and synthesize information in text to answer specific questions and support ideas.
(3) Evaluate the validity, accuracy, and adequacy of evidence behind authors' ideas and cite supporting evidence.
(4) Summarize ideas and information in text, including advertisements and public documents.
(5) Read and follow multistep directions to complete a complex task.

2. For the area of writing:

(a) Students write a variety of texts that inform, persuade, describe, evaluate, or tell a story and are appropriate to purpose and audience.

(1) Write well-developed informative papers utilizing a variety of sources.

(2) Write personal and business communications.

(3) Write organized narratives or short stories that include elements such as relevant dialogue and details and that reveal the author's attitude toward the subject.

(4) Respond to literary selections using supporting evidence from the text.

(5) Write summaries presenting main ideas and key supporting information.

(6) Write well-organized expository text that states a thesis and answers reader concerns and counter arguments.

(7) Write organized, persuasive editorials or essays that state a thesis supported by details, reasons, and examples.

(b) Students write with a clear focus and logical development, evaluating, revising, and editing for organization, style, tone, and word choice.

(1) Generate ideas utilizing a variety of strategies.

(2) Organize ideas according to the purpose and task.

(3) Draft coherent compositions with a controlling impression or thesis statement.

(4) Revise writing using given criteria.

(5) Edit for use of standard English.

(6) Produce writing with a voice that is expressive and appropriate to audience and purpose.

(c) Students write using standard English grammar, usage, punctuation, capitalization, and

spelling.

(1) Apply the rules of usage and grammar correctly.

(2) Use varied sentence structure to reinforce style.

(3) Use internal and external punctuation correctly.

(4) Use rules of capitalization.

(5) Demonstrate conventional spelling.

3. For the Areas of Listening & Speaking

(a) Students listen to and evaluate oral communications for content, style, speaker's purpose, and audience appropriateness.

(1) Paraphrase speaker's main ideas and supporting evidence to draw meaning and ask relevant questions.

(2) Evaluate content and delivery and provide constructive feedback.

(3) Analyze dialects associated with informal and formal speaking contexts as they are reflected in slang, jargon, and language styles.

(4) Follow multistep oral directions to complete a complex task.

(b) Students speak using organization, style, tone, voice, and media aids appropriate to audience and purpose.

(1) Select and use vocabulary and public speaking techniques appropriate to audience and purpose.

(2) Organize and deliver planned and impromptu presentations appropriate to audience and purpose.

(3) Give clear and concise multistep directions to complete a complex task.

(c) Students participate in discussions to offer information, clarify ideas, and support a position.

(1) Participate in conversations and group discussions as an active listener to provide constructive feedback.

(2) Examine and provide specific evidence to support an opinion.

(3) Follow group rules and understand individual roles in a variety of discussion formats.

(4) Express supported opinions while considering multiple or divergent viewpoints.

4. For the Area of Research

(a) Formulate research questions, use a variety of sources to obtain information, weigh the evidence, draw valid conclusions, and present findings.

(1) Formulate questions and develop a purpose which leads to inquiry, investigation, and research across the curriculum.

(2) Locate and select relevant information from multiple primary and secondary sources.

(3) Document research sources using a given format.

(4) Record information using a variety of note-taking and organizational strategies.

(5) Organize and present research findings using appropriate multimedia.

HIGH SCHOOL

Required Course of Study

By the end of the grade twelve, students know and are able to do everything required in the previous grades for courses in English Language Arts offered in public schools and must include instruction designed to have students meet the following performance standards by the completion of grade twelve:

1. For the area of reading:

(a) Students know and use word analysis skills and strategies to comprehend new words encountered in text.

(1) Apply knowledge of Anglo Saxon, Greek, and Latin roots adequately to determine the meanings of unknown words across the curriculum.

(2) Interpret the meanings of familiar literary allusions to comprehend text.

(3) Discern connotative differences between closely related words.

(b) Students use reading process skills and strategies to build comprehension.

(1) Independently apply pre-reading strategies.

(2) Monitor comprehension during reading and applies repair strategies when necessary.

(c) Students read to comprehend, interpret, and evaluate literature from a variety of authors, cultures, and times.

(1) Interpret themes in literature and defend the interpretation with textual evidence and/or application of historical and cultural contexts.

(2) Determine authors' purposes through analysis of authors' choices of genre and stylistic devices such as imagery, figurative language, and irony.

(d) Students read to comprehend, interpret, and evaluate informational texts for specific purposes.

(1) Determine authors' purposes in informational texts and public documents through analysis of text features, rhetorical strategies, and historical and cultural contexts.

(2) Locate, organize, interpret, and synthesize information in multiple primary and secondary sources to support ideas and positions.

(3) Read and apply multistep directions to perform complex procedures and tasks.

2. For the area of writing:

(a) Students write a variety of texts that inform, persuade, describe, evaluate, or tell a story and are appropriate to purpose and audience.

(1) Write research papers that adequately develop theses, use appropriate sources, and conform to a style manual.

(2) Produce subject-specific technical writing such as clear instructional manuals or field reports.

(3) Summarize large amounts of information into concise prose.

(4) Write narrative and reflective text that connects personal events to larger issues.

(5) Write responses to literature that reflect an understanding of literary elements.

(6) Write persuasive essays that support, clarify, and defend positions with relevant evidence.

(b) Students write with a clear focus and logical development, evaluating, revising, and editing for organization, style, tone, and word choice.

(1) Generate ideas for writing by selecting appropriate pre-writing strategies with attention to audience and purpose.

(2) Organize ideas by selecting and applying structures appropriate to purpose, such as cause/effect and comparison/contrast.

(3) Write compositions that develop complex ideas in a clear, detailed, and focused manner.

(4) Revise writing to improve idea development, word choice, organization, and point of view, using given criteria such as rubrics or feedback from others.

(5) Edit for use of standard English.

(c) Students write using standard English grammar, usage, punctuation, capitalization, and spelling.

(1) Apply the rules of usage, grammar, and capitalization.

(2) Use a variety of sentence structures, such as coordination and subordination, with attention to varying sentence length.

(3) Correctly use rules of punctuation; may occasionally manipulate the rules for emphasis in writing.

3. For the Areas of Listening & Speaking

(a) Students listen to and evaluate oral communications for content, style, speaker's purpose, and audience appropriateness.

(1) Summarize and evaluate oral communications according to speaker's purpose.

(2) Create and apply criteria for evaluating content and delivery of oral and multi-media presentations.

(3) Apply knowledge of the effects of language and dialect on audience response.

(b) Students speak using organization, style, tone, voice, and media aids appropriate to audience and purpose.

(1) Make planned speeches, which may be enhanced by multimedia, using language and public speaking techniques appropriate to audience and purpose.

(2) Deliver extemporaneous and impromptu presentations that address a particular topic and engage the audience.

(c) Students participate in discussions to offer information, clarify ideas, and support a

position.

(1) Participate in conversations or group discussions by identifying, synthesizing, and evaluating data in order to solve problems or propose possible options.

(2) Attend to issues that facilitate group productivity, such as adhering to time limits for speakers and deadlines for decision-making.

(3) Justify a position using logic and refuting opposing viewpoints.

4. For the Area of Research

(a) Formulate research questions, use a variety of sources to obtain information, weigh the evidence, draw valid conclusions, and present findings.

(1) Formulate focused research questions and use appropriate research designs to gather information.

(2) Evaluate possible sources of information for credibility and usefulness.

(3) Cite sources of information using a standard method of documentation.

(4) Organize and present findings in a multimedia format.

PERFORMANCE STANDARDS FOR MATHEMATICS

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

KINDERGARTEN AND ELEMENTARY SCHOOL

Instruction Through Second Grade

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

1. For the content areas of Numbers, Number Sense, and Computation:

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will accurately calculate and use estimation techniques, number relationships, operation rules, and algorithms; they will determine the reasonableness of answers and the accuracy of solutions.

(1) Identify and model basic addition facts (sums to 18) and the corresponding subtraction facts and immediately recall the addition facts with sums through 10 and the corresponding subtraction facts.

(2) Add and subtract multi-place numbers without regrouping.

(3) Generate, write, and solve one step addition and subtraction problems based on practical situations.

(4) Use decimals to show money amounts.

(5) Use the patterns in numbers to skip count by 2s, 3s, 5s, and 10s to 100 and beyond.

(6) Read and write numerals and order and compare numbers from 0-999.

(7) Estimate, with reasonable results, the number of objects in a set to 20.

(8) Read and write number words through 20 and use, model, and identify the ordinal positions first through the twentieth.

(9) Use, model, and identify the place value positions of 1s, 10s, and 100s.

(10) Identify, model, and label 1/2 and 1/4 as parts of a whole.

2. For the content areas of Patterns, Functions, and Algebra

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic relations as modeled in practical situations.

(1) Recognize, describe, extend, create, and use repeating and increasing patterns using symbols, objects, and manipulatives to solve problems.

(2) Use variables and open sentences to express relationships.

(3) Create, model, explain, and solve problems using addition and subtraction.

3. For the content area of Measurement:

(a) To solve problems, communicate, reason and make connections within and beyond the field of mathematics, students will use appropriate tools and techniques of measurement to determine, estimate, record, and verify direct and indirect measurements.

(1) Compare and order objects by various measurable attributes, such as time, temperature, length, weight, capacity, volume, and area and describe and define these various attributes.

(2) Compare objects that are greater than, less than, and /or equal to a given unit of measure such as inch, yard, centimeter, and meter.

(3) Determine the value of any given set of coins and bills.

(4) Recite and use the months of the year in order and use a calendar to identify days, weeks, months, and year.

(5) Read time to the nearest quarter hour and distinguish between A.M. and P.M.

4. For the content areas of Spatial Relationships and Geometry

(a) To solve problems, communicate, and make connections within and beyond the field of mathematics, students will identify, represent, verify, and apply spatial relationships and geometric properties.

(1) Identify, name, sort, sketch, describe, and compare circles, triangles, and rectangles including squares, regardless of position.

(2) Describe the location of objects and place objects in position using vocabulary such as before, far, below, and left.

(3) Compare the size of similar two-dimensional figures and identify shapes that are congruent.

(4) Identify symmetry in figures in the environment and create figures and designs that have a line of symmetry.

(5) Identify, name, sort, describe, compare, and contrast two- and three-dimensional figures.

5. For the content area of Data Analysis:

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections.

(1) Collect, organize, record, and explain classification of data using concrete materials.

6. For the process area of Problem Solving:

(a) Students will develop their ability to solve problems by engaging in developmentally appropriate problem solving opportunities in which there is a need to use various approaches to investigate and understand mathematical concepts in order to: formulate their own problems; find solutions to problems from everyday situations; develop and apply strategies to solve a wide variety of problems; and integrate mathematical reasoning, communication and connections.

(1) Use efficient approaches to investigate and understand mathematical concepts. Formulate problems.

(2) Find solutions to problems that occur in everyday situations.

(3) Select, modify, develop, and apply strategies to solve a wide variety of problems.

(4) Transfer and generalize previous experience to new problem solving situations.

(5) Demonstrate persistence in problem solving.

(6) Explain and verify results.

(7) Use technology as a tool in problem solving.

7. For the process area of Mathematical Communication:

(a) Students will develop their ability to communicate mathematically by solving problems in which there is a need to obtain information from the real world through reading,, listening, and observing in order to: translate this information into a mathematical language and symbols; process this information mathematically; and present results in written, oral and visual formats.

(1) Obtain information from the real world through reading, listening, observing, and inquiring and use this information to solve mathematical problems.

(2) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language.

(3) Present mathematical ideas and solutions in written, oral, and visual forms.

(4(Discuss, explain, justify, and evaluate mathematical ideas and solutions.

(5) Use physical, pictorial, and symbolic forms to represent mathematical ideas and relationships.

(6) Make conjectures, present arguments, and evaluate discussions regarding mathematical ideas presented in various forms including written and oral.

8. For the process area of Mathematical Reasoning:

(a) Student will develop their ability to reason mathematically by solving problems in which there is a need to investigate significant mathematical ideas and construct their own learning in all content areas in order to justify their thinking; reinforce and extend their logical reasoning abilities; reflect on and clarify their own thinking; and ask questions to extend their thinking.

(1) Construct meaning and justify thinking by investigating mathematical ideas, patterns, and relationships.

(2) Reinforce and extend logical reasoning abilities.

(3) Ask questions to reflect on, clarify, and extend thinking.

(4) Review, refine, explain, and justify mathematical processes, arguments and solutions using manipulatives, physical models, and abstract ideas.

(5) Determine relevant and/or sufficient information to solve mathematical problems.

(6) Follow, create, and defend valid logical mathematical arguments.

(7) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.

9. For the process area of Mathematical Connections:

(a) Students will develop the ability to make mathematical connections by solving problems in which there is a need to view mathematics as an integrated whole, identifying relationships between context strands, and integrating mathematics with other disciplines, allowing the flexibility to approach problems in a variety of ways within and beyond the field of mathematics.

(1) View mathematics as an integrated whole and identify relationships between content strands.

(2) Identify practical applications of mathematical principles that can be applied to other disciplines.

(3) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems.

(4) Link new concepts to prior knowledge.

(5) Explain the relationship of concepts to procedures using models.

(6) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.

Instruction Through Third Grade

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

1. For the content areas of Numbers, Number Sense, and Computation:

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will accurately calculate and use estimation techniques, number relationships, operation rules, and algorithms; they will determine the reasonableness of answers and the accuracy of solutions.

(1) Immediately recall and use addition and subtraction facts and multiplication facts with products through 81.

(2) Add and subtract multi-place numbers with regrouping.

(3) Use pencil and paper, mental computation, and estimation to generate and solve two-step addition and subtraction problems based on practical situations.

(4) Generate and solve one-step multiplication problems based on practical situations using paper and pencil, mental computation, and estimation.

(5) Add and subtract decimals that represent money amounts.

(6) Use addition to model and explain multiplication.

(7) Read and write numerals and compare and order numbers from 0-9,999.

(8) Determine the reasonableness of answers by rounding to the nearest ten and hundred.

(9) Use, model, and identify place value positions through 10,000.

(10) Model, sketch, and label fractions with denominators to 10.

(11) Write commonly used fractions using both numerals and number words.

2. For the content areas of Patterns, Functions, and Algebra

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic relations as modeled in practical situations.

(1) Recognize, describe, extend, and create repeating and increasing patterns using numbers; use number patterns and their extensions to solve problems.

(2) Identify missing symbols (+, -, >, <, =) and missing numbers in open number sentences involving number facts in addition and subtraction.

3. For the content area of Measurement:

(a) To solve problems, communicate, reason and make connections within and beyond the field of mathematics, students will use appropriate tools and techniques of measurement to determine, estimate, record, and verify direct and indirect measurements.

(1) Measure to a required degree of accuracy, record the measurement, and evaluate it for error, describing the appropriateness of selected units of measure.

(2) Estimate measurements and use measuring devices with standard and non-standard units to measure length, area of a region, liquid volume, capacity, temperature, and weight, communicating the concepts of more, less, and equivalent.

(3) Read, write, and use money notation and determine possible combinations of coins and bills to equal given amounts.

(4) Read time to the nearest minute using analog and digital clocks and determine elapsed time.

4. For the content areas of Spatial Relationships and Geometry

(a) To solve problems, communicate, and make connections within and beyond the field of mathematics, students will identify, represent, verify, and apply spatial relationships and geometric properties.

(1) Describe, sketch, compare, and contrast plane geometric figures.

(2) Demonstrate and describe the transformation (motion) of a geometric figure as a slide, rotation, or a flip.

(3) Describe, sketch, model, build, compare, and contrast two- and three-dimensional geometric figures

5. For the content area of Data Analysis:

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections.

(1) Collect, organize, display, and describe simple data using number lines, pictographs, bar graphs, and frequency tables, by hand and with computers when they are available.

(2) Use concepts of probability such as impossible, unlikely, likely, and certain to make predictions about future events.

6. For the process area of Problem Solving:

(a) Students will develop their ability to solve problems by engaging in developmentally appropriate problem solving opportunities in which there is a need to use various approaches to investigate and understand mathematical concepts in order to: formulate their own problems; find solutions to problems from everyday situations; develop and apply strategies to solve a wide variety of problems; and integrate mathematical reasoning, communication and connections.

(1) Use efficient approaches to investigate and understand mathematical concepts. Formulate problems.

(2) Find solutions to problems that occur in everyday situations.

(3) Select, modify, develop, and apply strategies to solve a wide variety of problems.

(4) Transfer and generalize previous experience to new problem solving situations.

(5) Demonstrate persistence in problem solving.

(6) Explain and verify results.

(7) Use technology as a tool in problem solving.

7. For the process area of Mathematical Communication:

(a) Students will develop their ability to communicate mathematically by solving problems in which there is a need to obtain information from the real world through reading,, listening, and observing in order to: translate this information into a mathematical language and symbols; process this information mathematically; and present results in written, oral and visual formats.

(1) Obtain information from the real world through reading, listening, observing, and inquiring and use this information to solve mathematical problems.

(2) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language.

(3) Present mathematical ideas and solutions in written, oral, and visual forms.

(4(Discuss, explain, justify, and evaluate mathematical ideas and solutions.

(5) Use physical, pictorial, and symbolic forms to represent mathematical ideas and relationships.

(6) Make conjectures, present arguments, and evaluate discussions regarding mathematical ideas presented in various forms including written and oral.

8. For the process area of Mathematical Reasoning:

(a) Student will develop their ability to reason mathematically by solving problems in which there is a need to investigate significant mathematical ideas and construct their own learning in all content areas in order to justify their thinking; reinforce and extend their logical reasoning abilities; reflect on and clarify their own thinking; and ask questions to extend their thinking.

(1) Construct meaning and justify thinking by investigating mathematical ideas, patterns, and relationships.

(2) Reinforce and extend logical reasoning abilities.

(3) Ask questions to reflect on, clarify, and extend thinking.

(4) Review, refine, explain, and justify mathematical processes, arguments and solutions using manipulatives, physical models, and abstract ideas.

(5) Determine relevant and/or sufficient information to solve mathematical problems.

(6) Follow, create, and defend valid logical mathematical arguments.

(7) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.

9. For the process area of Mathematical Connections:

(a) Students will develop the ability to make mathematical connections by solving problems in which there is a need to view mathematics as an integrated whole, identifying relationships between context strands, and integrating mathematics with other disciplines, allowing the

flexibility to approach problems in a variety of ways within and beyond the field of mathematics.

(1) View mathematics as an integrated whole and identify relationships between content strands.

(2) Identify practical applications of mathematical principles that can be applied to other disciplines.

(3) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems.

(4) Link new concepts to prior knowledge.

(5) Explain the relationship of concepts to procedures using models.

(6) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.

Instruction Through Fifth Grade

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

1. For the content areas of Numbers, Number Sense, and Computation:

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will accurately calculate and use estimation techniques, number relationships, operation rules, and algorithms; they will determine the reasonableness of answers and the accuracy of solutions.

(1) Immediately recall and use multiplication and corresponding division facts using factors of 0 through 12.

(2) Multiply and divide multi-place numbers by two-digit numbers including multiples of 10.

(3) Generate and solve addition, subtraction, multiplication, and division problems involving whole numbers and order of operations in practical situations.

(4) Compare and order negative numbers within the context of practical situations and plot integer values on a number line.

(5) Estimate to determine the reasonableness of answer by identifying and using the correct place value position.

(6) Model, draw, identify, compare, add, and subtract decimals and fractions with like denominators to solve problems.

2. For the content areas of Patterns, Functions, and Algebra

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic relations as modeled in practical situations.

(1) Identify, describe, and explain number patterns and relationships, including triangular numbers, perfect squares, arithmetic and geometric sequences, using concrete materials, paper and pencil, and calculators.

(2) Use variables in open sentences to describe simple functions and relationships.

(3) Solve simple whole numbers equations and inequalities using a variety of methods.

(4) Generate number sequences given the first term of the sequence and any simple computation rule.

3. For the content area of Measurement:

(a) To solve problems, communicate, reason and make connections within and beyond the field of mathematics, students will use appropriate tools and techniques of measurement to determine, estimate, record, and verify direct and indirect measurements.

(1) Measure, compare, and convert units of length, within the same measurement system, to the nearest fractional/decimal part.

(2) Estimate and directly measure length, volume, capacity, and quantity.

(3) Select and justify the use of estimation or direct measurement and weight in a given situation.

(4) Determine the total cost of purchases and the amount of change in practical situations.

(5) Describe the difference between perimeter and area and determine the perimeter of any polygon and the area of right triangles and rectangles, including squares.

(6) Identify equivalent periods of time using relationships between and among seconds, minutes, hours, days, months, and years.

4. For the content areas of Spatial Relationships and Geometry

(a) To solve problems, communicate, and make connections within and beyond the field of mathematics, students will identify, represent, verify, and apply spatial relationships and geometric properties.

(1) Draw and classify angles and triangles as right, acute, or obtuse.

(2) Identify and draw circles and elements of circles, describing the relationships between the various elements.

(3) Identify a transformation as translation, rotation, reflection, enlargement, or reduction.

(4) Identify shapes that have congruence, similarity, and/or symmetry using a variety of methods, including transformational motions and models, drawings, and measurement tools.

(5) Graph ordered pairs and identify coordinates for a given point in the first quadrant.

(6) Identify, describe, compare and classify two- and three-dimensional figures by their properties including the number of vertices, and edges and the number and shape of the faces.

(7) Identify, describe, classify and draw one- and two-dimensional geometric figures including intersecting, perpendicular and parallel lines, line segments, rays, and angles with given measurements.

5. For the content area of Data Analysis:

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections.

(1) Collect, organize, read, and interpret data using graphic representations including tables, line plots, stem and leaf plots, scatter plots, and histograms.

(2) Use data and graphs to formulate and explain conclusions and predictions with and without technology.

(3) Conduct simple probability experiments using concrete materials and represent the results in fractional form.

(4) Solve probability problems using a variety of methods including constructing sample spaces and tree diagrams.

(5) Model and compute measures of central tendency including mean, median, and mode.

(6) Describe the limitations of various graph formats and select a type of graph to accurately represent the given data; justify the selection.

6. For the process area of Problem Solving:

(a) Students will develop their ability to solve problems by engaging in developmentally appropriate problem solving opportunities in which there is a need to use various approaches to investigate and understand mathematical concepts in order to: formulate their own problems; find solutions to problems from everyday situations; develop and apply strategies to solve a wide variety of problems; and integrate mathematical reasoning, communication and connections.

(1) Use efficient approaches to investigate and understand mathematical concepts. Formulate problems.

(2) Find solutions to problems that occur in everyday situations.

(3) Select, modify, develop, and apply strategies to solve a wide variety of problems.

(4) Transfer and generalize previous experience to new problem solving situations.

(5) Demonstrate persistence in problem solving.

(6) Explain and verify results.

(7) Use technology as a tool in problem solving.

7. For the process area of Mathematical Communication:

(a) Students will develop their ability to communicate mathematically by solving problems in which there is a need to obtain information from the real world through reading,, listening, and observing in order to: translate this information into a mathematical language and symbols; process this information mathematically; and present results in written, oral and visual formats.

(1) Obtain information from the real world through reading, listening, observing, and inquiring and use this information to solve mathematical problems.

(2) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language.

(3) Present mathematical ideas and solutions in written, oral, and visual forms.

(4(Discuss, explain, justify, and evaluate mathematical ideas and solutions.

(5) Use physical, pictorial, and symbolic forms to represent mathematical ideas and relationships.

(6) Make conjectures, present arguments, and evaluate discussions regarding mathematical ideas presented in various forms including written and oral.

8. For the process area of Mathematical Reasoning:

(a) Student will develop their ability to reason mathematically by solving problems in which there is a need to investigate significant mathematical ideas and construct their own learning in all content areas in order to justify their thinking; reinforce and extend their logical reasoning abilities; reflect on and clarify their own thinking; and ask questions to extend their thinking.

(1) Construct meaning and justify thinking by investigating mathematical ideas, patterns, and relationships.

(2) Reinforce and extend logical reasoning abilities.

(3) Ask questions to reflect on, clarify, and extend thinking.

(4) Review, refine, explain, and justify mathematical processes, arguments and solutions using manipulatives, physical models, and abstract ideas.

(5) Determine relevant and/or sufficient information to solve mathematical problems.

(6) Follow, create, and defend valid logical mathematical arguments.

(7) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.

9. For the process area of Mathematical Connections:

(a) Students will develop the ability to make mathematical connections by solving problems in which there is a need to view mathematics as an integrated whole, identifying relationships between context strands, and integrating mathematics with other disciplines, allowing the flexibility to approach problems in a variety of ways within and beyond the field of mathematics.

(1) View mathematics as an integrated whole and identify relationships between content strands.

(2) Identify practical applications of mathematical principles that can be applied to other disciplines.

(3) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems.

(4) Link new concepts to prior knowledge.

(5) Explain the relationship of concepts to procedures using models.

(6) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.

Instruction Through Eighth Grade

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

1. For the content areas of Numbers, Number Sense, and Computation:

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will accurately calculate and use estimation techniques, number relationships, operation rules, and algorithms; they will determine the reasonableness of answers and the accuracy of solutions.

(1) Read, write, apply, and compute with real numbers in various forms including radicals, exponentials, and scientific notation.

(2) Determine, write, and use ratios and proportions to solve problems.

(3) Explain and use concepts of number theory such as factors and multiples, and properties of real numbers such as the commutative property and associative property, to solve problems.

(4) Explain and use properties of real numbers such as the associative, commutative, and distributive properties and order of operations to solve problems.

(5) Estimate in problem solving situations and practical applications to determine the reasonableness of answers and verify the results.

(6) Explain the relationship among fractions, decimals, and percents and translate among representations.

2. For the content areas of Patterns, Functions, and Algebra

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic relations as modeled in practical situations.

(1) Use inductive reasoning to find a missing term in numeric, arithmetic, and geometric sequences and to generalize basic patterns to the nth term, with and without calculators.

(2) Identify, describe, model, and evaluate relationships including patterns, sequences, and functions using oral, written, and symbolic language, with and without technology.

(3) Solve an equation or a formula for any variable.

(4) Describe how a change in one variable of a mathematical relationship affects the remaining variables using various tools and methods.

(5) Model, identify, and solve simple linear equations and inequalities and relate that process to the order of operations, using formal and informal methods.

(6) Add and subtract binomials describing the connection between the algebraic process and the arithmetic process.

3. For the content area of Measurement:

(a) To solve problems, communicate, reason and make connections within and beyond the field of mathematics, students will use appropriate tools and techniques of measurement to determine, estimate, record, and verify direct and indirect measurements.

(1) Compare and convert units of measure for length, weight/mass, and volume within the same measurement system (customary or metric); estimate conversions between like units of the two systems to solve problems.

(2) Identify the range of precision, error of measure, and tolerance in measurement when using the appropriate measurement tool and measuring to the required degree of accuracy.

(3) Estimate and measure length, weight/mass, and volume to the required degree of accuracy.

(4) Derive and apply formulas to find perimeter, circumference, and area of plane figures and volume and surface area of solid figures; identify the relationship between changes in area and volume and changes in linear measures of figures.

(5) Evaluate formulas and algebraic expressions for given values of a variable.

(6) Apply ratio and proportion to calculate rates and as a method of indirect measure.

4. For the content areas of Spatial Relationships and Geometry

(a) To solve problems, communicate, and make connections within and beyond the field of mathematics, students will identify, represent, verify, and apply spatial relationships and geometric properties.

(1) Identify, classify, compare, and draw regular and irregular polygons, given specifications; determine the sum of the interior angles of convex polygons.

(2) Apply the properties of equality and proportionally to solve problems involving congruent or similar shapes.

(3) Use coordinate geometry and models to illustrate change in scale and other geometric transformations.

(4) Create a model of a three-dimensional figure from two-dimensional drawings and make a two-dimensional drawing of a three-dimensional object.

(5) Represent and interpret relationships defined by equations and formulas (including distance, midpoint, and slope) on a coordinate plane with and without technology.

(6) Form generalizations and validate conclusions about properties of geometric shapes including those associated with parallel lines, perpendicular lines, bisectors, triangles, and quadrilaterals.

(7) Verify, explain and use both the Pythagorean Theorem and the Triangle Sum Theorem to determine missing sides and angles of triangles.

(8) Construct, draw, and sketch geometric figures, bisected angles and lines and line segments with given specifications, using hand tools and technology.

5. For the content area of Data Analysis:

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections.

(1) Organize, display, read, and analyze data, with and without technology, using a variety of displays including circle graphs, frequency distributions, and box and whisker plots.

(2) Determine the theoretical probability of a simple or independent event using different counting methods including tree diagrams, sample spaces, and organized lists and compare those results with the results of doing the experiment.

(3) Differentiate between the probability of an event and the odds of an event.

(4) Identify the number of combinations possible in given situations using a variety of counting methods.

(5) Evaluate arguments based on data analysis for accuracy and validity and analyze the effect a change of scale or a change of format will have on statistical charts and graphs.

(6) Formulate inferences and projections based on interpolations and extrapolations of data to solve problems.

6. For the process area of Problem Solving:

(a) Students will develop their ability to solve problems by engaging in developmentally appropriate problem solving opportunities in which there is a need to use various approaches to investigate and understand mathematical concepts in order to: formulate their own problems; find solutions to problems from everyday situations; develop and apply strategies to solve a wide variety of problems; and integrate mathematical reasoning, communication and connections.

(1) Use efficient approaches to investigate and understand mathematical concepts. Formulate problems.

(2) Find solutions to problems that occur in everyday situations.

(3) Select, modify, develop, and apply strategies to solve a wide variety of problems.

(4) Transfer and generalize previous experience to new problem solving situations.

(5) Demonstrate persistence in problem solving.

(6) Explain and verify results.

(7) Use technology as a tool in problem solving.

7. For the process area of Mathematical Communication:

(a) Students will develop their ability to communicate mathematically by solving problems in which there is a need to obtain information from the real world through reading,, listening, and observing in order to: translate this information into a mathematical language and symbols; process this information mathematically; and present results in written, oral and visual formats.

(1) Obtain information from the real world through reading, listening, observing, and inquiring and use this information to solve mathematical problems.

(2) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language.

(3) Present mathematical ideas and solutions in written, oral, and visual forms.

(4(Discuss, explain, justify, and evaluate mathematical ideas and solutions.

(5) Use physical, pictorial, and symbolic forms to represent mathematical ideas and relationships.

(6) Make conjectures, present arguments, and evaluate discussions regarding mathematical ideas presented in various forms including written and oral.

8. For the process area of Mathematical Reasoning:

(a) Student will develop their ability to reason mathematically by solving problems in which there is a need to investigate significant mathematical ideas and construct their own learning in all content areas in order to justify their thinking; reinforce and extend their logical reasoning abilities; reflect on and clarify their own thinking; and ask questions to extend their thinking.

(1) Construct meaning and justify thinking by investigating mathematical ideas, patterns, and relationships.

(2) Reinforce and extend logical reasoning abilities.

(3) Ask questions to reflect on, clarify, and extend thinking.

(4) Review, refine, explain, and justify mathematical processes, arguments and solutions using manipulatives, physical models, and abstract ideas.

(5) Determine relevant and/or sufficient information to solve mathematical problems.

(6) Follow, create, and defend valid logical mathematical arguments.

(7) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.

9. For the process area of Mathematical Connections:

(a) Students will develop the ability to make mathematical connections by solving problems in which there is a need to view mathematics as an integrated whole, identifying relationships between context strands, and integrating mathematics with other disciplines, allowing the flexibility to approach problems in a variety of ways within and beyond the field of mathematics.

(1) View mathematics as an integrated whole and identify relationships between content strands.

(2) Identify practical applications of mathematical principles that can be applied to other disciplines.

(3) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems.

(4) Link new concepts to prior knowledge.

(5) Explain the relationship of concepts to procedures using models.

(6) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.

HIGH SCHOOL

Required Course of Study

By the end of grade 12, students know and are able to do everything required in the previous grades for courses in mathematics offered in public schools and must include instruction designed to have students meet the following performance standards by the completion of grade 12:

1. For the content areas of Numbers, Number Sense, and Computation:

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will accurately calculate and use estimation techniques, number relationships, operation rules, and algorithms; they will determine the reasonableness of answers and the accuracy of solutions.

(1) Calculate and estimate sums, differences, products, quotients, powers, and roots, applying formulas and algorithms.

(2) Apply the laws of exponents to perform operations on expressions with integral exponents and scientific notation.

(3) Apply properties and theories of the real number system to practical situations.

(4) Add, subtract, and scalar multiply matrices.

2. For the content areas of Patterns, Functions, and Algebra

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic relations as modeled in practical situations.

(1) Represent, analyze, and solve problem situations using discrete models, including graphs and matrices, with and without technology.

(2) Create and use different forms of a variety of equations, proportions, and/or formulas, solving for the needed variable as necessary in given situations.

(3) Add, subtract and multiply polynomials, factor 1st and 2nd degree polynomials, and describe the process and connection between the algebraic process and arithmetic process.

(4) Use simple quadratic equations with integer roots to solve practical and mathematical problems.

(5) Model practical situations mathematically and translate a practical problem into a variety of mathematical forms including matrices and tabular, symbolic, and graphical representations of functions, with and without technology.

(6) Determine the domain and the range of linear relations given a graph or a set of ordered pairs and explain the importance of the domain and range in problem solving situations.

(7) Solve systems of two linear equations algebraically and graphically, using graphing calculators as a primary problem-solving tool and to verify solutions found by other methods.

3. For the content area of Measurement:

(a) To solve problems, communicate, reason and make connections within and beyond the field of mathematics, students will use appropriate tools and techniques of measurement to determine, estimate, record, and verify direct and indirect measurements.

(1) Distinguish, differentiate, and convert units of measure among and between customary and metric systems and between monetary systems.

(2) Select and use measurement tools, techniques, and formulas to calculate and compare rates, costs, distances, interests, temperatures, and weights/masses.

(3) Justify and communicate the differences between accuracy, precision, error of measure, and tolerance in measurement and describe how each of these can affect solutions found in problem situations.

(4) Use and interpret consumer data such as amortization tables, tax tables, and compound interest charts to make informed financial decisions related to practical applications such as budget.

(5) Use relationships and formulas to determine the measurement of unknown dimensions, angles, areas, and volumes to solve problems.

4. For the content areas of Spatial Relationships and Geometry

(a) To solve problems, communicate, and make connections within and beyond the field of mathematics, students will identify, represent, verify, and apply spatial relationships and geometric properties.

(1) Identify and use the properties of polygons, including determining measures of interior and exterior angles, and elements of circles to solve practical problems.

(2) Use coordinate geometry to graph linear equations, determine slopes of lines, identify parallel and perpendicular lines, and find possible solutions to sets of linear equations.

(3) Use algebraic techniques to solve problems involving geometric relationships.

(4) Use complementary and supplementary angles, congruent angles, vertical angles, angles formed when parallel lines are cut by a transversal, and angles in polygons to solve practical problems.

(5) Apply the Pythagorean Theorem, its converse, properties of special right triangles, and right triangle trigonometry (sine, cosine, and tangent) to solve practical problems.

(6) Use tools, technology, and models to sketch, draw, and construct geometric figures in order to solve problems and to demonstrate the properties of geometric figures.

(7) Construct, justify, and defend mathematical conclusions using logical, sequential, and deductive reasoning supported by established mathematical principles.

5. For the content area of Data Analysis:

(a) To solve problems, communicate, reason, and make connections within and beyond the field of mathematics, students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections.

(1) Use calculators and computers to create and manipulate tables, graphs, and matrices to communicate statistical information.

(2) Use the shape of graphs of normal distributions to compare and analyze information.

(3) Design, conduct, analyze, and communicate the results of multi-stage probability and statistical experiments.

(4) Identify a probability situation as a permutation or a combination and find the number of possible outcomes, with and without graphing calculators.

(5) Select and use the measures of central tendency such as mean, median, and mode that are appropriate for given situations.

(6) Select and use measures of dispersion including range, distribution, and possible outliers that are appropriate for given situations.

(7) Analyze the validity of statistical conclusions noting various sources of bias and misuse and abuse of data caused by a variety of factors.

6. For the process area of Problem Solving:

(a) Students will develop their ability to solve problems by engaging in developmentally appropriate problem solving opportunities in which there is a need to use various approaches to investigate and understand mathematical concepts in order to: formulate their own problems; find solutions to problems from everyday situations; develop and apply strategies to solve a wide variety of problems; and integrate mathematical reasoning, communication and connections.

(1) Use efficient approaches to investigate and understand mathematical concepts. Formulate problems.

(2) Find solutions to problems that occur in everyday situations.

(3) Select, modify, develop, and apply strategies to solve a wide variety of problems.

(4) Transfer and generalize previous experience to new problem solving situations.

(5) Demonstrate persistence in problem solving.

(6) Explain and verify results.

(7) Use technology as a tool in problem solving.

7. For the process area of Mathematical Communication:

(a) Students will develop their ability to communicate mathematically by solving problems in which there is a need to obtain information from the real world through reading,, listening, and observing in order to: translate this information into a mathematical language and symbols; process this information mathematically; and present results in written, oral and visual formats.

(1) Obtain information from the real world through reading, listening, observing, and inquiring and use this information to solve mathematical problems.

(2) Use mathematical language and symbols to explain thinking and processes and translate those ideas into everyday language.

(3) Present mathematical ideas and solutions in written, oral, and visual forms.

(4(Discuss, explain, justify, and evaluate mathematical ideas and solutions.

(5) Use physical, pictorial, and symbolic forms to represent mathematical ideas and relationships.

(6) Make conjectures, present arguments, and evaluate discussions regarding mathematical ideas presented in various forms including written and oral.

8. For the process area of Mathematical Reasoning:

(a) Student will develop their ability to reason mathematically by solving problems in which there is a need to investigate significant mathematical ideas and construct their own learning in all content areas in order to justify their thinking; reinforce and extend their logical reasoning abilities; reflect on and clarify their own thinking; and ask questions to extend their thinking.

(1) Construct meaning and justify thinking by investigating mathematical ideas, patterns, and relationships.

(2) Reinforce and extend logical reasoning abilities.

(3) Ask questions to reflect on, clarify, and extend thinking.

(4) Review, refine, explain, and justify mathematical processes, arguments and solutions using manipulatives, physical models, and abstract ideas.

(5) Determine relevant and/or sufficient information to solve mathematical problems.

(6) Follow, create, and defend valid logical mathematical arguments.

(7) Recognize and apply inductive and deductive reasoning in both concrete and abstract contexts.

9. For the process area of Mathematical Connections:

(a) Students will develop the ability to make mathematical connections by solving problems in which there is a need to view mathematics as an integrated whole, identifying relationships between context strands, and integrating mathematics with other disciplines, allowing the flexibility to approach problems in a variety of ways within and beyond the field of mathematics.

(1) View mathematics as an integrated whole and identify relationships between content strands.

(2) Identify practical applications of mathematical principles that can be applied to other disciplines.

(3) Use and analyze the connections within and beyond the field of mathematics in a variety of ways to solve problems.

(4) Link new concepts to prior knowledge.

(5) Explain the relationship of concepts to procedures using models.

(6) Apply mathematical thinking and modeling to solve problems that arise in other disciplines and in everyday life.

PERFORMANCE STANDARDS FOR SCIENCE

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

KINDERGARTEN AND ELEMENTARY SCHOOL

Instruction Through Second Grade

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

1. For the areas of Physical Science:

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

(1) Demonstrate or model objects moving at different speeds (e.g., car speeds up or slows down, one person runs faster than another).

(2) Using a model or pattern, demonstrate independently putting together and taking apart a structure (e.g., interlocking block tower, erector set crane, pattern block picture).

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

(1) Sort and describe objects in terms of some observable properties (e.g., color, shape, size, texture).

(2) Independently form large objects from smaller objects (e.g., put together a puzzle or quilt).

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

(1) Describe a variety of objects as being cold, cool, warm, or hot; describe the temperatures of similar objects in different outdoor locations and explain that heat from the sun warms the objects.

(2) Describe an object before and after change of state in terms of observable properties.

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

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

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

2. For the area of Life Science:

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

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

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

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

(1) Can explain that germs cause some diseases and may be spread by people who have them, explain that washing one's hands thoroughly with soap and water reduces the number of germs and their spread.

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

(1) Describe, using common examples, that animals produce offspring that are like themselves (e.g., dogs produce puppies, not kittens).

(2) Sort a group of living things and describe how some living things have similar observable characteristics (e.g., give rational justification of the sort).

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

3. For the areas of Earth and Space Sciences:

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

(1) Group rock samples according to a single attribute of shape, size, color, texture, or patterns of color or shading, and justify the reasons for their grouping.

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

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

(1) Observe and describe changes that take place in nature (e.g., weather, seasons, day and night).

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

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

(2) Observe and describe how weather changes (including temperature, cloudiness, precipitation) from day to day and throughout the year.

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

(1) Identify, from drawings or photographs, the sun, the moon, and stars; identify, from drawings, photographs, or verbal prompts, that the Earth is a planet.

(2) Describe the movement of the sun across the sky, and tell that the moon appears in different places at different times.

4. For the area of Environmental Sciences

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

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

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

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

(1) Demonstrate how some resources can be used and reused (e.g., use waste paper to make new paper, recycle glass).

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

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

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

(2) Illustrate how some things change in their daily lives and some things stay the same.

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

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

(1) Generate an idea or invention with prompting, and provide some examples of thinkers and inventors from around the world.

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

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

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

(1) Make qualitative observations and provide pictorial or word descriptions of objects or phenomenon.

(2) Record observations of investigations over time in a notebook or journal with minimal assistance (e.g., growth of a plant, changes in weather, insect growth and development).

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

(1) Generally follow verbal and written instructions accurately.

(2) Generally produce simple pictographs to describe observations.

(3) Cooperate and contribute ideas within a group.

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

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

(1) Generally use mental computation to make rough estimates (e.g., simple addition and subtraction problems).

(2) Adequately identify unexpected or unusual results in activities, when counting or measuring using non-standard units (e.g., measuring classroom chairs with "handspans" and with rulers).

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

(1) Generally keep accurate records of observations and measurements taken over time (e.g., plant growth, metamorphosis, evaporation, weather conditions).

Instruction Through Third Grade

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

1. For the areas of Physical Science:

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

(1) Demonstrate that a given push or pull (hard or soft) causes an object to change its speed (faster or slower) and/or direction.

(2) Predict whether or not an object will topple or balance.

(3) Effectively manipulate simple tools (e.g., hammer and nails, screwdriver and screws, nuts and bolts) and demonstrate when to use specific tools.

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

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

(2) Sort objects on the basis of two or more observable characteristics or attributes (e.g., dimensions, coloration, symmetry, parts, state of matter) using Venn diagrams or other schemes; identify or create a classification system from observing objects that are already grouped.

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

(1) Use a thermometer to measure and record a range of temperatures; label each as hot, warm, cool, or cold.

(2) Investigate, using direct observations, and describe in detail how a solid changes into a liquid, and water evaporates if left in an open container.

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

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

2. For the area of Life Science:

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

(1) Observe and describe the growth of a plant (e.g., a bean plant) over time and identify plant growth patterns (e.g., sprouting of seeds, formation of roots, leaves, and stems, development of flowers and seeds); observe and describe the life cycle of a domestic animal and an animal that undergoes metamorphosis (e.g., a frog, butterfly, or mealworm); describe the needs of living organisms.

(2) Classify plants and animals representative of major groups (e.g., evergreen vs. deciduous trees, animals with an external, internal or no skeleton, etc., with few errors.

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

(1) Describe and give with examples of how various living things behave differently under differing conditions (e.g., migration, coloration, hibernation) with minimal errors.

(2) Explain that germs affect the functions of the body and identify defenses that the human body has against germs (e.g., saliva, skin, special blood cells).

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

(1) Give examples of how offspring may resemble parents and other siblings.

(2) Sort a group of living things by appearance and behavior and give rational justification of the sort with minimal help.

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

(1) Illustrate by providing diverse examples of the many different kinds of living things that exists on earth.

(2) Provide general examples of how particular features of plants and animals help them live in different kinds of places (e.g., 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) Earth Structures and Composition-Students understand that the Earth is composed of interrelated systems of rocks, water, air, and life.

(1) Identify, with few or no errors, various samples of Earth materials (e.g., rocks, minerals, soil, sand, gravel, water, ice, air).

(2) Identify landforms (e.g., mountains, valleys).

(3) Describe the shape of the Earth as "round like a ball" (or as a sphere); compare, using maps and models, relative areas of ocean and land on Earth's surface.

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

(1) Indicate any one of three map directions as requested when given the fourth direction in the classroom.

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

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

(1) Observe and describe, with examples, how some changes are so slow (e.g., the growth of a plant, the movement of an hour hand on a clock) or so fast (e.g., lightning strikes, eye blinks, the change from dark to light when a light is turned on) and that they are hard to see while they happen.

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

(1) Observe and describe that some objects that give off light (e.g., small light bulbs, the sun) also give off heat.

(2) Observe, record, and describe seasonal differences (e.g., weather, changes in leaves of deciduous trees) using words, numbers (e.g., temperatures), and drawings, with minimal assistance.

(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 another.

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

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

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

4. For the area of Environmental Sciences

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

(1) Identify, using appropriate examples, some similarities and differences found in animals and plants that help them live in their unique habitats.

(2) Describe, using diagrams and/or illustrations, several ways organisms interact with each other.

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

(1) Explain that natural resources are used for many purposes (e.g., trees are used for construction, paper, and fuel); provide multiple examples.

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

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

(1) Provide examples of materials that can be recycled and used again, including some in different forms.

(2) Make a reasonable prediction of a pattern's continuation based on a given pattern of observable change.

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

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

(1) Make observations, ask questions, and seek answers with teacher support.

(2) Generally observe, and record accurately in order to compare findings with others.

(3) Identify that women and men of all different ages and backgrounds make contributions to science.

(4) Identify benefits of working with a team and sharing findings.

(5) Competently use tools (e.g., hammer, screwdrivers, balances, hand lens, pencil sharpener, and lever) to make a task easier.

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

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

(1) Compare 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 (e.g., life cycles, seasonal weather changes, phases of the moon).

(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 (e.g., bread and its ingredients, a working model car and its parts).

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

(1) Observe and raise questions about the world and seek answers through investigations (e.g., the actions of toys, development and characteristics of schoolyard plants).

(2) Record observations of investigations over time in a notebook or journal (e.g., changes in a terrarium, in a tadpole as it matures).

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

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

(2) Create adequate illustrations, graphs, and charts to convey ideas and record observations that are generally easy to understand.

(3) Generally cooperate and contribute ideas within a group.

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

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

(1) Generally use mental computation to make rough estimates (e.g., addition, subtraction, multiplication, division, measurement problems).

(2) Determine whether measurements and descriptions are reasonably accurate (i.e., compare objects by measuring their lengths, weights, and capacities; verify the reasonableness of their results by checking their measurements against "known" values (e.g., length of classroom, quart of milk).

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

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

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

Instruction Through Fifth Grade

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

1. For the areas of Physical Science:

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

(1) 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 force (gravity) is pulling them down.

(3) Categorize objects that move in different directions (e.g., forward and back and sideways), in a variety of ways (e.g., rotating, rolling, or revolving) and with varying ease of movement (friction).

(4) Can accurately predict which objects will sink or float in air or water and can classify them on the basis of this behavior.

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

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

(1) Separate the components of a mixture based on their properties when provided with directions (e.g., recovering sand and sugar from a mixture of the two or recovering sugar from a water solution) and describe why the technique worked.

(2) Compare and contrast elements, compounds, and mixtures. Give common examples of elements, compounds, and mixtures.

(3) Investigate and describe that 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 (e.g., a sheet of paper versus pieces of paper, chunk of rock and a fragment, cinnamon stick and powdered cinnamon).

(5) Describe the observable properties (e.g., state of matter, ductility, malleability, color, strength, shape, etc.) of various materials and suggest uses for them based on their properties. Compare and contrast the properties and composition of various materials.

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

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

(2) Investigate how energy and matter interact when water changes phases from solid to liquid to gas and vice versa; relate these interactions to and diagram the water cycle, indicating whether energy is absorbed or released in each phase 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, chopstick and a container of water; record and summarize the findings.

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

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

(1) Observe and record the effects of common physical and chemical changes (e.g., melting and burning candle wax, dissolving sugar in water, heating sugar, mixing baking soda with vinegar, baking a cake); distinguish between a phase and a chemical change.

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

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

(1) Observe, draw, label, and compare and contrast the essential features of the life cycles of representative plants and animals including birth or germination, development of plants (seeds to roots, stems and leaves to flowers to seeds) and development of animals (e.g., frog, silk moth, cricket) with only minor error or missions.

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

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

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

(1) Relate sensory input to behavioral response, with reasonable assistance (e.g., plant turning toward the sun, animals turning toward sound).

(2) Develop a reasonable plan to teach an organism a learned behavior.

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

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

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

(2) Explain that living things are classified by similar features, behaviors, and/or habits and provide some examples.

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

(4) Relate reproduction to the continuation of species.

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

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

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

(3) Identify examples of how differences in individual characteristics may give an advantage for survival.

3. For the areas of Earth and Space Sciences:

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

(1) Describe the mineral content of a rock sample in terms of easily observed properties of the minerals it contains (e.g., color/darkness of minerals, size of crystals).

(2) Describe relationships, using models and references to first-hand observations, between increase in slope and increase in erosion rate; increase in slope and decrease in deposition rate; and the ways in which man's activities can increase erosion rates (e.g., deforestation and soil removal) or decrease erosion rates (e.g., reforestation or minimum-impact construction).

(3) Describe, using models or maps, flat, protruding, and depressed features of the Earth's surface, including features of the ocean floor.

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

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

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

(2) Use the Nevada state road map to plan a route between various points of interest in the state (e.g., plan a route from their home to an interesting feature like the Berlin Ichthyosaur or Lehmann Caves), with minimal assistance; construct a map of a local or regional feature (e.g., the classroom, school grounds, or neighborhood), with minimal assistance.

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

(1) 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 (e.g., weathering, erosion, earthquakes, volcanic eruptions).

(2) Simulate, using hands-on materials, and describe the various ways that fossils form (e.g., cast/mold formation, imprints) with minimal assistance.

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

(1) Investigate and 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 (e.g., storms, flooding, drought), including their causes and effects.

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

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

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

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

(2) Describe, citing daily and nightly observations, or simulations (e.g., classroom ceiling star projector, college planetarium), the motion of the sun, moon, stars, and some planets across the sky.

(3) Describe, citing daily and nightly observations, or simulations (e.g., classroom ceiling star projector, college planetarium), the distribution, brightness, and color of some major stars and constellations.

4. For the area of Environmental Sciences

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

(1) Describe, using examples, several ways organisms interact with each other and with their non-living habitat, including dead plants and animals.

(2) Match plants and animals that will survive well, less well, or will not survive at all to particular environments.

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

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

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

(1) Observe samples of various materials (e.g., wood, cloth, paper, metal, plastic, composites), and describe their properties (e.g., how they respond to various stresses, how they react with other materials/chemicals, what happens in the presence of heat/fire, electrical and magnetic properties); identify ways that observed properties of samples of materials make them useful for various human activities.

(2) Investigate and describe the extent to which samples of man-made items (e.g., objects made of cloth, glass, paper, metal, plastic, composites, ceramics) can be used over and over; describe how a device can be made to operate with less energy (e.g., reducing friction by applying a lubricant such as graphite, using more aerodynamic and/or lightweight materials).

(3) Describe, using information from state and federal agencies (e.g., the Department of Business and Industry, Department of Wildlife, State Parks, Bureau of Land Management), the kinds and uses of natural resources found in Nevada (e.g., water, gold, gypsum, petroleum, ranch and farm land, recreation land, wildlife); describe, using print, multimedia, or Internet resources, the kinds and uses of natural resources acquired nationally or globally (e.g., lumber, grain, fish, coal).

(4) Contrast personal basic minimal resource needs (food/water, shelter, warmth) to actual resource use; suggest ways in which personal use of limited resources could be reduced.

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

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

(2) Describe components of an ecosystem that can be observed to change and components that do not change.

(3) Identify changes in environments as being natural events or influenced by human activities.

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

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

(1) 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, (e.g., Apollo 13, Thomas Edison's work on the light bulb).

(5)Use technological devices which can be used to determine motion (e.g., stop watches, radar guns).

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

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

(1) Justify conclusions or explanations by use of data and logical argument.
Recognize the limits of generalizations, assumptions, analogies and models. (e.g. solar system, evolution, model of atomÖ)

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

(1) Use 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 present conditions match previous conditions (e.g., weather, accidents).

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

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

(1) Keep accurate records of investigations and observations without changing those records later (i.e., do not change records to fit the norm).

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

(3) Offer reasons for their findings and consider suggestions by others.

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

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

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

(3) Collaborate on a group project.

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

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

(1) Investigate the change in the result of a simple experiment when they alter one of the experimental conditions (e.g., How will the length of the string affect the "swing" of a pendulum?).

(2) Can generally explain the strategy and thinking they used to solve a particular problem.

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

(4) Usually select the appropriate types of units for a particular measurement (e.g., meters for length, seconds for time, and kilograms for mass) and the appropriate magnitude of units for a particular measurement (e.g., meters, not centimeters, for measuring swimming pools).

(5) Generally recognize that there may be variations when everyone in the class makes a particular measurement, but inconsistently explain why.

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

(1) Consistently use safety equipment and attire.

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

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

(4) Generally label measurements, graphs, and diagrams correctly.

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

(6) Given a set procedure can manipulate objects and observe events in an experiment.

Instruction Through Eighth Grade

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

1. For the areas of Physical Science:

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

(1) Explain how multiple forces acting on an object along a straight line will affect the motion of the object (e.g., 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(e.g., moving an object from one place to another) and describe how simple machines change force and distance through which work is done.

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

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

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

(1) Use simple models (e.g., particle models) and measurements to explain observed properties of matter.

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

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

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

(5) Explain three states of matter (solids, liquids, and gasses) as systems of particles of varying densities and degrees of organization.

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

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

(1) Describe the movement of heat from object to object incorporating the concepts of composition and proximity of the objects; identify in general terms which kinds of substances will conduct heat most readily.

(2) Describe the specific energy changes that must occur for a substance to change states using such terms as, melting point, boiling point, etc. (e.g., diagram a heating or cooling curve identifying the phase changes that are taking place).

(3) Investigate and describe the characteristics of waves using such things as ropes, water tables, and springs; describe that waves move at different speeds in different materials, using examples such as sound waves traveling in air as opposed to water; describe the electromagnetic spectrum and how wavelength changes from one end to the other; describe that the energy of waves can be changed into other forms of energy.

(4) Create parallel, series and combination circuits; describe very simple properties of parallel and combination circuits (e.g., in these circuits, there are branches and current is distributed among the branches) and more sophisticated properties of series circuits (e.g., voltage, resistance, current).

(5) Describe various ways energy can be transferred between systems or objects and the different forms of energy (radiant, chemical, electrical, nuclear, and mechanical).

(6) Distinguish between potential and kinetic energy; give specific examples of each.

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

(1) Apply the concept of the conservation of mass to a given chemical reactions specifying the total mass of reactants and products; confirm that the same elements are present in the product(s) 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; give examples of applications of this concept such as storing certain substances in brown bottles, refrigeration, the effect of acid rain.

(3) Observe and describe, using commonplace examples, chemical reactions which overall either require or release energy.

(4) Describe the basic organization of the periodic table and describe patterns (i.e., location of metals, nonmetals, metalloids, noble gases) and chemical reactivity.

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

(1) Investigate and describe the interaction of light with matter (e.g., transmission, absorption, scattering of light).

(2) Explain what is meant by 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; 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 (fusion) with nuclear reactors (fission).

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

2. For the area of Life Science:

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

(1) Explain with minimal assistance 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 body's cells.

(3) Identify various plant structures and systems, giving the function of each with minimal errors.

(4) Explain, in general terms, that cellular functions are guided by information stored in DNA.

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

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

(2) Explain that behavior may be based on experience and/or evolutionary history, but provide weak examples.

(3) Accurately relate a given behavior to the stimulus that prompted it.

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

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

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

(2) Classify given examples of living things on the basis of similar characteristics and tell why certain organisms are grouped together.

(3) Explain that selective breeding has resulted in new varieties of domestic animals and plants, cite 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 (e.g., use Punnett squares).

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

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

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

(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.

(5) Outline, using drawings, diagrams, charts, etc., major lines of evidence that support evolutionary relationships among species (e.g., fossil record, DNA sequences, any atomical similarities, etc.).

3. For the areas of Earth and Space Sciences:

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

(1) Describe mineral samples on the basis of physical properties (hardness, luster, color, streak, cleavage, and crystal shape) and describe rock samples on the basis of obvious physical features (e.g., sedimentary structures such as ripple marks, metamorphic structures such as foliation, igneous structures such as interlocking crystals).

(2) Explain, using models (e.g., stream tables, clay layers), how erosion, deposition, and pushing and pulling forces inside the Earth create landforms (e.g., mountains, valleys).

(3) Describe, using three-dimensional models or drawings, the internal layers of the Earth (i.e., continental and oceanic crust, a hot, convecting mantle, and a dense, metallic core).

(4) Demonstrate, compare, and contrast the properties of various soil samples (e.g., color, texture, capacity to retain water), and explain, citing observations of actual soil samples, that soil contains materials that are required for things that live in the soil.

(5) List the major components of the atmosphere at the Earth's surface and their relative abundance (i.e., nitrogen is the largest component, followed by oxygen, with other gases like carbon dioxide and water vapor in smaller amounts); describe how the properties (temperature, density, and pressure) and composition of the atmosphere vary with elevation.

(6) Describe causes and effects of geologic events (e.g., earthquakes, landslides, volcanoes, floods).

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

(1) locations on the Earth's surface using degrees of latitude and longitude coordinates.

(2) Compare and contrast the kinds of features found on various kinds of maps (contour, physical, political, geological); find the state of Nevada or Nevada features (depending on map scale) on various kinds of maps (contour, physical, political, geological).

(3) Use a color-coded map to compare and contrast various features (e.g., temperature, population density, geology, precipitation).

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

(1) Identify key processes and rates of change that occurred in the formation of a landform (e.g., slow processes of weathering, erosion, deposition; relatively fast processes of volcanism, 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: the fossil record reflects a pattern of change in organisms over time; 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 (e.g., scavenger and decomposer activity, weathering/erosion).

(4) Describe reasons that fossil evidence may not form or may be destroyed (e.g., scavenger and decomposer activity, weathering/erosion).

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

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

(1) Explain, using diagrams and words, that the sun is the ultimate source of energy for major Earth processes (e.g., from sun to plant to fossil fuel; from sun to evaporation to precipitation to weathering and erosion due to water).

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

(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 cloud types are associated with particular patterns of weather (e.g., particular clouds often precede particular kinds of fronts between air masses; cumulonimbus clouds are typically associated with thunderstorms).

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

(6) Explain, citing first hand observations (e.g., radiation striking a surface from a light bulb at various angles of incidence), the relationship between changes in the aspect of 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 (e.g., 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 groundwater 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 amply some processes that are reversible (e.g., pH indicator changes, stretching a spring within its elastic limit) and others that are practically irreversible (e.g., burning, stretching a spring beyond its elastic limit, extinction of a species)

(11) Explain, citing first-hand observations (e.g., the conservation of energy in calorimeter experiments) that the energy the Earth receives over geologic time approximately equals the energy that it loses.

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

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

(1) Investigate, using print, multimedia, or Internet resources, and describe, using drawings or models, principle characteristics such as size, mass composition (i.e., gas, ice, rock), and surface features (e.g., volcanic and erosional features, coloration) of the planets in our solar system.
(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; compare the chemical composition of galaxies to that of planet Earth.
(4) Explain how various tools (e.g., optical and radio telescopes, unmanned robotic spacecraft), allow us to investigate objects in the sky that are too distant, faint, or bright to observe directly from Earth.
(5) Describe the historical development of some of the laws of motion (e.g., the laws of Kepler and Newton) that apply to the motion of objects in the solar system.

4. For the area of Environmental Sciences

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

(1) Develop a presentation to represent visually and explain how organisms interact with the living and non-living components of their ecosystems; include food chains and food webs.

(2) Characterize organisms in a variety of ecosystems by their function (i.e., producer, consumer, predator, prey, parasite, host, scavenger, decomposer). Analyze the role of predators as a stabilizing factor in an ecosystem, explaining how they can prevent habitat destruction or species extinction, citing specific examples.

(3) 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 (e.g., compare the resource implications of a vegetarian diet to one with high meat consumption).

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

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

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

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

(3) Investigate, using print, multimedia, or Internet resources, and describe the location and distribution of non-renewable energy 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 unintended consequences of technology can cause resource depletion (e.g., internal combustion engines burn fossil fuels which are non-renewable) and environmental degradation. (e.g., internal combustion engines cause air pollution); describe how technology can increase resource availability (e.g., internal combustion engines allow us to harvest and transport resources more efficiently), can mitigate environmental degradation (e.g., improvements in internal combustion engines design and their fuels lower rates of air pollution), and can make new resources economical (e.g., improvements in mining technology make it financially feasible to mine ores previously considered too low-grade to be profitable).

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

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

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

(1) Demonstrate that scientific investigations involve: use of logic (e.g., scientific investigation using step-by-step thinking); respecting rules of evidence (e.g., generally use truthful, careful, and accurate collection of evidence and information in a scientific investigation); follow the standards for keeping a science notebook; openness to criticism (e.g., respectfully consider constructive criticism and peer review; respectfully offer constructive criticism and peer review); public reporting of methods and procedures (e.g., peer review).
(2) Successfully Carry out at least one of the following kinds of investigations successfully (i.e., a controlled experiment, a field study and a multiple-source research report).
(3) Explain, using examples, that ancient peoples provided knowledge about the natural world that is still regarded as valid today, even though that knowledge may not have originated by scientific methods
(4) Adequately model that scientists may work in teams and some may work alone, but all communicate extensively with each other. (e.g., by doing investigations and sharing results with others doing similar work, students benefit by learning through communication).
(5) Compare and contrast scientific inquiry and technological design using multiple and related examples of research and the application of the research in

technology (e.g., fish ladders, habitats and walkways for tortoises, handicap access, and pace makers).
(6) Critique results, techniques, and processes used in a scientific investigation.
(7) Compare and contrast the strengths and limitations of science as related to other human social and intellectual activities.

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

(1) Identify and evaluate 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 (e.g., cloning, electric automobiles, and pest control).

(3) Analyze and describe a simple system (e.g., pendulum, aquarium, toilet) in terms of its efficiency, optimal function, and possible sources of malfunction.

(4) Evaluate information to distinguish between fact and opinion when problem solving (e.g., product advertising, early theories concerning flat earth vs. round earth).

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

(1) two different models to demonstrate the same thing (e.g., a map and a globe).
(2) Use models to predict change (e.g., a stream table).

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

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

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

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

(1) Clearly state reasons for keeping honest, clear, and accurate records (e.g., maintaining integrity of the scientific process; mitigation of injury to persons, property, or the environment).

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

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

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

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

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

(3) Discuss scientific topics by paraphrasing, asking for clarification or elaboration, and expressing alternative positions using print, Internet and multi media resources.

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

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

(1) Explain that quantities can vary in proportion to one another; provide examples (e.g., the mass of a substance is directly proportional to its volume; the time it takes a vehicle to travel is directly proportional to the distance traveled).

(2) Can generally explain the steps required to solve a given problem and why they are necessary.

(3) Explain, using examples, that probabilities are ratios and can be expressed as fractions, percentages, or odds; make reasonable estimates of outcomes in familiar situations (e.g., probability of being born a boy or girl, struck by lightening, involved in an automobile accident).

(4) Explain that, with very few exceptions, numbers in science are expressed with units; consistently select and use the appropriate SI unit for a particular measurement (e.g., meters for length, seconds for time, kilograms for mass).

(5) Define accuracy and precision; decide if repeated measurements and computations of quantities are reasonably precise and accurate and explain why.

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

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

(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 (e.g., designing an apparatus using simple machines).

(4) Keep accurate, organized records of scientific investigations.

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

(6) Design and carry out a controlled experiment working in a small group.

HIGH SCHOOL

Required Course of Study

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

1. For the areas of Physical Science:

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

(1) 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. Apply the principle of gravity to the motion of falling objects (e.g., objects accelerate as they fall).

(3) Determine the mechanical advantage and efficiency of various simple machines, (i.e., 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 (e.g., the gas pressure change in an expanding container or the pressure differences between sharp and dull objects); investigate and describe the relationship between pressure and depth in a liquid.

(5) Describe or explain the relationship between electromagnetic forces and electromagnetic systems (e.g., generators, circuits, electric motors). Calculate variables for simple electromagnetic systems (i.e., current, resistance, wattage, voltage). Investigate and describe that the electromagnetic spectrum (including radio waves, light, infrared, etc.) is a form of energy consisting of both electrical and magnetic energy.

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

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

(2) Apply techniques of spectral analysis (e.g., flame tests, colorimetry, etc, to the identification of elements and compounds.

(3) Distinguish among and describe various types of chemical bonds (e.g., 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, discreet 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.

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

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

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

(2) Investigate, using first hand observations, and explain that pressure may affect changes of state.

(3) Investigate, using first hand 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, using first hand observations, and describe the properties of electrical circuits in terms of moving electrons, conductivity, resistance, and electrical potential energy.

(5) Investigate, using first hand observations, (e.g., data on conservation of momentum, predictions of projectile motion, careful measurements and calculations of transfer between potential and kinetic energy) how matter and energy may be changed and energy can be

transferred in many ways; describe the conservation of mass-energy as it applies to a closed system (E=mc2).

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

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

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

(2) Qualitatively describe the way in which various factors affect the rate of a chemical reaction (i.e., temperature, particle size, pressure, presence of a catalyst, pH, concentration of reactants).

(3) Distinguish between endothermic and exothermic reactions (i.e., redox reactions, burning fuel, photosynthesis, respiration, electrochemical reactions in batteries).

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

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

(1) Use lenses to demonstrate the interaction of light with matter (e.g., reflection, refraction); diagram converging and diverging lenses and describe major applications.

(2) Estimate the age of some materials using predictable rates of nuclear reaction (i.e., half-lives).

(3) Describe the differences in disposal techniques that are required for high-and low-level nuclear wastes.

(4) Describe electromagnetic spectrum labeling principle regions (e.g., gamma rays, x-rays, visible light, UV, IR, radio waves).

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

(6) Describe the release of energy during the nuclear processes of fission and fusion and give examples of elements that undergo fission and fusion respectively; compare the amount of energy in fission and fusion with that in chemical and phase changes.

2. For the area of Life Science:

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

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

(2) Distinguish among the systems of the human body (e.g., skeletal, nervous, digestive, etc.), and can describe the different cells of each with minimal assistance.

(3) Trace with assistance the digestion, absorption, and use of a food or group of foods through an organism.

(4) Reasonably explain the process of photosynthesis.

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

(1) Relate behavior patterns to survival of a species by providing 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.

(4) Develop a presentation, suitable for middle school students, which explains how the immune system works and how AIDS, a viral disease, destroys critical cells, thereby making the body vulnerable to infectious agents and cancerous cells.

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

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

(2) Explain, using diagrams and/or charts, how similarity of DNA sequences can 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 how multiple pairs of genes may control patterns of inheritance with minor errors.

(6) Point out, with some examples, how diversity and variation of organisms increase the chance of survival when environmental conditions change.

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

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

(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 and those 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 there are various lines of evidence which are used to establish 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.

(7) Cite evidence that cells with nuclei existed over 1 billion years ago and that these cells were the precursors to increasingly complex organisms.

3. For the areas of Earth and Space Sciences:

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

(1) Describe the general processes of formation of a given sample of rock (i.e., weathering/erosion/ deposition, melting, heat/pressure); list uses for at least five common earth materials (e.g., gypsum in drywall, metals in electrical devices).

(2) Explain the formation of some topographical features (e.g., volcanoes, rift valleys, ocean trenches, fault-block mountains) in terms of moving lithosphere plates.

(3) Explain how the Earth is generally layered from the most dense material (solids - rocks) outward to less dense materials (liquids - oceans, lakes, streams) with the outermost layer being least dense (gases – the atmosphere).

(4) Describe the origin of constituents in various samples of soil (e.g., organic materials came from decomposed plants and animals; mineral materials came from weathered rock); compare and contrast composition and properties of different soil horizons.

(5) Describe, citing print, multimedia, or Internet resources, some historical changes in Earth's atmosphere (e.g., the change from a predominantly methane/ammonia atmosphere to today's composition); and describe, citing print, multimedia, or Internet resources, present-day changes in Earth's atmosphere (e.g., increase in carbon dioxide, ozone depletion, air pollution).

(6) Compare and contrast, using maps, models, photographs, and/or field observations, large geologic features throughout the state (e.g., basin and range fault-block mountains, Sierra batholiths); compare and contrast, using maps, models, photographs, and/or field observations, specific local geologic features (e.g., glacial features in Lamoille Canyon, local beach benchmarks from ancient lakes, thrust faults in the Spring Mountains).

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

(1) Construct a contour map of a simple model landform; 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; determine the time in any time zone given the time of day in any other time zone.

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

(1) Analyze the causes, using Internet, print, or audio-visual materials, and describe two both recent and ancient examples of catastrophic geologic events.

(2) Create a representation of a stratigraphic column based on actual or photographic data which represents rock sequences and unconformities (erosion surfaces).

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

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

(1) Explain that Earth systems 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; explain, using diagrams and citing first-hand observations, how uneven heating of the Earth's surface from the sun forms convection currents within the atmosphere and ocean, producing wind and ocean currents that are modified by the Earth's rotation.

(3) Investigate water's unusual ability to dissolve a wide range of substances and explain, using diagrams and citing first-hand observations, how water dissolves minerals and gases as it passes through the water cycle and carries them to oceans and lakes.

(4) 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 Earth's surface; describe how relatively small changes in solar output may have contributed to large changes in the Earth's climate in the past (e.g., ice ages, interglacial periods).

(5) Explain how large-scale, long-term equilibrium can accommodate small-scale changes, citing specific examples such as: a relatively small disruption (e.g., fire, landslide, flood) of a large ecosystem may disturb patterns, (e.g., food webs, cycles of matter) found in that ecosystem, but over time new patterns may form or old patterns may re-establish; a regional disruption of climate (e.g., El NiÒo) may cause global changes in weather, but it may not have a significant impact on climate over long periods of time (i.e., hundreds or thousands of years).

(6) 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.

(7) Describe the model of the greenhouse effect, including listing the various gases, which impede the transfer of long-wave radiation ("heat") from Earth into space; explain that the idea of global warming is based on observations subject to multiple interpretations and predictions, and is less certain than the model of the greenhouse effect, which is one component of the idea of global warming, but which is based on reproducible laboratory data.

(8) Model, using multimedia software or other methods, and explain how the energy that propels the Earth's lithosphere plates is dominantly a result of nuclear processes deep in the Earth.

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

(1) Investigate, 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 ten billion years and cite supporting scientific evidence.

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

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

4. For the area of Environmental Sciences

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

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

(2) Explain how an ecosystem may change or remain the same in response to different kinds of influences; contrast the immediate and long-term effects of a disaster (e.g., flood, fire) with those produced by a change in climate or introduction of a new species.

(3) Interpret a food web showing how materials and energy are cycled through ecosystems.

(4) Compare and contrast the geologic, hydrologic, climatic, and biological characteristics of Nevada's principal bioregions (e.g., Northern Nevada's cold desert, Southern Nevada's warm desert).

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

(1) Investigate, using print, multimedia, and/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 (e.g., moving from fossil fuels to solar power might reduce air pollution, but

would likely involve the extraction and use of Earth materials to make solar apparatus; 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; cite environmental implications.

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

(4) Analyze and describe the limitations of Earth's ability to respond to several different kinds of stresses produced by human or natural activities. For example: excessive rates of groundwater removal can destroy an aquifer's ability to recharge; channelization of mature rivers can change capacity for bioremediation by reducing the amount of wetland or marsh area the water normally passes through forest fire in marginally arable areas can, over the short or long term, reduce soil stability and increase erosion.

(5) Analyze and evaluate the effects that changes in human populations have caused (e.g., resource depletion and environmental degradation with population increase; changes in ecosystems, both positive and negative, when human populations migrate), citing specific cases.

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

(1) Analyze the energy condition, conservation efforts, and societal behavior patterns of the U.S.

(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.

(4) Provide examples of global actions that may affect Nevada's environment or economy and the impact of related trade-offs.

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

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

(1) Demonstrate to their peers that the scientific way of knowing uses a critique and consensus process (e.g., communicate methods and procedures used in scientific investigations to peers and teachers).

(2) Investigate and explain that public policy impacts the allocation of research monies (e.g., nuclear research, cancer, AIDS research).

(3) Research and explain how a scientific innovation that was originally challenged is now widely accepted (e.g., 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 built on previous information and communicate that entire theories are rarely completely discarded in favor of new ones (e.g., the Greek view of the atom vs. the quantum mechanical view.

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

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

(1) Evaluate how the validity of the techniques (e.g., sampling procedures) used affect the credibility of the information obtained in a specific kind of scientific investigation such as 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 (e.g., creating a man-made lake to enhance a new subdivision).

(3) Identify and accurately describe examples of systems which are quantitatively different from the components which comprise them (e.g., how populations differ from individuals, how a cardiac system differs from its individual cells; how the features of a carburetor are unique to it yet it functions in an engine system; a raindrop's role in the water cycle).

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

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

(1) Use mathematical symbols and formulas to express (e.g., universal gas law, Newton's Laws of Motion).

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

(3) Can identify and describe how systems are often different from their components using an example (e.g. aquaria or automobiles).

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

(5) Identify types of hazards (e.g. chemical transportation on highways or railways, earthquakes, drought). Choose one example and: estimate impacts (fire, explosion); estimate consequences of exposure to a hazard (illness, death, economic loss of property, loss of livelihood.

(6) Provide examples of ways of reducing or eliminating risks (laws, planning and zoning, safety precautions.

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

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

(2) Repeat experimentation for statistical analysis to produce conclusions that are well-supported.

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

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

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

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

(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 multi- media resources.

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

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

(1) Determine the relationship between variables in an investigation (e.g., direct, inverse, square).

(2) Use a "pre-selected" algebraic relationship to calculate the answer to a problem (e.g., given density = mass/volume, calculate one of the three variables given the values of the other two).

(3) Be able to identify what the correct order of magnitude would be for an answer to a specific problem.

(4) Can 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 (e.g., the calculation of percent accuracy and class precision).

(6) Can select samples by a random system to avoid bias.

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

(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.

(6) Design, carry out, and report on a scientific investigation.

NEVADA DEPARTMENT OF EDUCATION

NEVADA STATE BOARD OF EDUCATION
NEVADA STATE BOARD FOR OCCUPATIONAL EDUCATION

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

IMPACT STATEMENT

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

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

Notice of Workshop to Solicit Comments on Proposed Regulations was sent to approximately one-hundred twenty-five individuals and educational organizations. One workshop was held February 16, 1999. There were comments from the public.

The Notice of Intent to Act Upon a Regulation for public hearing on the proposed revisions to NAC 389 was sent to approximately one-hundred twenty-five individuals and educational organizations. One public hearing was conducted on April 16, 1999 to provide the opportunity for comments by affected parties and the public. Public response focused on proposed revisions to English Language Arts Course of Study, Science Course of Study and Mathematics Course of Study. There were one comment from the public.

2. The Number of Persons Who:

a) Attended Each Hearing: Workshop: 20 First Hearing: 14 Second Hearing: n/a

b) Testified at Each Hearing; Workshop: 4 First Hearing: 1 Second Hearing: n/a

and,

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

No written comments were submitted.

A copy of any written comments may be obtained by calling LaDonna Byrd, Board Secretary, at the Department of Education (775) 687-9225, or by writing to the Department of Education, 700 East Fifth Street, Carson City, Nevada 89701-5096.

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

Comment was solicited through the workshop notice of February 1, 1999, and public hearing notice of March 15, 1999.

At the Workshop to Solicit Public Comments held by the Council to Establish Academic Standards for Public Schools, comment from interested parties was as follows: Dr. Kay McCann, CBE, reviewed the mathematics, English Language Arts and science performance standards. Richard Vineyard, Consultant, Department of Education, noted that the science curriculum will need to be adjusted to meet the standards. Anne Loring, Washoe County School District, stated that the new science standards may require the students to take another year of science. Kendyl DePaoli, Washoe County School District, relayed that the teachers feel that the new standards will provide consistency.

At the public hearing held by the Nevada State Board of Education/Nevada State Board for Occupational Education, comment from interested parties was as follows: Bill Parker, Las Vegas, expressed concern for the courses to be offered that will meet the new standards.

A copy of the summary and/or minutes of the public hearing may be obtained by calling LaDonna Byrd, Board Secretary, at the Department of Education (775) 687-9225, or by writing to the Department of Education at 700 East Fifth Street, Carson City, Nevada 89701-5096.

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

The temporary regulation was adopted by the Nevada State Board of Education at the public hearing held April 16, 1999, without change to the recommended regulation language as approved by the Council to Establish Academic Standards for Public Schools (per Senate Bill 482, enacted by the 1997 Legislature) to become effective July 1, 1999.

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

The possible economic effect on the local school districts will in developing the curriculum to meet the performance standards outlined. There is no estimated economic effect on the public, either adversely or beneficially, nor immediate or long term.

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

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

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

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

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

There are none.

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

This regulation does not provide or involve a new fee.

4/99