

ALASKA STANDARDS

STANDARDS

FOURTH EDITION

CONTENT AND PERFORMANCE
STANDARDS FOR ALASKA STUDENTS

REVISED MARCH 2006



Frank H. Murkowski, Governor

MESSAGE FROM THE GOVERNOR

I am proud to introduce the Third Edition of the Alaska Content and Performance Standards, which has been adopted into regulation by the State Board of Education & Early Development.

These standards represent the efforts of many people working for more than a decade to decide what young Alaskans should know and be able to do as a result of their public schooling.

During my administration, the State Board and Department of Education & Early Development have taken school accountability and expectations to a higher level than ever before. The third edition lays out clear, measurable academic grade level expectations in reading, writing, math, and science for students in grades 3 through 10.

This publication is for teachers, parents, local school board members, and other community members involved in the education of our children. Taken seriously and used well, this information will help prepare all our children to do their best in school and on state exams.

These efforts will help achieve our goal of educating young Alaskans to step forward confidently after high school prepared to tackle the next stage of life, whether in college, in technical school, or in the workplace.



Roger Sampson, Commissioner
Education & Early Development

MESSAGE FROM THE COMMISSIONER

This revised edition of the Alaska standards booklet represents the intense effort by many people to describe what the students in our state should know and be able to do as a result of their public school experience.

Our state embarked on this campaign in 1993 with the development of content standards—broad statements of what our students should know and be able to do. The first edition of this booklet included content standards in ten core subject areas: English/language arts, mathematics,

science, geography, government and citizenship, history, skills for a healthy life, arts, world languages, and technology.

A second edition added content standards for employability and library information/literacy; performance standards in reading, writing, and mathematics; and cultural standards for students.

To fulfill requirements of the No Child Left Behind Act of 2001 (NCLB), the third edition of the standards booklet added:

- Expanded performance standards in reading, writing, and mathematics by inclusive grade level expectations for grades 3 through 10;
- Revised science content standards; and
- Science performance standards and grade level expectations for grades 3 through 11.

The State of Alaska has called upon school districts to adopt the state standards. In September 2001, the State Board of Education & Early Development adopted a regulation that extended statewide testing to all students in grades 3 through 9. Beginning in 2004, high school students were required to pass the High School Graduation Qualifying Examination, a criterion-referenced test targeting essential skills, in order to earn a high school diploma.

In April 2005, in response to NCLB, the state implemented criterion-referenced tests for students in grades 3 through 9, in order to measure how well all students meet the Alaska performance standards. Norm-referenced tests were required in fifth and seventh grades. In 2006, students in tenth grade will also be assessed on grade-specific performance standards.

This system of standards and assessments gives educators, families, and policy makers solid information with which to hold schools and communities accountable for the academic achievement of children and prepare all Alaska students for the future.



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June 2005

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ALL CHILDREN . . .
RISE EASILY TO THE COMMON LEVEL.
THERE THE MASS STOP; STRONG
MINDS ONLY ASCEND HIGHER. BUT
RAISE THE STANDARD,
AND, BY A SPONTANEOUS MOVEMENT, THE
MASS WILL RISE AGAIN AND REACH IT.

Horace Mann's First Annual Report (1837)

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CONTENT STANDARDS FOR ALASKA STUDENTS

The State Board of Education & Early Development adopted into regulation Content Standards listed on the following pages. Content Standards are broad statements of what students should know and be able to do as a result of their public school experience.

SCIENCE

A

Science as Inquiry and Process

A student should understand and be able to apply the processes and applications of scientific inquiry.

A student who meets the content standard should:

- 1) develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments;
- 2) develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review; and
- 3) develop an understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and local applications provide opportunity for understanding scientific concepts and global issues.

B

Concepts of Physical Science

A student should understand and be able to apply the concepts, models, theories, universal principles, and facts that explain the physical world.

A student who meets the content standard should:

- 1) develop an understanding of the characteristic properties of matter and the relationship of these properties to their structure and behavior;
- 2) develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, may be unavailable for use, and is ultimately conserved;
- 3) develop an understanding of the interactions between matter and energy, including physical, chemical, and nuclear changes, and the effects of these interactions on physical systems; and
- 4) develop an understanding of motions, forces, their characteristics and relationships, and natural forces and their effects.

C

Concepts of Life Science

A student should understand and be able to apply the concepts, models, theories, facts, evidence, systems, and processes of life science.

A student who meets the content standard should:

- 1) develop an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution;
- 2) develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms; and
- 3) develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

D**Concepts of Earth Science**

A student should understand and be able to apply the concepts, processes, theories, models, evidence, and systems of earth and space sciences.

A student who meets the content standard should:

- 1) develop an understanding of Earth's geochemical cycles;
- 2) develop an understanding of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth;
- 3) develop an understanding of the cyclical changes controlled by energy from the sun and by Earth's position and motion in our solar system; and
- 4) develop an understanding of the theories regarding the origin and evolution of the universe.

E**Science and Technology**

A student should understand the relationships among science, technology, and society.

A student who meets the content standard should:

- 1) develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events;
- 2) develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits; and
- 3) develop an understanding of how scientific discoveries and technological innovations affect and are affected by our lives and cultures

F**Cultural, Social, Personal Perspectives and Science**

A student should understand the dynamic relationships among scientific, cultural, social, and personal perspectives.

A student who meets the content standard should:

- 1) develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology;
- 2) develop an understanding that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world; and
- 3) develop an understanding of the importance of recording and validating cultural knowledge.

G**History and Nature of Science**

A student should understand the history and nature of science.

A student who meets the content standard should:

- 1) develop an understanding that historical perspectives of scientific explanations demonstrate that scientific knowledge changes over time, building on prior knowledge;
- 2) develop an understanding that the advancement of scientific knowledge embraces innovation and requires empirical evidence, repeatable investigations, logical arguments, and critical review in striving for the best possible explanations of the natural world;
- 3) develop an understanding that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmation(s); and
- 4) develop an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base.

GEOGRAPHY

A

A student should be able to make and use maps, globes, and graphs to gather, analyze, and report spatial (geographic) information.

A student who meets the content standard should:

- 1) use maps and globes to locate places and regions;
- 2) make maps, globes, and graphs;
- 3) understand how and why maps are changing documents;
- 4) use graphic tools and technologies to depict and interpret the world's human and physical systems;
- 5) evaluate the importance of the locations of human and physical features in interpreting geographic patterns; and
- 6) use spatial (geographic) tools and technologies to analyze and develop explanations and solutions to geographic problems.

B

A student should be able to utilize, analyze, and explain information about the human and physical features of places and regions.

A student who meets the content standard should:

- 1) know that places have distinctive geographic characteristics;
- 2) analyze how places are formed, identified, named, and characterized;
- 3) relate how people create similarities and differences among places;
- 4) discuss how and why groups and individuals identify with places;
- 5) describe and demonstrate how places and regions serve as cultural symbols, such as the Statue of Liberty;
- 6) make informed decisions about where to live, work, travel, and seek opportunities;
- 7) understand that a region is a distinct area defined by one or more cultural or physical features; and
- 8) compare, contrast, and predict how places and regions change with time.

C

A student should understand the dynamic and interactive natural forces that shape the Earth's environments.

A student who meets the content standard should:

- 1) analyze the operation of the Earth's physical systems, including ecosystems, climate systems, erosion systems, the water cycle, and tectonics;
- 2) distinguish the functions, forces, and dynamics of the physical processes that cause variations in natural regions; and
- 3) recognize the concepts used in studying environments and recognize the diversity and productivity of different regional environments.

D

A student should understand and be able to interpret spatial (geographic) characteristics of human systems, including migration, movement, interactions of cultures, economic activities, settlement patterns, and political units in the state, nation, and world.

A student who meets the content standard should:

- 1) know that the need for people to exchange goods, services, and ideas creates population centers, cultural interaction, and transportation and communication links;
- 2) explain how and why human networks, including networks for communications and for transportation of people and goods, are linked globally;
- 3) interpret population characteristics and distributions;
- 4) analyze how changes in technology, transportation, and communication impact social, cultural, economic, and political activity; and
- 5) analyze how conflict and cooperation shape social, economic, and political use of space.

E

A student should understand and be able to evaluate how humans and physical environments interact.

A student who meets the content standard should:

- 1) understand how resources have been developed and used;
- 2) recognize and assess local, regional, and global patterns of resource use;
- 3) understand the varying capacities of physical systems, such as watersheds, to support human activity;
- 4) determine the influence of human perceptions on resource utilization and the environment;
- 5) analyze the consequences of human modification of the environment and evaluate the changing landscape; and
- 6) evaluate the impact of physical hazards on human systems.

F

A student should be able to use geography to understand the world by interpreting the past, knowing the present, and preparing for the future.

A student who meets the content standard should:

- 1) analyze and evaluate the impact of physical and human geographical factors on major historical events;
- 2) compare, contrast, and predict how places and regions change with time;
- 3) analyze resource management practices to assess their impact on future environmental quality;
- 4) interpret demographic trends to project future changes and impacts on human environmental systems;
- 5) examine the impacts of global changes on human activity; and
- 6) utilize geographic knowledge and skills to support interdisciplinary learning and build competencies required of citizens.

GOVERNMENT AND CITIZENSHIP

A

A student should know and understand how societies define authority, rights, and responsibilities through a governmental process.

A student who meets the content standard should:

- 1) understand the necessity and purpose of government;
- 2) understand the meaning of fundamental ideas, including equality, authority, power, freedom, justice, privacy, property, responsibility, and sovereignty;
- 3) understand how nations organize their governments; and
- 4) compare and contrast how different societies have governed themselves over time and in different places.

B

A student should understand the constitutional foundations of the American political system and the democratic ideals of this nation.

A student who meets the content standard should:

- 1) understand the ideals of this nation as expressed in the Declaration of Independence, the United States Constitution, and the Bill of Rights;
- 2) recognize American heritage and culture, including the republican form of government, capitalism, free enterprise system, patriotism, strong family units, and freedom of religion;
- 3) understand the United States Constitution, including separation of powers, the executive, legislative, and judicial branches of government, majority rule, and minority rights;
- 4) know how power is shared in the United States' constitutional government at the federal, state, and local levels;
- 5) understand the importance of individuals, public opinion, media, political parties, associations, and groups in forming and carrying out public policy;
- 6) recognize the significance of diversity in the American political system;
- 7) distinguish between constitution-based ideals and the reality of American political and social life;
- 8) understand the place of law in the American political system; and
- 9) recognize the role of dissent in the American political system.

C

A student should understand the character of government of the state.

A student who meets the content standard should:

- 1) understand the various forms of the state's local governments and the agencies and commissions that influence students' lives and property;
- 2) accept responsibility for protecting and enhancing the quality of life in the state through the political and governmental processes;

C (continued)

- 3) understand the Constitution of Alaska and Sec. 4 of the Alaska Statehood Act, which is known as the Statehood Compact;
- 4) understand the importance of the historical and current roles of Alaska Native communities;
- 5) understand the Alaska Native Claims Settlement Act and its impact on the state;
- 6) understand the importance of the multicultural nature of the state;
- 7) understand the obligations that land and resource ownership place on the residents and government of the state; and
- 8) identify the roles of and relationships among the federal, tribal, and state governments and understand the responsibilities and limits of the roles and relationships.

D

A student should understand the role of the United States in international affairs.

A student who meets the content standard should:

- 1) analyze how domestic politics, the principles of the United States Constitution, foreign policy, and economics affect relations with other countries;
- 2) evaluate circumstances in which the United States has politically influenced other nations and how other nations have influenced the politics and society of the United States;
- 3) understand how national politics and international affairs are interrelated with the politics and interests of the state;
- 4) understand the purpose and function of international government and non-governmental organizations in the world today; and
- 5) analyze the causes, consequences, and possible solutions to current international issues.

E

A student should have the knowledge and skills necessary to participate effectively as an informed and responsible citizen.

A student who meets the content standard should:

- 1) know the important characteristics of citizenship;
- 2) recognize that it is important for citizens to fulfill their public responsibilities;
- 3) exercise political participation by discussing public issues, building consensus, becoming involved in political parties and political campaigns, and voting;
- 4) establish, explain, and apply criteria useful in evaluating rules and laws;
- 5) establish, explain, and apply criteria useful in selecting political leaders;
- 6) recognize the value of community service; and
- 7) implement ways of solving problems and resolving conflict.

F

A student should understand the economies of the United States and the state and their relationships to the global economy.

A student who meets the content standard should:

- 1) understand how the government and the economy interrelate through regulations, incentives, and taxation;
- 2) be aware that economic systems determine how resources are used to produce and distribute goods and services;
- 3) compare alternative economic systems;
- 4) understand the role of price in resource allocation;
- 5) understand the basic concepts of supply and demand, the market system, and profit;
- 6) understand the role of economic institutions in the United States, including the Federal Reserve Board, trade unions, banks, investors, and the stock market;
- 7) understand the role of self-interest, incentives, property rights, competition, and corporate responsibility in the market economy;
- 8) understand the indicators of an economy's performance, including gross domestic product, inflation, and the unemployment rate;
- 9) understand those features of the economy of the state that make it unique, including the importance of natural resources, government ownership and management of resources, Alaska Native regional corporations, the Alaska Permanent Fund Corporation, the Alaska Housing Finance Corporation, and the Alaska Industrial Development and Export Authority; and
- 10) understand how international trade works.

G

A student should understand the impact of economic choices and participate effectively in the local, state, national, and global economies.

A student who meets the content standard should:

- 1) apply economic principles to actual world situations;
- 2) understand that choices are made because resources are scarce;
- 3) identify and compare the costs and benefits when making choices;
- 4) make informed choices on economic issues;
- 5) understand how jobs are created and their role in the economy;
- 6) understand that wages and productivity depend on investment in physical and human capital; and
- 7) understand that economic choices influence public and private institutional decisions.

HISTORY

A

A student should understand that history is a record of human experiences that links the past to the present and the future.

A student who meets the content standard should:

- 1) understand chronological frameworks for organizing historical thought and place significant ideas, institutions, people, and events within time sequences;
- 2) know that the interpretation of history may change as new evidence is discovered;
- 3) recognize different theories of history, detect the weakness of broad generalization, and evaluate the debates of historians;
- 4) understand that history relies on the interpretation of evidence;
- 5) understand that history is a narrative told in many voices and expresses various perspectives of historical experience;
- 6) know that cultural elements, including language, literature, the arts, customs, and belief systems, reflect the ideas and attitudes of a specific time and know how the cultural elements influence human interaction;
- 7) understand that history is dynamic and composed of key turning points;
- 8) know that history is a bridge to understanding groups of people and an individual's relationship to society; and
- 9) understand that history is a fundamental connection that unifies all fields of human understanding and endeavor.

B

A student should understand historical themes through factual knowledge of time, places, ideas, institutions, cultures, people, and events.

A student who meets the content standard should:

- 1) comprehend the forces of change and continuity that shape human history through the following persistent organizing themes:
 - a. the development of culture, the emergence of civilizations, and the accomplishments and mistakes of social organizations;
 - b. human communities and their relationships with climate, subsistence base, resources, geography, and technology;
 - c. the origin and impact of ideologies, religions, and institutions upon human societies;
 - d. the consequences of peace and violent conflict to societies and their cultures; and
 - e. major developments in societies as well as changing patterns related to class, ethnicity, race, and gender;

B *(continued)*

- 2) understand the people and the political, geographic, economic, cultural, social, and environmental events that have shaped the history of the state, the United States, and the world;
- 3) recognize that historical understanding is relevant and valuable in the student's life and for participating in local, state, national, and global communities;
- 4) recognize the importance of time, ideas, institutions, people, places, cultures, and events in understanding large historical patterns; and
- 5) evaluate the influence of context upon historical understanding.

C

A student should develop the skills and processes of historical inquiry.

A student who meets the content standard should:

- 1) use appropriate technology to access, retrieve, organize, and present historical information;
- 2) use historical data from a variety of primary resources, including letters, diaries, oral accounts, archeological sites and artifacts, art, maps, photos, historical sites, documents, and secondary research materials, including almanacs, books, indices, and newspapers;
- 3) apply thinking skills, including classifying, interpreting, analyzing, summarizing, synthesizing, and evaluating, to understand the historical record; and
- 4) use historical perspective to solve problems, make decisions, and understand other traditions.

D

A student should be able to integrate historical knowledge with historical skill to effectively participate as a citizen and as a lifelong learner.

A student who meets the content standard should:

- 1) understand that the student is important in history;
- 2) solve problems by using history to identify issues and problems, generate potential solutions, assess the merits of options, act, and evaluate the effectiveness of actions;
- 3) define a personal position on issues while understanding the historical aspects of the positions and roles assumed by others;
- 4) recognize and demonstrate that various issues may require an understanding of different positions, jobs, and personal roles depending on place, time, and context;
- 5) base personal citizenship action on reasoned historical judgment with recognition of responsibility for self and others; and
- 6) create new approaches to issues by incorporating history with other disciplines, including economics, geography, literature, the arts, science, and technology.

SKILLS FOR A HEALTHY LIFE

A

A student should be able to acquire a core knowledge related to well-being.

A student who meets the content standard should:

- 1) understand that a person's well-being is the integration of health knowledge, attitudes, and behaviors;
- 2) understand how the human body is affected by behaviors related to eating habits, physical fitness, personal hygiene, harmful substances, safety, and environmental conditions;
- 3) understand and identify the causes, preventions, and treatments for diseases, disorders, injuries, and addictions;
- 4) recognize patterns of abuse directed at self or others and understand how to break these patterns;
- 5) use knowledge and skills to promote the well-being of the family;
- 6) use knowledge and skills related to physical fitness, consumer health, independent living, and career choices to contribute to well-being;
- 7) understand the physical and behavioral characteristics of human sexual development and maturity; and
- 8) understand the ongoing life changes throughout the life span and healthful responses to these changes.

B

A student should be able to demonstrate responsibility for the student's well-being.

A student who meets the content standard should:

- 1) demonstrate an ability to make responsible decisions by discriminating among risks and by identifying consequences;
- 2) demonstrate a variety of communication skills that contribute to well-being;
- 3) assess the effects of culture, heritage, and traditions on personal well-being;
- 4) develop an awareness of how personal life roles are affected by and contribute to the well-being of families, communities, and cultures;
- 5) evaluate what is viewed, read, and heard for its effect on personal well-being; and
- 6) understand how personal relationships, including those with family, friends, and co-workers, impact personal well-being.

C

A student should understand how well-being is affected by relationships with others.

A student who meets the content standard should:

- 1) resolve conflicts responsibly;
- 2) communicate effectively within relationships;
- 3) evaluate how similarities and differences among individuals contribute to relationships;
- 4) understand how respect for the rights of self and others contributes to relationships;
- 5) understand how attitude and behavior affect the well-being of self and others; and
- 6) assess the effects of culture, heritage, and traditions on well-being.

D

A student should be able to contribute to the well-being of families and communities.

A student who meets the content standard should:

- 1) make responsible decisions as a member of a family or community;
- 2) take responsible actions to create safe and healthy environments;
- 3) describe how public policy affects the well-being of families and communities;
- 4) identify and evaluate the roles and influences of public and private organizations that contribute to the well-being of communities;
- 5) describe how volunteer service at all ages can enhance community well-being; and
- 6) use various methods of communication to promote community well-being.

ARTS

A

A student should be able to create and perform in the arts.

A student who meets the content standard should:

- 1) participate in dance, drama, music, visual arts, and creative writing;
- 2) refine artistic skills and develop self-discipline through rehearsal, practice, and revision;
- 3) appropriately use new and traditional materials, tools, techniques, and processes in the arts;
- 4) demonstrate the creativity and imagination necessary for innovative thinking and problem solving;
- 5) collaborate with others to create and perform works of art;
- 6) integrate two or more art forms to create a work of art; and
- 7) investigate careers in arts production.

B

A student should be able to understand the historical and contemporary role of the arts in Alaska, the nation, and the world.

A student who meets the content standard should:

- 1) recognize Alaska Native cultures and their arts;
- 2) recognize United States and world cultures and their arts;
- 3) recognize the role of tradition and ritual in the arts;
- 4) investigate the relationships among the arts and the individual, the society, and the environment;
- 5) recognize universal themes in the arts such as love, war, childhood, and community;
- 6) recognize specific works of art created by artists from diverse backgrounds;
- 7) explore similarities and differences in the arts of world cultures;
- 8) respect differences in personal and cultural perspectives; and
- 9) investigate careers relating to arts history and culture.

C

A student should be able to critique the student's art and the art of others.

A student who meets the content standard should:

- 1) know the criteria used to evaluate the arts; these may include craftsmanship, function, organization, originality, technique, and theme;
- 2) examine historical and contemporary works of art, the works of peers, and the student's own works as follows:

C *(continued)*

- a. identify the piece;
 - b. describe the use of basic elements;
 - c. analyze the use of basic principles;
 - d. interpret meaning and artist's intent; and
 - e. express and defend an informed opinion;
- 3) accept and offer constructive criticism;
 - 4) recognize and consider an individual's artistic expression;
 - 5) exhibit appropriate audience skills; and
 - 6) investigate careers relating to arts criticism.

D

A student should be able to recognize beauty and meaning through the arts in the student's life.

A student who meets the content standard should:

- 1) make statements about the significance of the arts and beauty in the student's life;
- 2) discuss what makes an object or performance a work of art;
- 3) recognize that people tend to devalue what they do not understand;
- 4) listen to another individual's beliefs about a work of art and consider the individual's reason for holding those beliefs;
- 5) consider other cultures' beliefs about works of art;
- 6) recognize that people connect many aspects of life through the arts;
- 7) make artistic choices in everyday living; and
- 8) investigate careers related to the search for beauty and meaning, which is aesthetics.

WORLD LANGUAGES

A

A student should be able to communicate in two or more languages, one of which is English.

A student who meets the content standard should:

- 1) understand written and oral communication in two or more languages;
- 2) write and speak understandably in two or more languages;
- 3) use two or more languages effectively in real life situations; and
- 4) use two or more languages to learn new information in academic subjects.

B

A student should expand the student's knowledge of peoples and cultures through language study.

A student who meets the content standard should:

- 1) understand the relationship between language and culture;
- 2) learn about and experience surface characteristics of the culture, including art, cuisine, dance, dress, geography, history, music, and literature;
- 3) learn about and experience deep characteristics of the culture, including folkways, mores, laws, traditions, customs, and patterns of behavior;
- 4) improve the student's understanding of the student's language and culture through experiences with other languages and cultures;
- 5) apply knowledge of the functions and structure of one language to the study of another language; and
- 6) recognize through language study that all cultures contribute to the global society.

C

A student should possess the language skills and cultural knowledge necessary to participate successfully in multilingual communities and the international marketplace.

A student who meets the content standard should:

- 1) interact appropriately in multilingual communities through various means, including printed and electronic media, audio and visual sources, face-to-face conversations, penpals, and travel;
- 2) use experiences with language and culture to explore the student's personal interests and career options;
- 3) learn how language skills and cultural knowledge enhance a person's competitiveness in the international marketplace; and
- 4) apply language skills and cultural knowledge to enhance the student's intellectual and social growth and to promote lifelong learning.

TECHNOLOGY

A

A student should be able to operate technology-based tools.

A student who meets the content standard should:

- 1) use a computer to enter and retrieve information;
- 2) use technological tools for learning, communications, and productivity;
- 3) use local and worldwide networks;
- 4) manage and maintain technology tools; and
- 5) diagnose and solve common technology problems.

B

A student should be able to use technology to locate, select, and manage information.

A student who meets the content standard should:

- 1) identify and locate information sources using technology;
- 2) choose sources of information from a variety of media; and
- 3) select relevant information by applying accepted research methods.

C

A student should be able to use technology to explore ideas, solve problems, and derive meaning.

A student who meets the content standard should:

- 1) use technology to observe, analyze, interpret, and draw conclusions;
- 2) solve problems both individually and with others; and
- 3) create new knowledge by evaluating, combining, or extending information using multiple technologies.

D

A student should be able to use technology to express ideas and exchange information.

A student who meets the content standard should:

- 1) convey ideas to a variety of audiences using publishing, multi-media, and communications tools;
- 2) use communications technology to exchange ideas and information; and
- 3) use technology to explore new and innovative methods for interaction with others.

E

A student should be able to use technology responsibly and understand its impact on individuals and society.

A student who meets the content standard should:

- 1) evaluate the potentials and limitations of existing technologies;
- 2) discriminate between responsible and irresponsible uses of technology;
- 3) respect others' rights of privacy in electronic environments;
- 4) demonstrate ethical and legal behavior regarding intellectual property, which is the manifestation of an original idea, such as computer software, music, or literature;
- 5) examine the role of technology in the workplace and explore careers that require the use of technology;
- 6) evaluate ways that technology impacts culture and the environment;
- 7) integrate the use of technology into daily living; and
- 8) recognize the implications of emerging technologies.

EMPLOYABILITY

A

A student should be able to develop and be able to use employability skills in order to effectively make the transition from school to work and lifelong learning.

A student who meets the content standard should:

- 1) develop and maintain a work ethic necessary for success in the workplace that includes honesty, integrity, dependability, punctuality, self-discipline, initiative, reliability, accuracy, productivity, respect, and perseverance;
- 2) understand how to apply skills and academic knowledge in a variety of work settings;
- 3) understand the process for seeking employment including résumé development, application completion, interview skills, and appropriate dress for work settings;
- 4) understand the process for developing self-employment opportunities including marketing studies, business plan development, and managing business finances;
- 5) understand how an individual job fits into the overall organization and how the organization fits into the overall economy;
- 6) understand the need for safe practices in workplaces; and
- 7) understand employer and employee rights and responsibilities.

B

A student should be able to identify career interests and plan for career options.

A student who meets the content standard should:

- 1) identify and appreciate personal interests, aptitudes, abilities, and priorities;
- 2) identify possible career options, considering both employment and self employment, and understand how changes in the workplace affect career choice;
- 3) use labor market information to identify occupational and economic trends and opportunities, and evaluate possible career options;
- 4) identify education and/or training needed for career options and advancement, and develop a career plan; and
- 5) identify resources available to support education and training related to career possibilities.

LIBRARY/INFORMATION LITERACY

A

A student should understand how information and resources are organized.

A student who meets the content standard should:

- 1) recognize that libraries use classification systems to organize, store, and provide access to information and resources;
- 2) understand how library classification and subject heading systems work;
- 3) understand how information in print, non-print, and electronic formats is organized and accessed;
- 4) search for information and resources by author, title, subject, or keyword, as appropriate; and
- 5) identify and use search strategies and terms that will produce successful results.

B

A student should understand and use research processes necessary to locate, evaluate, and communicate information and ideas.

A student who meets the content standard should:

- 1) state a problem, question, or information need;
- 2) consider the variety of available resources and determine which are most likely to be useful;
- 3) access information;
- 4) evaluate the validity, relevancy, currency, and accuracy of information;
- 5) organize and use information to create a product; and
- 6) evaluate the effectiveness of the product to communicate the intended message.

C

A student should recognize that being an independent reader, listener, and viewer of material in print, non-print, and electronic formats will contribute to personal enjoyment and lifelong learning.

A student who meets the content standard should:

- 1) read for pleasure and information;
- 2) read, listen, and view a wide variety of literature and other creative expressions; and
- 3) recognize and select materials appropriate to personal abilities and interests.

D

A student should be aware of the freedom to seek information and possess the confidence to pursue information needs beyond immediately available sources.

A student who meets the content standard should:

- 1) know how to access information through local, national, and international sources in printed and electronic formats;
- 2) recognize the importance of access to information and ideas in a democratic society;
- 3) access information on local, state, national, and world cultures and issues;
- 4) evaluate information representing diverse views in order to make informed decisions; and
- 5) assimilate and understand how newly acquired information relates to oneself and others.

E

A student should understand ethical, legal, and social behavior with respect to information resources.

A student who meets the content standard should:

- 1) use library materials and information resources responsibly;
- 2) understand and respect the principles of intellectual freedom;
- 3) understand and respect intellectual property rights and copyright laws; and
- 4) develop and use citations and bibliographies.



CULTURAL STANDARDS FOR ALASKA STUDENTS

The Alaska Cultural Standards for Students were developed by the Alaska Native Knowledge Network in 1998. They also were adopted by the State Board of Education & Early Development in the same year. The Cultural Standards are meant to enrich the Content

Standards and provide guidelines for nurturing and building in students the rich and varied cultural traditions that continue to be practiced in communities throughout Alaska.

The standards are broad statements of what students should know and be able to do as a result of their experience in a school that is aware of and sensitive to the surrounding physical and cultural environment.

CULTURAL STANDARDS

A

Culturally-knowledgeable students are well grounded in the cultural heritage and traditions of their community.

Students who meet this cultural standard are able to:

- 1) assume responsibilities for their role in relation to the well-being of the cultural community and their lifelong obligations as a community member;
- 2) recount their own genealogy and family history;
- 3) acquire and pass on the traditions of their community through oral and written history;
- 4) practice their traditional responsibilities to the surrounding environment;
- 5) reflect through their own actions the critical role that the local heritage language plays in fostering a sense of who they are and how they understand the world around them;
- 6) live a life in accordance with the cultural values and traditions of the local community and integrate them into their everyday behavior; and
- 7) determine the place of their cultural community in the regional, state, national, and international political and economic systems.

B

Culturally-knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life.

Students who meet this cultural standard are able to:

- 1) acquire insights from other cultures without diminishing the integrity of their own;
- 2) make effective use of the knowledge, skills, and ways of knowing from their own cultural traditions to learn about the larger world in which they live;
- 3) make appropriate choices regarding the long-term consequences of their actions; and
- 4) identify appropriate forms of technology and anticipate the consequences of their use for improving the quality of life in the community.

C

Culturally-knowledgeable students are able to actively participate in various cultural environments.

Students who meet this cultural standard are able to:

- 1) perform subsistence activities in ways that are appropriate to local cultural traditions;
- 2) make constructive contributions to the governance of their community and the well-being of their family;

C (continued)

- 3) attain a healthy lifestyle through which they are able to maintain their social, emotional, physical, intellectual, and spiritual well-being; and
- 4) enter into and function effectively in a variety of cultural settings.

D

Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning.

Students who meet this cultural standard are able to:

- 1) acquire in-depth cultural knowledge through active participation and meaningful interaction with Elders;
- 2) participate in and make constructive contributions to the learning activities associated with a traditional camp environment;
- 3) interact with Elders in a loving and respectful way that demonstrates an appreciation of their role as culture-bearers and educators in the community;
- 4) gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance;
- 5) identify and utilize appropriate sources of cultural knowledge to find solutions to everyday problems; and
- 6) engage in a realistic self-assessment to identify strengths and needs and make appropriate decisions to enhance life skills.

E

Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them.

Students who meet this cultural standard are able to:

- 1) recognize and build upon the interrelationships that exist among the spiritual, natural, and human realms in the world around them, as reflected in their own cultural traditions and beliefs as well as those of others;
- 2) understand the ecology and geography of the bioregion they inhabit;
- 3) demonstrate an understanding of the relationship between world view and the way knowledge is formed and used;
- 4) determine how ideas and concepts from one knowledge system relate to those derived from other knowledge systems;
- 5) recognize how and why cultures change over time;
- 6) anticipate the changes that occur when different cultural systems come in contact with one another;
- 7) determine how cultural values and beliefs influence the interaction of people from different cultural backgrounds; and
- 8) identify and appreciate who they are and their place in the world.

Introduction to Science Performance Standards

(Grade Level Expectations)

The Alaska Science Performance Standards/Grade Level Expectations (PSGLEs) have been developed for grades 3 through 11 in fulfillment of the No Child Left Behind Act of 2001 (NCLB) requirements.

This document is intended to provide a road map for the development of assessment items as well as the basis upon which school districts refine, align, and develop their science curriculum. The content described by the PSGLEs does not represent the entire science curriculum for a grade or course. Nor does it represent the final word on the science content that is presented since one of the basic understandings in science is that our knowledge continues to grow and change as we gather more evidence about a subject. The PSGLEs indicate core content to be mastered by the end of a given grade. Science content can be added and enriched as appropriate for a district program, school, or student. It may be necessary to introduce some skills at an earlier grade in order for students to achieve mastery at a given level. Similarly, skills will need to be maintained after mastery has occurred at a given grade level.

The Alaska Science PSGLEs are aligned to the Alaska Science Content Standards. The Content Standards were revised in 2003 to align with the National Science Education Standards. Participants in the development of the PSGLEs actively researched the concepts and skills contained within this document.

References

National Research Council (U.S.). (1996). *National Science Education Standards: Observe, interact, change, learn*. Washington, DC: National Academy Press.

Project 2061 (American Association for the Advancement of Science). (2001). *Atlas of science literacy*. Washington, DC: American Association for the Advancement of Science: National Science Teachers Association.

SCIENCE PERFORMANCE STANDARDS (Grade Level Expectations)

The Science Content Standards are grouped into seven strands, A-1 through G-1.

Each PSGLE includes a bolded statement called the “stem.” Each stem is the same or similar across the grades for a given PSGLE and is meant to communicate the main curriculum and instructional focus of the PSGLE across the grades.

The number in brackets indicates the grade level.

A1—Science as Inquiry and Process		
GR ADE 3	GR ADE 4	GR ADE 5
<p>The student demonstrates an understanding of the processes of science by</p> <p>[3] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating</p> <p>[3] SA1.2 observing and describing their world to answer simple questions</p>	<p>The student demonstrates an understanding of the processes of science by</p> <p>[4] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating*</p> <p>[4] SA1.2 observing, measuring, and collecting data from explorations and using this information to classify, predict, and communicate</p>	<p>The student demonstrates an understanding of the processes of science by</p> <p>[5] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating*</p> <p>[5] SA1.2 using quantitative and qualitative observations to create their own inferences and predictions</p>
<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[3] SA2.1 answering “how do you know?” questions with reasonable answers</p>	<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[4] SA2.1 supporting their ideas with observations and peer review (L)</p>	<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[5] SA2.1 supporting their <u>statements with facts from a variety of resources and by identifying their sources</u> (L)</p>
<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by</p> <p>[3] SA3.1 observing local conditions that determine which plants and/or animals survive (L)</p>	<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by</p> <p>[4] SA3.1 identifying the local limiting factors (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive (L)</p>	<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by</p> <p>[5] SA3.1 <u>identifying the limiting factors</u> (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive</p>

PSGLEs repeated with no changes across grade levels are marked with asterisks to indicate that the PSGLE assumes increasing complexity to indicate growth in the PSGLE.

Note: Items differentiated with an “i.e.” indicate that statewide assessment items may be written only to the content contained within the statement in the parentheses. Items differentiated with an “e.g.” do not limit assessment items to that content, but indicate examples of content that may be used in statewide assessment items.

Some PSGLEs have been identified as Local. They are for local assessment and will not be on a state assessment.

The number indicates the Content Standard and the Grade Level Expectation number; thus PSGLE [4] SA3.1 represents Content Standard SA3, and the first PSGLE for that Content Standard for grade 4.

Differences between grade levels are underlined.

Participants in the development of the PSGLEs actively researched the concepts and skills contained within this document.

References

National Research Council (U.S.). (1996). *National Science Education Standards: Observe, interact, change, learn*. Washington, DC: National Academy Press.

Project 2061 (American Association for the Advancement of Science). (2001). *Atlas of science literacy*. Washington, DC: American Association for the Advancement of Science: National Science Teachers Association.

A1—Science as Inquiry and Process

- SA Students develop an understanding of the processes and applications of scientific inquiry.
- SA1 Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments.
- SA2 Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review.
- SA3 Students develop an understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and that local applications provide opportunity for understanding scientific concepts and global issues.

GRADE 3	GRADE 4	GRADE 5
<p>The student demonstrates an understanding of the processes of science by</p> <p>[3] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating</p> <p>[3] SA1.2 observing and describing the student’s own world to answer simple questions</p>	<p>The student demonstrates an understanding of the processes of science by</p> <p>[4] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating*</p> <p>[4] SA1.2 observing, measuring, and collecting data from explorations and using this information to classify, predict, and communicate</p>	<p>The student demonstrates an understanding of the processes of science by</p> <p>[5] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating*</p> <p>[5] SA1.2 using quantitative and qualitative observations to create inferences and predictions</p>
<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[3] SA2.1 answering “how do you know?” questions with reasonable answers</p>	<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[4] SA2.1 supporting the student’s own ideas with observations and peer review (L)</p>	<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[5] SA2.1 supporting the student’s own <u>statements with facts from a variety of resources and by identifying their sources</u> (L)</p>
<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by</p> <p>[3] SA3.1 observing local conditions that determine which plants and/or animals survive (L)</p>	<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by</p> <p>[4] SA3.1 identifying the local limiting factors (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive (L)</p>	<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by</p> <p>[5] SA3.1 <u>identifying the limiting factors</u> (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive</p>

* Same concept at a higher level

B1— Concepts of Physical Science

- SB Students develop an understanding of the concepts, models, theories, universal principles, and facts that explain the physical world.
- SB1 Students develop an understanding of the characteristic properties of matter and the relationship of these properties to their structure and behavior.
- SB2 Students develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, may be unavailable for use, and is ultimately conserved.
- SB3 Students develop an understanding of the interactions between matter and energy, including physical, chemical, and nuclear changes, and the effects of these interactions on physical systems.
- SB4 Students develop an understanding of motions, forces, their characteristics and relationships, and natural forces and their effects.

GRADE 3	GRADE 4	GRADE 5
<p>The student demonstrates an understanding of the structure and properties of matter by</p> <p>[3] SB1.1 classifying matter according to physical properties (i.e., color, size, shape, weight, texture, flexibility)</p>	<p>The student demonstrates an understanding of the structure and properties of matter by</p> <p>[4] SB1.1 identifying and comparing the characteristics of gases, liquids, and solids</p>	<p>The student demonstrates an understanding of the structure and properties of matter by</p> <p>[5] SB1.1 comparing models that represent matter as solids, liquids, or gases and the changes from one state to another (L)</p>
<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by</p> <p>[3] SB2.1 classifying materials as insulators or conductors (i.e., fur, metal, wood, plastic) and identifying their applications</p>	<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by</p> <p>[4] SB2.1 investigating the effectiveness of different insulating and conducting materials with respect to heat flow and record the results (L)</p>	<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by</p> <p>[5] SB2.1 classifying the changes (i.e., heat, light, sound, and motion) that electrical energy undergoes in common household appliances (i.e., toaster, blender, radio, light bulb, heater)</p>
<p>The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by</p> <p>[3] SB3.1 recognizing that temperature changes cause changes in phases of substances (e.g., ice changing to liquid, water changing to water vapor, and vice versa)</p>	<p>The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by</p> <p>[4] SB3.1 <u>explaining</u> that temperature changes cause changes in phases of substances (e.g., ice changing to liquid water and liquid water to water vapor)</p>	<p>The student demonstrates understanding of the interactions between matter and energy and the effects of these interactions on systems by</p> <p>[5] SB3.1 identifying physical and chemical changes based on observable characteristics (e.g., tearing paper vs. burning paper)</p>
<p>The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by</p> <p>[3] SB4.2 recognizing that objects can be moved without being touched (e.g., using magnets, falling objects, static electricity)</p>	<p>The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by</p> <p>[4] SB4.1 simulating that changes in speed or direction of motion are caused by forces (L)</p>	<p>The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by</p> <p>[5] SB4.1 investigating that the greater the force acting on an object, the greater the change in motion will be (L)</p>

SB4.1 is not addressed until grade 4.

C1—Concepts of Life Science

- SC Students develop an understanding of the concepts, models, theories, facts, evidence, systems, and processes of life science.
- SC1 Students develop an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution.
- SC2 Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.
- SC3 Students develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

GRADE 3	GRADE 4	GRADE 5
<p>The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by</p> <ul style="list-style-type: none"> [3] SC1.1 sorting Alaskan plants and/or animals using physical characteristics (e.g., leaves, beaks) (L) [3] SC1.2 describing how some traits (e.g., claws, teeth, camouflage) of living organisms have helped them survive as a species 	<p>The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by</p> <ul style="list-style-type: none"> [4] SC1.1 showing the relationship between physical characteristics of Alaskan organisms and the environment in which they live [4] SC1.2 describing fossil evidence (e.g., casts, track ways, imprints, etc.) of extinct organisms 	<p>The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by</p> <ul style="list-style-type: none"> [5] SC1.1 contrasting inherited traits (e.g., flower color, number of limbs) with those that are not (riding a bike, scar from an accident) [5] SC1.2 making reasonable inferences about fossil organisms based on physical evidence
<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by</p> <ul style="list-style-type: none"> [3] SC2.1 sorting animals and plants into groups based on appearance and behaviors [3] SC2.2 observing and comparing external features of plants and of animals that may help them grow, survive, and reproduce 	<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by</p> <ul style="list-style-type: none"> [4] SC2.1 choosing appropriate tools (i.e., hand lens, microscopes, ruler, balance) to examine the basic structural components (e.g., stems, leaves, fish scales, wings) of living things [4] SC2.2 describing the basic characteristics and requirements of living things 	<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by</p> <ul style="list-style-type: none"> [5] SC2.1 identifying and sorting animals into groups using basic external and internal features [5] SC2.2 explaining how external features and internal systems (i.e., respiratory, excretory, skeletal, circulatory, and digestive) of plants and animals may help them grow, survive, and reproduce [5] SC2.3 recognizing that organisms are composed of cells
<p>The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by</p> <ul style="list-style-type: none"> [3] SC3.1 identifying and sorting examples of living and non-living things in the local environment (L) [3] SC3.2 organizing a simple food chain of familiar plants and animals (L) 	<p>The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by</p> <ul style="list-style-type: none"> [4] SC3.1 identifying examples of living and non-living things <u>and the relationship between them</u> (e.g., living things need water, herbivores need plants) [4] SC3.2 <u>identifying</u> a simple food chain of familiar plants and animals, diagramming how energy flows through it; describing the effects of removing one link 	<p>The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by</p> <ul style="list-style-type: none"> [5] SC3.1 diagramming how matter and energy are transferred within and between living and nonliving things [5] SC3.2 <u>organizing</u> a simple food chain of familiar plants and animals <u>that traces the source of the energy back to sunlight</u>

D1— Concepts of Earth Science

- SD Students develop an understanding of the concepts, processes, theories, models, evidence, and systems of earth and space sciences.
- SD1 Students develop an understanding of Earth’s geochemical cycles.
- SD2 Students develop an understanding of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth.
- SD3 Students develop an understanding of the cyclical changes controlled by energy from the sun and by Earth’s position and motion in our solar system.
- SD4 Students develop an understanding of the theories regarding the evolution of the universe.

GRADE 3	GRADE 4	GRADE 5
<p>The student demonstrates an understanding of geochemical cycles by</p> <ul style="list-style-type: none"> [3] SD1.1 recognizing that most rocks are composed of combinations of different substances [3] SD1.2 describing the water cycle to show that water circulates through the crust, oceans, and atmosphere of Earth 	<p>The student demonstrates an understanding of geochemical cycles by</p> <ul style="list-style-type: none"> [4] SD1.1 describing that most smaller rocks come from the breaking and weathering of larger rocks as part of the rock cycle [4] SD1.2 recognizing the physical properties of water as they relate to the rock cycle 	<p>The student demonstrates an understanding of geochemical cycles by</p> <ul style="list-style-type: none"> [5] SD1.1 <u>observing a model of the rock cycle</u> showing that smaller rocks come from the breaking and weathering of larger rocks <u>and that smaller rocks (e.g., sediments and sands) may combine with plant materials to form soils</u> (L)
<p>The student demonstrates an understanding of the forces that shape Earth by</p> <ul style="list-style-type: none"> [3] SD2.1 identifying and comparing a variety of Earth’s land features (i.e., rivers, deltas, lakes, glaciers, mountains, valleys, and islands) 	<p>The student demonstrates an understanding of the forces that shape Earth by</p> <ul style="list-style-type: none"> [4] SD2.1 observing models of how waves, wind, water, and ice shape and reshape the Earth’s surface by eroding rock and soil (L) [4] SD2.2 identifying causes (i.e., earthquakes, tsunamis, volcanoes, floods, landslides, and avalanches) of rapid changes on the surface 	<p>The student demonstrates an understanding of the forces that shape Earth by</p> <ul style="list-style-type: none"> [5] SD2.1 <u>describing</u> how wind and water tear down and <u>build up</u> the Earth’s surface <u>resulting in new land formations (i.e., deltas, moraines, and canyons)</u>
<p>The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by</p> <ul style="list-style-type: none"> [3] SD3.1 using recorded weather patterns (e.g., temperature, cloud cover, or precipitation) to make reasonable predictions (L) 	<p>The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by</p> <ul style="list-style-type: none"> [4] SD3.1 recognizing changes to length of daylight over time and its relationship to seasons [4] SD3.2 observing that heat flows from one object to another (L) 	<p>The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by</p> <ul style="list-style-type: none"> [5] SD3.1 observing a model that shows how the regular and predictable motion of the Earth and moon determine the apparent shape (phases) of the moon over time (L) [5] SD3.2 comparing heat absorption and loss by land and water

The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by

[3] SD4.1 recognizing that objects appear smaller the farther away they are

[3] SD4.2 recognizing that objects have properties, locations, and movements that can be observed and described

[3] SD4.3 recognizing and using appropriate instruments of magnification (e.g., binoculars and telescopes) (L)

The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by

[4] SD4.1 recognizing that stars are like the sun but are so far away that they look like points of light

[4] SD4.2 recognizing that objects have properties, locations, and movements that can be observed and described*

[4] SD4.3 recognizing and using appropriate instruments of magnification (e.g., binoculars and telescopes)* (L)

The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by

[5] SD4.1 distinguishing among stars, planets, moons, comets, and meteors (L)

[5] SD4.2 recognizing that the Earth is in regular and predictable motion and this motion explains the length of a day and a year

[5] SD4.3 recognizing and using appropriate instruments of magnification (e.g., binoculars and telescopes)* (L)

* *Same concept at a higher level*

E1—Science and Technology

- SE Students develop an understanding of the relationships among science, technology, and society.
- SE1 Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events.
- SE2 Students develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits.
- SE3 Students develop an understanding of how scientific discoveries and technological innovations affect and are affected by our lives and cultures.

GRADE 3	GRADE 4	GRADE 5
<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by</p> <p>[3] SE1.1 identifying local problems and discussing solutions (L)</p>	<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by</p> <p>[4] SE1.1 recognizing that tools (e.g., spear, hammer, hand lens, kayak, computer) and processes (e.g., drying fish, sewing, photography) are an important part of human cultures</p>	<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by</p> <p>[5] SE1.1 identifying a community problem or issue and describing the information needed to develop a scientific solution (L)</p>
<p>The student demonstrates an understanding that solving problems involves different ways of thinking, perspectives, and curiosity by</p> <p>[3] SE2.1 identifying local tools and materials used in everyday life (L)</p>	<p>The student demonstrates an understanding that solving problems involves different ways of thinking, perspectives, and curiosity by</p> <p>[4] SE2.1 identifying the function of a variety of tools (e.g., spear, hammer, hand lens, kayak, computer)</p> <p>[4] SE2.2 identifying multiple explanations (e.g., oral traditions, folklore, scientific theory) of everyday events (e.g., weather, seasonal changes) (L)</p>	<p>The student demonstrates an understanding that solving problems involves different ways of thinking, perspectives, and curiosity by</p> <p>[5] SE2.1 investigating a problem or project over a specified period of time and identifying the tools and processes used in that project (L)</p> <p>[5] SE2.2 <u>comparing</u> multiple explanations (e.g., oral traditions, folklore, scientific theory) of everyday events (e.g., weather, seasonal changes) (L)</p>
<p>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by</p> <p>[3] SE3.1 listing the positive and negative effects of a single technological development in the local community (e.g., fish trap, fish wheel, four-wheeler, computer) (L)</p>	<p>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by</p> <p>[4] SE3.1 listing the positive and negative effects of a <u>scientific</u> discovery</p>	<p>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by</p> <p>[5] SE3.1 describing the various effects of an innovation (e.g., snow machines, airplanes, immunizations) on the safety, health, and environment of the local community (L)</p>

F1—Cultural, Social, Personal Perspectives, and Science

- SF Students develop an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives.
- SF1 Students develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology.
- SF2 Students develop an understanding that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world.
- SF3 Students develop an understanding of the importance of recording and validating cultural knowledge.

GRADE 3	GRADE 4	GRADE 5
<p>The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by</p> <p>[3] SF1.1-SF3.1 exploring local or traditional stories that explain a natural event (L) Cross referenced with SA3.1.</p>	<p>The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by</p> <p>[4] SF1.1-SF3.1 <u>connecting observations of nature to a local or traditional story</u> that explains a natural event (e.g., <u>animal adaptation, weather, rapid changes to Earth’s surface</u>) (L) Cross referenced with SA3.1.</p>	<p>The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by</p> <p>[5] SF1.1-SF3.1 <u>telling a local or traditional story</u> that explains a natural event (e.g., animal adaptation, weather, rapid changes to Earth’s surface) and <u>relating it to a scientific explanation</u>*(L) Cross referenced with SA3.1.</p>

G1—History and Nature of Science

- SG Students develop an understanding of the history and nature of science.
- SG1 Students develop an understanding that historical perspectives of scientific explanations demonstrate that scientific knowledge changes over time, building on prior knowledge.
- SG2 Students develop an understanding that the advancement of scientific knowledge embraces innovation and requires empirical evidence, repeatable investigations, logical arguments, and critical review in striving for the best possible explanations of the natural world.
- SG3 Students develop an understanding that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmation(s).
- SG4 Students develop an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base.

GRADE 3	GRADE 4	GRADE 5
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[3] SG 1.1**	[4] SG 1.1**	[5] SG 1.1**
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GRADE 3	GRADE 4	GRADE 5
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<p>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by</p> <p>[3] SG2.1 comparing the results of multiple observations of a single local event (L)</p>	<p>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by</p> <p>[4] SG2.1 recognizing the need for repeated measurements</p>	<p>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by</p> <p>[5] SG2.1 reviewing and recording results of investigations into the natural world</p>
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GRADE 3	GRADE 4	GRADE 5
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[3] SG 3.1**	[4] SG 3.1**	[5] SG 3.1**
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GRADE 3	GRADE 4	GRADE 5
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<p>The student demonstrates an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by</p> <p>[3] SG4.1 asking questions about the natural world</p>	<p>The student demonstrates an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by</p> <p>[4] SG4.1 using an account of a discovery to recognize that an individual's (e.g., George Washington Carver, Marie Curie) curiosity led to advancements in science</p>	<p>The student demonstrates an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by</p> <p>[5] SG4.1 <u>investigating that scientists' curiosity</u> led to advancements in science (L)</p>
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**“Most of the historical benchmarks do not appear until high school.” (Project 2061 [American Association for the Advancement of Science], 2001, p. 129)

A1—Science as Inquiry and Process

- SA Students develop an understanding of the processes and applications of scientific inquiry.
- SA1 Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments.
- SA2 Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review.
- SA3 Students develop an understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and that local applications provide opportunity for understanding scientific concepts and global issues.

GRADE 6	GRADE 7	GRADE 8
<p>The student demonstrates an understanding of the processes of science by</p> <p>[6] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating*</p> <p>[6] SA1.2 collaborating to design and conduct simple repeatable investigations (L)</p>	<p>The student demonstrates an understanding of the processes of science by</p> <p>[7] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating*</p> <p>[7] SA1.2 collaborating to design and conduct simple repeatable investigations, <u>in order to record, analyze (i.e., range, mean, median, mode), interpret data, and present findings</u> (L)</p>	<p>The student demonstrates an understanding of the processes of science by</p> <p>[8] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating*</p> <p>[8] SA1.2 collaborating to design and conduct repeatable investigations, in order to record, analyze (i.e., range, mean, median, mode), interpret data, and present findings (L)*</p>
<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[6] SA2.1 identifying and differentiating fact from opinion</p>	<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[7] SA2.1 identifying and <u>evaluating</u> the sources used to support scientific statements</p>	<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[8] SA2.1 recognizing and analyzing differing scientific explanations and models</p>
<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by</p> <p>[6] SA3.1 gathering data to build a knowledge base that contributes to the development of questions about the local environment (e.g., moose browsing, trail usage, river erosion) (L)</p>	<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by</p> <p>[7] SA3.1 designing and conducting a simple investigation about the local environment (L)</p>	<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by</p> <p>[8] SA3.1 <u>conducting research</u> to learn how the local environment is <u>used by a variety of competing interests</u> (e.g., <u>competition for habitat/resources, tourism, oil and mining companies, hunting groups</u>) (L)</p>

* Same concept at a higher level

B1—Concepts of Physical Science

- SB Students develop an understanding of the concepts, models, theories, universal principles, and facts that explain the physical world.
- SB1 Students develop an understanding of the characteristic properties of matter and the relationship of these properties to their structure and behavior.
- SB2 Students develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, may be unavailable for use, and is ultimately conserved.
- SB3 Students develop an understanding of the interactions between matter and energy, including physical, chemical, and nuclear changes, and the effects of these interactions on physical systems.
- SB4 Students develop an understanding of motions, forces, their characteristics and relationships, and natural forces and their effects.

GRADE 6	GRADE 7	GRADE 8
<p>The student demonstrates understanding of the structure and properties of matter by</p> <p>[6] SB1.1 <u>using</u> models to represent matter as it changes from one state to another</p>	<p>The student demonstrates understanding of the structure and properties of matter by</p> <p>[7] SB1.1 using physical properties (i.e., density, boiling point, freezing point, conductivity) to differentiate among and/or separate materials (i.e., elements, compounds, and mixtures)</p>	<p>The student demonstrates an understanding of the structure and properties of matter by</p> <p>[8] SB1.1 using physical and <u>chemical</u> properties (i.e., density, boiling point, freezing point, conductivity, <u>flammability</u>) to differentiate among materials (i.e., elements, compounds, and mixtures)</p>
<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by</p> <p>[6] SB2.1 recognizing that energy can exist in many forms (i.e., heat, light, chemical, electrical, mechanical)</p>	<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by</p> <p>[7] SB2.1 <u>explaining</u> that energy (i.e., heat, light, chemical, electrical, mechanical) <u>can change</u> form</p>	<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by</p> <p>[8] SB2.1 identifying the initial source and resulting change in forms of energy in common phenomena (e.g., sun to tree to wood to stove to cabin heat)</p>
<p>The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by</p> <p>[6] SB3.1 recognizing that most substances can exist as a solid, liquid, or gas depending on temperature</p>	<p>The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by</p> <p>[7] SB3.1 recognizing that most substances can exist as a solid, liquid, or gas depending <u>on the motion of their particles</u></p>	<p>The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by</p> <p>[8] SB3.1 exploring changes of state with increase or decrease of particle speed associated with heat transfer (L)</p> <p>[8] SB3.2 exploring through a variety of models (e.g., gumdrops and toothpicks) how atoms may bond together into well defined molecules or bond together in large arrays (L)</p>
<p>The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by</p> <p>[6] SB4.2 stating that every object exerts gravitational force on every other object</p> <p>[6] SB4.3 making waves move through a variety of media (L)</p> <p><i>SB4.1 is not addressed in grade 6.</i></p>	<p>The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by</p> <p>[7] SB4.1 illustrating that unbalanced forces will cause an object to accelerate</p> <p>[7] SB4.2 recognizing that electric currents and magnets can exert a force on each other</p> <p>[7] SB4.3 describing the characteristics of a wave (i.e., amplitude, wavelength, and frequency)</p>	<p>The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by</p> <p>[8] SB4.1 demonstrating (L) and explaining circular motion</p> <p>[8] SB4.2 describing the interactions between charges</p>

C1—Concepts of Life Science

- SC Students develop an understanding of the concepts, models, theories, facts, evidence, systems, and processes of life science.
- SC1 Students develop an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution.
- SC2 Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.
- SC3 Students develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

GRADE 6	GRADE 7	GRADE 8
<p>The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by</p> <ul style="list-style-type: none"> [6] SC1.1 recognizing sexual and asexual reproduction [6] SC1.2 recognizing that species survive by adapting to changes in their environment 	<p>The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by</p> <ul style="list-style-type: none"> [7] SC1.1 <u>comparing and contrasting</u> sexual and asexual reproduction [7] SC1.2 describing possible outcomes of mutations (i.e., no effect, damage, benefit) 	<p>The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by</p> <ul style="list-style-type: none"> [8] SC1.1 describing the role of genes in sexual reproduction (i.e., traits of the offspring)
<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by</p> <ul style="list-style-type: none"> [6] SC2.1 using a <u>dichotomous key</u> to <u>classify</u> animals <u>and plants</u> into groups using external or internal features [6] SC2.2 identifying basic behaviors (e.g., migration, communication, hibernation) used by organisms to meet the requirements of life [6] SC2.3 describing the levels of organization within a human body (i.e., cells, tissues, organs, systems) 	<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by</p> <ul style="list-style-type: none"> [7] SC2.1 describing the basic structure and function of plant and animal cells [7] SC2.2 identifying <u>the seven levels of classification</u> of organisms [7] SC2.3 identifying and describing the functions of human organs (i.e., heart, lungs, brain) 	<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by</p> <ul style="list-style-type: none"> [8] SC2.1 placing vertebrates into correct classes of taxonomy based on external, observable features [8] SC2.2 explaining that most organisms utilize inherited and learned behaviors to meet the basic requirements of life [8] SC2.3 describing the functions and interdependence of human body systems (i.e., circulatory, respiratory, nervous)
<p>The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by</p> <ul style="list-style-type: none"> [6] SC3.1 recognizing that organisms can cause physical and chemical changes (e.g., digestion, growth, respiration, photosynthesis) to matter and recognizing the importance of energy transfer in these changes [6] SC3.2 organizing a food <u>web</u> using familiar plants and animals 	<p>The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by</p> <ul style="list-style-type: none"> [7] SC3.1 recognizing <u>and explaining</u> that organisms can cause physical and chemical changes (e.g., digestion, growth, respiration, photosynthesis) to matter and recognizing <u>and explaining</u> the importance of energy transfer in these changes [7] SC3.2 <u>classifying organisms</u> within a food web as <u>producers, consumers, or decomposers</u> 	<p>The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by</p> <ul style="list-style-type: none"> [8] SC3.1 stating that energy flows and that matter cycles but is conserved within an ecosystem [8] SC3.2 <u>organizing</u> a food web that shows the <u>cycling matter</u>

D1—Concepts of Earth Science

- SD Students develop an understanding of the concepts, processes, theories, models, evidence, and systems of earth and space sciences.
- SD1 Students develop an understanding of Earth’s geochemical cycles.
- SD2 Students develop an understanding of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth.
- SD3 Students develop an understanding of the cyclical changes controlled by energy from the sun and by Earth’s position and motion in our solar system.
- SD4 Students develop an understanding of the theories regarding the evolution of the universe.

GRADE 6	GRADE 7	GRADE 8
<p>The student demonstrates an understanding of geochemical cycles by</p> <ul style="list-style-type: none"> [6] SD1.1 exploring the rock cycle and its relationship to igneous, metamorphic, and sedimentary rocks (L) [6] SD1.2 identifying the physical properties of water within the stages of the water cycle 	<p>The student demonstrates an understanding of geochemical cycles by</p> <ul style="list-style-type: none"> [7] SD1.1 <u>describing</u> the rock cycle and its relationship to igneous, metamorphic, and sedimentary rocks [7] SD1.2 explaining the water cycle’s connection to changes in the Earth’s surface 	<p>The student demonstrates an understanding of geochemical cycles by</p> <ul style="list-style-type: none"> [8] SD1.1 making connections between components of the locally observable geologic environment and the rock cycle (L) [8] SD1.2 <u>applying knowledge of the water cycle</u> to explain changes in the Earth’s surface
<p>The student demonstrates an understanding of the forces that shape Earth by</p> <ul style="list-style-type: none"> [6] SD2.1 describing the formation and composition (i.e., sand, silt, clay, organics) of soils [6] SD2.2 identifying and describing its layers (i.e., crust, mantle, core) [6] SD2.3 describing how the surface can change rapidly as a result of geological activities (i.e., earthquakes, tsunamis, volcanoes, floods, landslides, avalanches) 	<p>The student demonstrates an understanding of the forces that shape Earth by</p> <ul style="list-style-type: none"> [7] SD2.1 identifying strategies (e.g., reforestation, dikes, wind breaks, off road activity guidelines) for minimizing erosion [7] SD2.2 describing how the movement of the tectonic plates results in both slow changes (e.g., formation of mountains, ocean floors, and basins) and short-term events (e.g., volcanic eruptions, seismic waves, and earthquakes) on the surface 	<p>The student demonstrates an understanding of the forces that shape Earth by</p> <ul style="list-style-type: none"> [8] SD2.1 interpreting topographical maps to identify features (i.e., rivers, lakes, mountains, valleys, islands, and tundra) [8] SD2.2 using models to show the relationship between convection currents within the mantle and the large-scale movement of the surface (L)
<p>The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by</p> <ul style="list-style-type: none"> [6] SD3.1 connecting the water cycle to weather phenomena [6] SD3.2 identifying that energy transfer is affected by surface conditions (e.g., snow cover, asphalt, vegetation) and that this affects weather 	<p>The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by</p> <ul style="list-style-type: none"> [7] SD3.1 describing the weather using accepted meteorological terms (e.g., pressure systems, fronts, precipitation) [7] SD3.2 recognizing the relationship between phase changes (i.e., sublimation, condensation, evaporation) and energy transfer 	<p>The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by</p> <ul style="list-style-type: none"> [8] SD3.1 recognizing the relationship between the seasons and Earth’s tilt relative to the sun and describing the day/night cycle as caused by the rotation of the Earth every 24 hours [8] SD3.2 recognizing types of energy transfer (convection, conduction, and radiation) and how they affect weather

The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by

[6] SD4.1 contrasting characteristics of planets and stars (i.e., light reflecting, light emitting, orbiting, orbited, composition)

[6] SD4.2 defining a light year

The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by

[7] SD4.1 comparing and contrasting characteristics of planets and stars (i.e., light reflecting, light emitting, orbiting, orbited, composition)

[7] SD4.2 using light years to describe distances between objects in the universe

The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by

[8] SD4.1 creating models of the solar system illustrating size, location/position, composition, moons/rings, and conditions (L)

[8] SD4.2 comparing the brightness of a star to its distance and size

E1—Science and Technology

- SE Students develop an understanding of the relationships among science, technology, and society.
- SE1 Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events.
- SE2 Students develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits.
- SE3 Students develop an understanding of how scientific discoveries and technological innovations affect and are affected by our lives and cultures.

GRADE 6	GRADE 7	GRADE 8
<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by</p> <p>[6] SE1.1 recognizing that technology cannot always provide successful solutions for problems or fulfill every human need</p>	<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by</p> <p>[7] SE1.1 describing how public policy affects the student’s life (e.g., public waste disposal) (L)</p>	<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by</p> <p>[8] SE1.1 describing how public policy affects the student’s life and <u>participating diplomatically in evidence-based discussions</u> relating to the student’s community (L)</p>
<p>The student demonstrates an understanding that solving problems involves different ways of thinking by</p> <p>[6] SE2.1 identifying and designing a solution to a problem</p> <p>[6] SE2.2 comparing the student’s work to the work of peers in order to identify multiple paths that can be used to investigate a question or problem (L)</p>	<p>The student demonstrates an understanding that solving problems involves different ways of thinking by</p> <p>[7] SE2.1 identifying, designing, <u>testing, and revising solutions</u> to a <u>local</u> problem (L)</p> <p>[7] SE2.2 comparing the student’s work to the work of peers in order to identify multiple paths that can be used to investigate a question or problem* (L)</p>	<p>The student demonstrates an understanding that solving problems involves different ways of thinking by</p> <p>[8] SE2.1 identifying, designing, testing, and revising solutions to a local problem* (L)</p> <p>[8] SE2.2 comparing the student’s work to the work of peers in order to identify multiple paths that can be used to investigate <u>and evaluate potential solutions</u> to a question or problem (L)</p>
<p>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by</p> <p>[6] SE3.1 describing the various effects of an innovation on a <u>global level</u></p>	<p>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by</p> <p>[7] SE3.1 recognizing the effects of a past scientific discovery, invention, or scientific breakthrough (e.g., DDT, internal combustion engine)</p>	<p>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by</p> <p>[8] SE3.1 <u>predicting the possible effects of a recent</u> scientific discovery, invention, or scientific breakthrough (L)</p>

* Same concept at a higher level

F1—Cultural, Social, Personal Perspectives, and Science

- SF Students develop an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives.
- SF1 Students develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology.
- SF2 Students develop an understanding that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world.
- SF3 Students develop an understanding of the importance of recording and validating cultural knowledge.

GRADE 6	GRADE 7	GRADE 8
<p>The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by</p> <p>[6] SF1.1-SF3.1 telling a local or traditional story that explains a natural event (e.g., animal adaptation, weather, rapid changes to Earth’s surface) and relating it to a scientific explanation* (L). Cross referenced with SA3.1.</p>	<p>The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by</p> <p>[7] SF1.1-SF3.1 investigating the basis of local knowledge (e.g., describing and predicting weather) and sharing that information (L). Cross referenced with SA3.1.</p>	<p>The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by</p> <p>[8] SF1.1-SF3.1 <u>describing</u> how local knowledge, <u>culture</u>, <u>and the technologies of various activities (e.g., hunting, fishing, subsistence) influence the development of scientific knowledge</u> (L). Cross referenced with SA3.1.</p>

* Same concept at a higher level

G1—History and Nature of Science

- SG Students develop an understanding of the history and nature of science.
- SG1 Students develop an understanding that historical perspectives of scientific explanations demonstrate that scientific knowledge changes over time, building on prior knowledge.
- SG2 Students develop an understanding that the advancement of scientific knowledge embraces innovation and requires empirical evidence, repeatable investigations, logical arguments, and critical review in striving for the best possible explanations of the natural world.
- SG3 Students develop an understanding that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmation(s).
- SG4 Students develop an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base.

GRADE 6	GRADE 7	GRADE 8
<p>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by</p> <p>[6] SG1.1**</p> <p>[6] SG2.1 recognizing differences in results of repeated experiments</p>	<p>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by</p> <p>[7] SG1.1**</p> <p>[7] SG2.1 <u>explaining</u> differences in results of repeated experiments</p>	<p>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by</p> <p>[8] SG1.1**</p> <p>[8] SG2.1 <u>describing</u> how repeating experiments improves the likelihood of accurate results</p>
<p>See [6] SE 3.1</p>	<p>The student demonstrates an understanding that scientific knowledge is ongoing and subject to change by</p> <p>[7] SG3.1 revising a personal idea when presented with experimental/observational data inconsistent with that personal idea (e.g., the rates of falling bodies of different masses) (L)</p>	<p>The student demonstrates an understanding that scientific knowledge is ongoing and subject to change by</p> <p>[8] SG3.1 revising a personal idea when presented with experimental/observational data inconsistent with that personal idea (e.g., the rates of falling bodies of different masses)* (L)</p>
<p>[6] SG4.1**</p>	<p>[7] SG4.1**</p>	<p>[8] SG4.1**</p>

* Same concept at a higher level

**“Most of the historical benchmarks do not appear until high school.” (Project 2061 [American Association for the Advancement of Science], 2001, p. 129)

Project 2061 (American Association for the Advancement of Science). (2001). *Atlas of science literacy*. Washington, DC: American Association for the Advancement of Science: National Science Teachers Association.

A1—Science as Inquiry and Process

- SA Students develop an understanding of the processes and applications of scientific inquiry.
- SA1 Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments.
- SA2 Students develop an understanding that the processes of science require integrity, logical reasoning, skepticism, openness, communication, and peer review.
- SA3 Students develop an understanding that culture, local knowledge, history, and interaction with the environment contribute to the development of scientific knowledge, and that local applications provide opportunity for understanding scientific concepts and global issues.

GRADE 9	GRADE 10	GRADE 11
<p>The student demonstrates an understanding of the processes of science by</p> <p>[9] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating*</p> <p>[9] SA1.2 hypothesizing, designing a controlled experiment, making qualitative and quantitative observations, interpreting data, and using this information to communicate conclusions</p>	<p>The student demonstrates an understanding of the processes of science by</p> <p>[10] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, <u>analyzing data</u>, <u>developing models</u>, inferring, and communicating</p> <p>[10] SA1.2 <u>reviewing pertinent literature</u>, hypothesizing, making qualitative and quantitative observations, controlling experimental variables, <u>analyzing data statistically</u> (i.e., <u>mean</u>, <u>median</u>, <u>mode</u>), and using this information to draw conclusions, <u>compare results to others</u>, <u>suggest further experimentation</u>, and <u>apply student’s conclusions to other problems</u> (L)</p>	<p>The student demonstrates an understanding of the processes of science by</p> <p>[11] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, analyzing data, developing models, inferring, and communicating*</p> <p>[11] SA1.2 recognizing and analyzing multiple explanations and models, using this information to revise student’s own explanation or model if necessary (L)</p>
<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[9] SA2.1 formulating conclusions that are logical and supported by evidence</p>	<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[10] SA2.1 examining methodology and conclusions to identify bias and determining if evidence logically supports the conclusions</p>	<p>The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by</p> <p>[11] SA2.1 evaluating the credibility of cited sources when conducting the student’s own scientific investigation (L)</p>
		<p>The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by</p> <p>[11] SA3.1 conducting research and communicating results to solve a problem (e.g., fish and game management, building permits, mineral rights, land use policies) (L)</p>

*Same concept at a higher level

B1—Concepts of Physical Science

- SB Students develop an understanding of the concepts, models, theories, universal principles, and facts that explain the physical world.
- SB1 Students develop an understanding of the characteristic properties of matter and the relationship of these properties to their structure and behavior.
- SB2 Students develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, may be unavailable for use, and is ultimately conserved.
- SB3 Students develop an understanding of the interactions between matter and energy, including physical, chemical, and nuclear changes, and the effects of these interactions on physical systems.
- SB4 Students develop an understanding of motions, forces, their characteristics and relationships, and natural forces and their effects.

GRADE 9	GRADE 10	GRADE 11
<p>The student demonstrates an understanding of the structure and properties of matter by</p> <p>[9] SB1.1 describing atoms and their base components (i.e., protons, neutrons, electrons)</p>	<p>The student demonstrates an understanding of the structure and properties of matter by</p> <p>[10] SB1.1 <u>using the periodic table</u> to describe atoms in terms of their base components (i.e., protons, neutrons, electrons)</p>	<p>The student demonstrates an understanding of the structure and properties of matter by</p> <p>[11] SB1.1 predicting the properties of an element (i.e., reactivity, metal, non-metal) using the periodic table and verifying the predictions through experimentation (L)</p>
<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by</p> <p>[9] SB2.1 applying the concepts of heat transfer (i.e., conduction, convection, radiation) to Alaskan dwellings</p> <p>[9] SB2.2 recognizing simple electrical circuits</p>	<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by</p> <p>[10] SB2.1 examining energy (i.e., nuclear, electromagnetic, chemical, mechanical, thermal) transfers, transformations, and efficiencies by comparing useful energy to total energy</p>	<p>The student demonstrates an understanding of how energy can be transformed, transferred, and conserved by</p> <p>[11] SB2.1 <u>demonstrating</u> energy (e.g., nuclear, electromagnetic, chemical, mechanical, thermal) transfers and transformations by comparing useful energy to total energy (<u>entropy</u>) (L)</p>
<p>The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by</p> <p>[9] SB3.1 recognizing that a chemical reaction has taken place</p> <p>[9] SB3.2 explaining that in chemical and nuclear reactions, energy (e.g., heat, light, mechanical, and electrical) is transferred into and out of a system</p> <p>[9] SB3.3 recognizing that atoms emit and absorb electromagnetic radiation</p>	<p>The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by</p> <p>[10] SB3.1 describing the behavior of electrons in chemical bonding</p> <p>[10] SB3.2 recognizing that radioactivity is a result of the decay of unstable nuclei</p> <p>[10] SB3.3 comparing the relative wavelengths and applications of different forms of electromagnetic radiation (i.e., x-ray, visible, infrared, microwaves, radio)</p>	<p>The student demonstrates an understanding of the interactions between matter and energy and the effects of these interactions on systems by</p> <p>[11] SB3.1 predicting how an atom can interact with other atoms based on its electron configuration and verifying the results (L)</p> <p>[11] SB3.2 researching applications of nuclear reactions in which a small amount of matter is converted directly into a huge amount of energy (i.e., $E=MC^2$) (L)</p>

The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by

[9] SB4.1 explaining the relationship of motion to an object's mass and the applied force

[9] SB4.2 recognizing that the gravitational attraction between objects is proportional to their masses and decreasing with their distance

[9] SB4.3 describing the interactions of waves (i.e., reflection, refraction, wave addition)

The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by

[10] SB4.1 recognizing that when one thing exerts a force on another, an equal amount of force is exerted back on it

[10] SB4.2 explaining that different kinds of materials respond to electric and magnetic forces (i.e., conductors, insulators, magnetic, and non-magnetic materials)

The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by

[11] SB4.1 conducting an experiment to demonstrate that when one thing exerts a force on another, an equal amount of force is exerted back on it (L)

[11] SB4.2 conducting an experiment to explore the relationship between magnetic forces and electric forces to show that they can be thought of as different aspects of a single electromagnetic force (e.g., generators and motors) (L)

C1—Concepts of Life Science

- SC Students develop an understanding of the concepts, models, theories, facts, evidence, systems, and processes of life science.
- SC1 Students develop an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution.
- SC2 Students develop an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms.
- SC3 Students develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

GRADE 9	GRADE 10	GRADE 11
<p>The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by</p> <p>[9] SC1.1 recognizing that all organisms have chromosomes made of DNA and that DNA determines traits</p> <p>[9] SC1.2 using probabilities to recognize patterns of inheritance (e.g., Punnett Squares)</p> <p>[9] SC1.3 inferring evolutionary pathways from evidence (e.g., fossils, geologic samples, recorded history)</p>	<p>The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by</p> <p>[10] SC1.2 explaining how the processes of natural selection can cause speciation and extinction</p> <p>[10] SC1.3 examining issues related to genetics (L)</p> <p><i>SC1.1 is not addressed in grade 10.</i></p>	<p>The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by</p> <p>[11] SC1.1 relating the structure of DNA to characteristics of an organism</p> <p>[11] SC1.2 researching how the processes of natural selection cause changes in species over time (L)</p>
<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by</p> <p>[9] SC2.1 describing and comparing the characteristics of phyla/divisions from each kingdom</p> <p>[9] SC2.3 stating the function of major physiological systems (i.e., circulatory, excretory, digestive, respiratory, reproductive, nervous, immune, endocrine, musculoskeletal, and integumentary)</p> <p><i>SC2.2 is not addressed in grade 9.</i></p>	<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by</p> <p>[10] SC2.1 describing the structure-function relationship (e.g., joints, lungs)</p> <p>[10] SC2.2 explaining that cells have specialized structures in which chemical reactions occur</p> <p>[10] SC2.3 explaining the functions of organs of major systems (i.e., respiratory, digestive, circulatory, reproductive, nervous, musculoskeletal, and excretory)</p> <p>[10] SC2.4 tracing the pathways of the digestive, circulatory, and excretory systems</p>	<p>The student demonstrates an understanding of the structure, function, behavior, development, life cycles, and diversity of living organisms by</p> <p>[11] SC2.1 describing the structure-function relationship*</p> <p>[11] SC2.2 describing the learned behaviors (e.g., classical conditioning, imprinting, trial and error) that are utilized by living organisms to meet the requirements of life</p> <p>[11] SC2.3 describing the functions and interdependencies of the organs within the immune system and within the endocrine system</p>

* Same concept at a higher level

The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by

[9] SC3.1 describing the carbon and nitrogen cycle within an ecosystem and how the continual input of energy from sunlight keeps the process going (L)

[9] SC3.3 identifying dynamic factors (e.g., carrying capacity, limiting factors, biodiversity, and productivity) that affect population size

SC3.2 is not addressed in grade 9.

** Same concept at a higher level*

The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by

[10] SC3.1 relating the carbon cycle to global climate change

[10] SC3.2 exploring ecological relationships (e.g., competition, niche, feeding relationships, symbiosis) (L)

The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by

[11] SC3.1 relating the carbon cycle to global climate change*

[11] SC3.2 analyzing the potential impacts of changes (e.g., climate change, habitat loss/gain, cataclysms, human activities) within an ecosystem

D1—Concepts of Earth Science

- SD Students develop an understanding of the concepts, processes, theories, models, evidence, and systems of earth and space sciences.
- SD1 Students develop an understanding of Earth’s geochemical cycles.
- SD2 Students develop an understanding of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth.
- SD3 Students develop an understanding of the cyclical changes controlled by energy from the sun and by Earth’s position and motion in our solar system.
- SD4 Students develop an understanding of the theories regarding the evolution of the universe.

GRADE 9	GRADE 10	GRADE 11
<p>The student demonstrates an understanding of geochemical cycles by</p> <p>[9] SD1.1 using a model to demonstrate the rock cycle (L)</p> <p>[9] SD1.2 applying knowledge of the water cycle to explain changes in the Earth’s surface*</p>	<p>The student demonstrates an understanding of geochemical cycles by</p> <p>[10] SD1.1 using a model to <u>explain the processes (i.e., formation, sedimentation, erosion, reformation)</u> of the rock cycle</p> <p>[10] SD1.2 describing their interrelationships (i.e., water cycle, carbon cycle, oxygen cycle)</p>	<p>The student demonstrates an understanding of geochemical cycles by</p> <p>[11] SD1.1 <u>creating a model to demonstrate</u> the rock cycle (L)</p> <p>[11] SD1.2 integrating knowledge of the water cycle and biogeochemical cycling to explain changes in the Earth’s surface (L)</p>
<p>The student demonstrates an understanding of the forces that shape Earth by</p> <p>[9] SD2.1 recognizing the dynamic interaction of erosion and deposition including human causes</p> <p>[9] SD2.2 describing how the theory of plate tectonics explains the dynamic nature of its surface</p>	<p>The student demonstrates an understanding of the forces that shape Earth by</p> <p>[10] SD2.1 recognizing the dynamic interaction of erosion and deposition including human causes*</p> <p>[10] SD2.2 describing how the theory of plate tectonics explains the dynamic nature of its surface*</p>	<p>The student demonstrates an understanding of the forces that shape Earth by</p> <p>[11] SD2.1 recognizing the dynamic interaction of erosion and deposition including human causes*</p> <p>[11] SD2.2 describing how the theory of plate tectonics explains the dynamic nature of its surface*</p>
<p>The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by</p> <p>[9] SD3.1 recognizing the effect of the moon and sun on tides</p> <p>[9] SD3.2 explaining the phenomena of the aurora</p>	<p>The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by</p> <p>[10] SD3.1 describing causes, effects, preventions, and mitigations of human impact on climate</p>	<p>The student demonstrates an understanding of cycles influenced by energy from the sun and by Earth’s position and motion in our solar system by</p> <p>[11] SD3.1 describing causes, effects, preventions, and mitigations of human impact on climate*</p> <p>[11] SD3.2 exploring causes and effects related to phenomena (e.g., the aurora, solar winds, Coriolis Effect) (L)</p>

* Same concept at a higher level

The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by

- [9] SD4.1 recognizing that a star changes over time
- [9] SD4.2 explaining that the position of stars changes in the expanding universe
- [9] SD4.4 identifying the Big Bang Theory

SD4.3 is not continued in 9-11.

** Same concept at a higher level*

The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by

- [10] SD 4.1 recognizing phenomena in the universe (i.e., black holes, nebula)
- [10] SD 4.2 explaining that the position of stars changes in the expanding universe*
- [10] SD 4.4 describing the Big Bang Theory

The student demonstrates an understanding of the theories regarding the origin and evolution of the universe by

- [11] SD4.1 describing phenomena in the universe (i.e., black holes, nebula)
- [11] SD4.2 using evidence to explain how the position of stars changes in the expanding universe
- [11] SD4.4 describing the Big Bang Theory and exploring the evidence that supports it (L)

E1—Science and Technology

- SE Students develop an understanding of the relationships among science, technology, and society.
- SE1 Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events.
- SE2 Students develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits.
- SE3 Students develop an understanding of how scientific discoveries and technological innovations affect and are affected by our lives and cultures.

GRADE 9	GRADE 10	GRADE 11
<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by</p> <p>[9] SE1.1 recognizing that the value of any given technology may be different for different groups of people and at different points in time (e.g., different uses of snow machines in different regions of Alaska)</p>	<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by</p> <p>[10] SE1.1 identifying that progress in science and invention is highly interrelated to what else is happening in society</p>	<p>The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by</p> <p>[11] SE1.1 researching how social, economic, and political forces strongly influence which technology will be developed and used (L)</p>
<p>The student demonstrates an understanding that solving problems involves different ways of thinking by</p> <p>[9] SE2.1 <u>questioning, researching, modeling, simulating,</u> and testing a solution to a problem (L)</p>	<p>The student demonstrates an understanding that solving problems involves different ways of thinking by</p> <p>[10] SE2.1 questioning, researching, modeling, simulating, and testing <u>multiple solutions</u> to a problem (L)</p>	<p>The student demonstrates an understanding that solving problems involves different ways of thinking by</p> <p>[11] SE2.1 questioning, researching, modeling, simulating, and testing multiple solutions to a problem* (L)</p>
<p>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by</p> <p>[9] SE3.1 predicting <u>and evaluating</u> the possible effects of a recent scientific discovery, invention, or scientific breakthrough (L)</p>	<p>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by</p> <p>[10] SE3.1 researching a current problem, identifying possible solutions, and evaluating the impact of each solution (L)</p>	<p>The student demonstrates an understanding of how scientific discoveries and technological innovations affect our lives and society by</p> <p>[11] SE3.1 researching a current problem, identifying possible solutions, and evaluating the impact of each solution* (L)</p>

* Same concept at a higher level

F1—Cultural, Social, Personal Perspectives, and Science

- SF Students develop an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives.
- SF1 Students develop an understanding of the interrelationships among individuals, cultures, societies, science, and technology.
- SF2 Students develop an understanding that some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world.
- SF3 Students develop an understanding of the importance of recording and validating cultural knowledge.

GRADE 9

The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by

[9] SF1.1-SF3.1 describing the scientific principles involved in a subsistence activity (e.g., hunting, fishing, gardening) (L). Cross referenced with SA3.1.

GRADE 10

The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by:

[10] SF1.1-SF3.1 analyzing the competition for resources by various user groups to describe these interrelationships. Cross referenced with SA3.1.

GRADE 11

The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by

[11] SF1.1-SF3.1 investigating the influences of societal and/or cultural beliefs on science (L). Cross referenced with SA3.1.

G1—History and Nature of Science

- SG Students develop an understanding of the history and nature of science.
- SG1 Students develop an understanding that historical perspectives of scientific explanations demonstrate that scientific knowledge changes over time, building on prior knowledge.
- SG2 Students develop an understanding that the advancement of scientific knowledge embraces innovation and requires empirical evidence, repeatable investigations, logical arguments, and critical review in striving for the best possible explanations of the natural world.
- SG3 Students develop an understanding that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmation(s).
- SG4 Students develop an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base.

GRADE 9	GRADE 10	GRADE 11
<p>The student demonstrates an understanding of changes in historical perspectives of science by</p> <p>[9] SG1.1 identifying those perspectives (i.e., cultural, political, religious, philosophical) that have impacted the advancement of science</p>	<p>The student demonstrates an understanding of changes in historical perspectives of science by</p> <p>[10] SG1.1 <u>describing</u> how those perspectives (i.e., cultural, political, religious, philosophical) have impacted the advancement of science</p>	
<p>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by</p> <p>[9] SG2.1 explaining the importance of innovations (i.e., microscope, immunization, computer)</p>	<p>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by</p> <p>[10] SG2.1 using an account of an event to recognize the processes of science used by historically significant scientists (e.g., Goodall, Watson & Crick, Newton)</p>	<p>The student demonstrates an understanding of the bases of the advancement of scientific knowledge by</p> <p>[11] SG2.1 describing the importance of logical arguments (i.e., thought experiments by Einstein, Hawking, Newton)</p>
<p>The student demonstrates an understanding that scientific knowledge is ongoing and subject to change by</p> <p>[9] SG3.1 describing the role of serendipity in scientific discoveries</p>	<p>The student demonstrates an understanding that scientific knowledge is ongoing and subject to change by</p> <p>[10] SG3.1 using experimental or observational data to evaluate a hypothesis</p>	<p>The student demonstrates an understanding that scientific knowledge is ongoing and subject to change by</p> <p>[11] SG3.1 investigating instances when scientists' observations were not in accord with prevailing ideas of the time (L)</p>
	<p>The student demonstrates an understanding that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base by</p> <p>[10] SG4.1 recognizing the role of these factors on scientific advancements</p>	



Introduction to Alaska History Standards

Unlike the Performance Standards/Grade Level Expectations developed for each grade in reading, writing, mathematics, and science, the Alaska History Standards reflect the cumulative knowledge a student must demonstrate in order to fulfill the Alaska history graduation requirement detailed in regulation 4 AAC 06.075 (g) High school graduation requirements.

The teaching of history should introduce students to the process of historical inquiry. This process requires critical examination of evidence and careful weighing of facts and hypotheses. It provides experience in the kind of reasoned and informed decision-making that should characterize each student's knowledge of and participation in state events and issues. For this reason, the standard for historical inquiry stands alone; the intent is to integrate this standard, where appropriate, into the standards that follow. The objective of the historical inquiry standard is to apply conceptual knowledge and skills as designated in all strands of Alaska History by problem solving, communicating, reasoning, and making connections.

This framework uses the scholarly approach of the historian to define the content of the standards. This approach presents the people, ideas, events, themes, and sources to be included in order for a student to demonstrate competency in Alaska History. While recognizing that knowledge of specifics is important, the framework design emphasizes that knowledge of context is crucial to meaning and understanding.

The framework organizes Alaska history into four central themes that give perspective and meaning to the people, ideas, and events that shaped the state. The framework also divides Alaska history into five chronological periods that structure the sequence of events.

From the statewide perspective, these are the essential learnings. The state encourages districts to add to and enrich the scope of their local Alaska history curriculum.

HISTORY PERFORMANCE STANDARDS (Grade Level Expectations)

Items differentiated with an “i.e.” indicate that assessment items may be written only to the content contained with the statement in the parentheses. Items differentiated with an “e.g.” do not limit assessment items to that content, but indicate examples of content that may be used in assessment items.

Chronological Period

Themes

The first column of each table includes suggested topics for instruction. As this is not an inclusive list, it is expected that other topics will also be explored.

Chronological Period	PEOPLE, PLACES, ENVIRONMENT	CONSUMPTION, PRODUCTION, DISTRIBUTION	INDIVIDUAL, CITIZENSHIP, GOVERNANCE, POWER	CONTINUITY AND CHANGE
<p>Colonial Era— The Russian period (1741-1867)</p> <p>Suggested Topics <i>[not an inclusive list]</i></p> <ul style="list-style-type: none"> • Rationale for European explorations • Epidemics • Utilization of Alaskan resources • Relationships with indigenous peoples • Role of significant leaders (e.g., Katlian, Baranov, Veniaminov, Netsvetov) • Missionary activities • Russian dependence on Alaska Natives • Russia’s incentive to sell 	<p>The student demonstrates an understanding of the interaction between people and their physical environment by:</p> <p>AH. PPE 2 using texts/sources to analyze the similarities and differences in the cultural attributes (e.g., language, hunting and gathering practices, art, music/dance, beliefs, worldview), movement, interactions, and settlement of Alaska Native peoples. [DOK 3] (G. D1, D4) — <i>repeated from Indigenous Alaskans</i></p> <p>AH. PPE 3 using texts/sources to analyze the effect of the historical contributions and/or influences of significant individuals, groups and local, regional, statewide, and/or international organizations. [DOK 3] (H. B4) — <i>repeated in Colonial Era, United States period</i></p>	<p>The student demonstrates an understanding of the discovery, impact, and role of natural resources by:</p> <p>AH. CPD 1 identifying patterns of growth, transformation, competition, and boom and bust, in response to use of natural resources (e.g., supply and demand of fur, minerals, and whaling). [DOK 2] (G. D1)</p>	<p>The student demonstrates an understanding of the historical rights and responsibilities of Alaskans by:</p> <p>AH. ICGP 2 using texts/sources to analyze the impacts of the relationships between Alaska Natives and Russians (i.e., Russian Orthodox Church, early fur traders, Russian American Companies, enslavement, and Creoles). [DOK 3] (H. B1d)</p>	<p>The student demonstrates an understanding of the chronology of Alaska history by:</p> <p>AH. CC 1 using texts/sources to recognize and explain the interrelationships among Alaska, national, and international events and developments (e.g., international interest, trade, commerce). [DOK 3] (H. B2)</p>

Depth of Knowledge*

History – Section B – Standard number 4

The coding in parentheses at the end of the standard indicates alignment of the Alaska History standard to existing Alaska Content Standards for social studies. G= Geography; GC= Government and Citizenship; H= History; C= Cultural Standards

* Depth of Knowledge (DOK) is the cognitive demand associated with each item. Briefly, DOK levels reflect the following: DOK 1: Recall of Information; DOK 2: Basic Reasoning; DOK 3: Complex Reasoning; DOK 4: Extended Reasoning. For additional information, please see the accompanying document, *Depth-of-Knowledge (DOK) Levels for Social Studies*.

Because the Alaska History standards are intended to provide the content to which a student demonstrates knowledge of Alaska History, the DOK assigned to each standard should be used as the ceiling to which assessment items are written. When considering the highest DOK Level as the ceiling not the target, the standard has the potential to be assessed at Depth of Knowledge Levels at the ceiling, and up to the ceiling, depending upon the demand of the standard.

Depth-of-Knowledge (DOK) Levels for Social Studies

Descriptors of DOK Levels for Social Studies (based on Webb, *Technical Issues in Large-Scale Assessment*, report published by CCSSO, December 2002)

Level 1 Recall of Information

Level 1 asks students to recall facts, terms, concepts, trends, generalizations and theories or to recognize or identify specific information contained in graphics. This level generally requires students to identify, list, or define. The items at this level usually ask the student to recall who, what, when and where. Items that require students to “describe” and “explain” could be classified at Level 1 or 2 depending on what is to be described and explained. A Level 1 “describe or explain” would recall, recite or reproduce information. Items that require students to recognize or identify specific information contained in maps, charts, tables, graphs or drawings are generally level 1.

Level 2 Basic Reasoning

Level 2 includes the engagement of some mental processing beyond recalling or reproducing a response. This level generally requires students to contrast or compare people, places, events and concepts; convert information from one form to another; give an example; classify or sort items into meaningful categories; describe, interpret or explain issues and problems, patterns, reasons, cause and effect, significance or impact, relationships, points of view or processes. A Level 2 “describe or explain” would require students to go beyond a description or explanation of recalled information to describe or explain a result or “how” or “why.”

Level 3 Complex Reasoning

Level 3 requires reasoning, using evidence, and a higher level of thinking than the previous two levels. Students would go beyond explaining or describing “how and why” to justifying the “how and why” through application and evidence. The cognitive demands at Level 3 are more complex and more abstract than Levels 1 or 2. Items at Level 3 include drawing conclusions; citing evidence; applying concepts to new situations; using concepts to solve problems; analyzing similarities and differences in issues and problems; proposing and evaluating solutions to problems; recognizing and explaining misconceptions or making connections across time and place to explain a concept or big idea.

Level 4 Extended Reasoning

Level 4 requires the complex reasoning of Level 3 with the addition of planning, investigating, or developing that will most likely require an extended period of time. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. At this level the cognitive demands should be high and the work should be very complex. Students should be required to connect and relate ideas and concepts *within* the content area or *among* content areas in order to be at this highest level. The distinguishing factor for Level 4 would be evidence through a task or product that the cognitive demands have been met. A Level 4 performance will require students to analyze and synthesize information from multiple sources, examine and explain alternative perspectives across a variety of sources, and/or describe and illustrate how common themes and concepts are found across time and place. In some Level 4 performance students will make predictions with evidence as support, develop a logical argument, or plan and develop solutions to problems.

Many on-demand assessment instruments will not include assessment activities that could be classified as Level 4. However, standards, goals, and objectives can be stated so as to expect students to perform thinking at this level. On-demand assessments that do include tasks, products, or extended responses would be classified as Level 4 when the task or response requires evidence that the cognitive requirements have been met.

HISTORY

Historical Inquiry

The student demonstrates an understanding of the methods of documenting history by:

AH. HI 1 planning and developing history projects, utilizing research tools such as: interviewing protocols, oral history, historical context, pre-interview research, primary sources, secondary sources, proper citation, corroboration, and cause and effect of historical events. [DOK 4] (H. C1-4)

	PEOPLE, PLACES, ENVIRONMENT	CONSUMPTION, PRODUCTION, DISTRIBUTION	INDIVIDUAL, CITIZENSHIP, GOVERNANCE, POWER	CONTINUITY AND CHANGE
<p>Indigenous Alaskans before western contact (time immemorial—contact)</p> <p>Suggested Topics <i>[not an inclusive list]</i></p> <ul style="list-style-type: none"> • Locations • Social organizations • Cultures • Political traditions • Natural resources • Cultural changes • Archeology • Native oral traditions 	<p>The student demonstrates an understanding of the interaction between people and their physical environment by:</p> <p>AH. PPE 1 comparing and contrasting geographic regions of Alaska. [DOK 2] (G. B4, B8)</p> <p>AH. PPE 2 using texts/sources to analyze the similarities and differences in the cultural attributes (e.g., language, hunting and gathering practices, art, music/dance, beliefs, worldview), movement, interactions, and settlement of Alaska Native peoples. [DOK 3] (G. D1, D4)</p> <p>AH. PPE 3 using texts/sources to analyze the effect of the historical contributions and/or influences of significant individuals, groups and local, regional, statewide, international organizations. [DOK 3] (H. B4)</p>		<p>The student demonstrates an understanding of the historical rights and responsibilities of Alaskans by:</p> <p>AH. ICGP 1 identifying and summarizing the structures, functions, and transformation of various attributes (e.g., leadership, decision-making, social and political organization) of traditional Alaska Native governance. [DOK 2] (GC. A4)</p>	

Colonial Era—
The Russian period
(1741-1867)

Suggested Topics
[not an inclusive list]

- Rationale for European explorations
- Epidemics
- Utilization of Alaskan resources
- Relationships with indigenous peoples
- Role of significant leaders (e.g., Katlian, Baranov, Veniaminov, Netsvetov)
- Missionary activities
- Russian dependence on Alaska Natives
- Russia's incentive to sell

PEOPLE, PLACES,
ENVIRONMENT

The student demonstrates an understanding of the interaction between people and their physical environment by:

AH. PPE 2 using texts/sources to analyze the similarities and differences in the cultural attributes (e.g., language, hunting and gathering practices, art, music/dance, beliefs, worldview), movement, interactions, and settlement of Alaska Native peoples. [DOK 3] (G. D1, D4)

AH. PPE 3 using texts/sources to analyze the effect of the historical contributions and/or influences of significant individuals, groups and local, regional, statewide, and/or international organizations. [DOK 3] (H. B4)

CONSUMPTION,
PRODUCTION, DISTRIBUTION

The student demonstrates an understanding of the discovery, impact, and role of natural resources by:

AH. CPD 1 identifying patterns of growth, transformation, competition, and boom and bust, in response to use of natural resources (e.g., supply and demand of fur, minerals, and whaling). [DOK 2] (G. D1)

INDIVIDUAL, CITIZENSHIP,
GOVERNANCE, POWER

The student demonstrates an understanding of the historical rights and responsibilities of Alaskans by:

AH. ICGP 2 using texts/sources to analyze the impacts of the relationships between Alaska Natives and Russians (i.e., Russian Orthodox Church, early fur traders, Russian American Companies, enslavement, and Creoles). [DOK 3] (H. B1d)

CONTINUITY
AND CHANGE

The student demonstrates an understanding of the chronology of Alaska history by:

AH. CC 1 using texts/sources to recognize and explain the interrelationships among Alaska, national, and international events and developments (e.g., international interest, trade, commerce). [DOK 3] (H. B2)

**Colonial Era
The United States
Period (1867-1912)**

Suggested Topics
[Not an inclusive list]

- United States' motives for purchasing Russia's interest in Alaska
- Treaty of Cession
- Legal status of Alaska Natives under the Commerce Clause and the Marshall Trilogy
- Mining Law of 1872
- Organic Act of 1884
- Role of Sheldon Jackson
- Resources (e.g., whaling, fur trading, mining, commercial fisheries)
- Gold Rush
- Nelson Act of 1905 and the dual school system
- Creation of National Forests

The student demonstrates an understanding of the interaction between people and their physical environment by:

AH. PPE 3 using texts/sources to analyze the effect of the historical contributions and/or influences of significant individuals or groups and local, regional, statewide, and/or international organizations. [DOK 3] (H. B4)

The student demonstrates an understanding of the discovery, impact, and role of natural resources by:

AH. CPD 2 using texts/source to draw conclusions about the role of the federal government in natural resource development and land management (e.g., jurisdiction, authority, agencies, programs, policies). [DOK 3] (GC. F1)

The student demonstrates an understanding of the historical rights and responsibilities of Alaskans by:

AH. ICGP 3 explaining and analyzing tribal and western concepts of land ownership and how acting upon those concepts contributes to changes in land use, control, and ownership. [DOK 4] (H. C7, C8)

AH. ICGP 4 explaining Alaskans' quest for self-determination (i.e., full rights as U.S. citizens) through the statehood movement. [DOK 1] (GC. C3)

AH.ICGP 5 explaining the impacts of military actions (e.g., Naval bombardment of Angoon, Aleut internment, military expeditions) relative to Native communities. [DOK 2] (H. B1)

IGCP 6 using texts/sources to analyze how the military population and its activities, including administrative, policing, defense, mapping, communication, and construction, have impacted communities. [DOK 3] (H. B2)

AH. ICGP 7 describing the historical basis of federal recognition of tribes, their inherent and delegated powers, the ongoing nature and diversity of tribal governance, and the plenary power of Congress. [DOK 1] (GC. C8)

The student demonstrates an understanding of the chronology of Alaska history by:

AH. CC 2 describing how policies and practices of non-natives (e.g., missionaries, miners, Alaska Commercial Company merchants) influenced Alaska Natives. [DOK 2] (H. B4, B5)

Alaska as a Territory (1912-1959)

Suggested Topics
[Not an inclusive list]

- Territorial Organic Act of 1912
- Native efforts toward civil and land rights (e.g., founding of Alaska Native Brotherhood (ANB), Alaska Native Sisterhood (ANS), and Tanana Chiefs)
- Role of significant individuals (e.g., Judge Wickersham, William Paul, Elizabeth Peratrovich, Ernest Gruening)
- Infrastructure (e.g., railroad, aviation, roads, ships)
- Indian Reorganization Act
- World War II and internment of Aleuts and Japanese Americans
- Cold War
- National Parks and National Forests, resources (e.g., oil, timber, coal)
- Constitutional Convention, constitution, and statehood

PEOPLE, PLACES, ENVIRONMENT

The student demonstrates an understanding of the interaction between people and their physical environment by:

AH. PPE 4 describing how Alaska's strategic location played an important role in military buildup and explaining the interrelated social and economic impacts. [DOK 2] (G. A5)

CONSUMPTION, PRODUCTION, DISTRIBUTION

The student demonstrates an understanding of the discovery, impact, and role of natural resources by:

AH. CPD 3 using texts/sources to draw conclusions about the significance of natural resources (e.g., fisheries, timber, Swanson River oil discovery, "sustained yield" in the Alaska Constitution) in Alaska's development and in the statehood movement. [DOK 3] (G. F1, F4)

INDIVIDUAL, CITIZENSHIP, GOVERNANCE, POWER

The student demonstrates an understanding of the historical rights and responsibilities of Alaskans by:

AH. ICGP 4 explaining Alaskans' quest for self-determination (i.e., full rights as U.S. citizens) through the statehood movement. [DOK 1] (GC. C3)

AH.ICGP 5 explaining the impacts of military actions relative to Native communities (e.g., Naval bombardment of Angoon, Aleut internment, military expeditions). [DOK 2] (H. B1)

AH. ICGP 8 describing how Alaskans, particularly the Native people, challenge the status quo to gain recognition of their civil rights (e.g., appeals to the Russian government, Ward Cove Packing Co. Case, Molly Hootch, anti-discrimination acts, women's suffrage). [DOK 2] (H. B2, GC. B5)

AH. ICGP 9 exploring the federal government's influence on settlements in Alaska (e.g., Matanuska Colony, Anchorage, Adak, Tok, Hydaburg) by establishment of post offices, military facilities, schools, courts, and railroads. [DOK 1] (G. G2, H. B1)

AH. ICGP 10 identifying the role of Alaska Native individuals and groups in actively proposing and promoting federal legislation

and policies (e.g., William Paul, Tanana Chiefs, ANB, ANS) [DOK 1] (H. A1, B2)

AH. ICGP 11 exploring federal policies and legislation (e.g., Alaska Citizenship Act, Tlingit-Haida Jurisdictional Act, Indian Citizenship Act of 1924, Alaska Reorganization Act, ANCSA) that recognized Native rights. [DOK 1] (H. B2)

CONTINUITY AND CHANGE

The student demonstrates an understanding of the chronology of Alaska history by:

AH. CC 3 describing how the roles and responsibilities in Alaska Native societies have been continuously influenced by changes in technology, economic practices, and social interactions. [DOK 2] (G. D4, H. B1b)

Alaska as a State (1959-present)

Suggested Topics
[Not an inclusive list]

- Role of significant individuals (e.g., Eben Hopson, Howard Rock, Ted Stevens, Katie John)
- Controversies of Statehood Act land selections
- Disasters (e.g., 1964 Earthquake, 1967 Interior flood, Exxon Valdez oil spill)
- Formation of Inuit Circumpolar Conference
- Formation of AFN
- Development of public education (e.g., Molly Hootch case)
- Prudhoe Bay and oil pipeline construction
- Permanent Fund
- Alaska Native Claims Settlement Act (ANCSA)
- Marine Mammal Protection Act 1972 (MMPA)
- Alaska National Interest Lands Conservation Act (ANILCA)
- Indian Self-Determination Act 1975
- Indian Child Welfare Act 1978
- Arctic National Wildlife Refuge (ANWR)
- Tourism
- Fiscal issues

The student demonstrates an understanding of the interaction between people and their physical environment by:

AH. PPE 4 describing how Alaska's strategic location played an important role in military buildup and explaining the interrelated social and economic impacts. [DOK 2] (G. A5)

AH. PPE 5 comparing and contrasting the differing perspectives between rural and urban areas. [DOK 2] (H. B1b, C. E4)

AH. PPE 6 analyzing patterns of movement and settlement. [DOK 2] (H. B4, G. D3)

AH. PPE 7 using texts/sources to explain the political, social, cultural, economic, geographic, and historic characteristics of the student's community or region. [DOK 3] (H. B1b, C. E2, E8)

The student demonstrates an understanding of the discovery, impact, and role of natural resources by:

AH. CPD 4 describing the federal government's construction and maintenance of Alaska's infrastructure (e.g., transportation, communication, public health system, education). [DOK 1] (G. D4)

AH. CPD 5 using texts/sources to analyze the multiple perspectives in the continuing debate between conservation and development of resources. [DOK 3] (G. E4, F3)

AH. CPD 6 describing the formation of Alaska Native Corporations and their impact on Alaska's economy. [DOK 2] (GC. F9)

AH. CPD 7 explaining the creation and implementation of the Permanent Fund and how it has impacted the state. [DOK 2] (GC. F9)

The student demonstrates an understanding of the historical rights and responsibilities of Alaskans by:

AH. ICGP 3 explaining and analyzing tribal and western concepts of land ownership and how acting upon those concepts contributes to changes in land use, control, and ownership (e.g., ANCSA, ANILCA). [DOK 4] (H. C7, C8)

AH. ICGP 8 describing how Alaskans, particularly the Native people, challenge the status quo to gain recognition of their civil rights (e.g., appeals to the Russian government, Ward Cove Packing Co. Case, Molly Hootch, anti-discrimination acts, women's suffrage). [DOK 2] (H. B2, GC. B5)

AH. ICGP 10 identifying the role of Alaska Native individuals and groups in actively proposing and promoting federal legislation and policies (e.g., William Paul, Tanana Chiefs, ANB, ANS) [DOK 1] (H. A1, B2)

AH. ICGP 12 using texts/sources to analyze the evolution of self-government through an examination of organic documents (i.e., Treaty of Cession, Organic Act, Territorial Act, Alaska State Constitution, Statehood Act). [DOK 3] (H. B2, B4)

The student demonstrates an understanding of the chronology of Alaska history by:

AH. CC 4 giving correct and incorrect examples to explain subsistence as a way of life. [DOK 2] (H. B1b)

AH. CC 5 defining, describing, and illustrating the economic, political, and social characteristics of the major periods, their key turning points (e.g., implementation of Prudhoe Bay pipeline, Molly Hootch case, ANCSA, ANILCA, ANWR, natural and manmade disasters, establishment of Alaska Native Corporations) and how they interrelate. [DOK 4] (H. B2)

AH. CC 6 explaining the historical context and the legal foundations (e.g., Alaska Constitution, ANCSA, MMPA, ANILCA, Katie John case) pertinent to subsistence. [DOK 1] (GC. A2, C. A4)

AH. CC 7 comparing and contrasting the perspectives of sport, commercial, and subsistence users on policies regarding fish and game management. [DOK 2] (G. E4, F5)