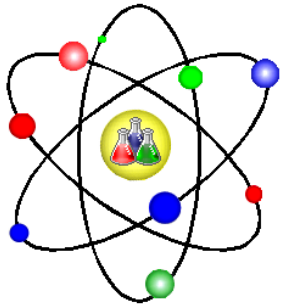
Science Curriculum

Grades K-5



Juneau School District Board of Education

Adopted February 13, 2018

JSD Elementary Science Curriculum

Juneau School District Science Curriculum, Grades K-5

JSD Elementary Science Curriculum

Introduction

"Don't forget our way of life. This wonderful thing that was born on the world, that saved our ancestors. Don't ever let it go. Hold onto it. It was born for us," - K aajaakwti, Dr. Walter Soboleff, L'eeneidi, Dog Salmon Clan Leader, Scholar

The Juneau School District K-12 Science Curriculum represents the essential skills and knowledge that students will need to be scientifically literate citizens in the twenty-first century. By adopting this curriculum, the Juneau School District affirms its commitment to provide a guaranteed and viable science education for all of our students.

Many stakeholders of the community were involved in developing this curriculum. The goal was to uphold our students to rigor by integrating culturally-relevant and place-based experiences and using the Next Generation Science Standards (NGSS) as the foundation framework.

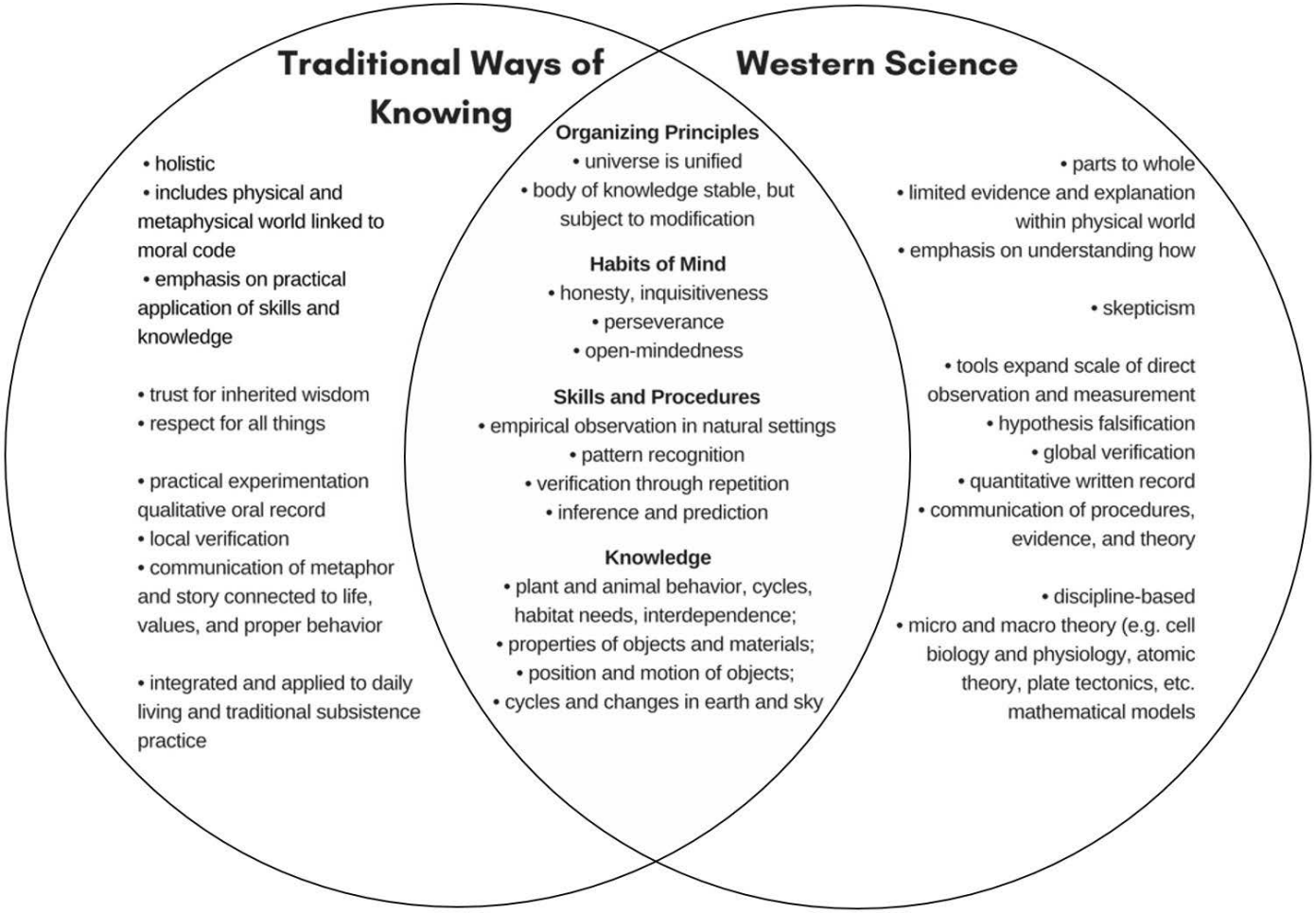
"Place-based education involves integrating local history, indigenous [Tlingit] knowledge and a deep sense of place into the curriculum. Place-based education is the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science and other subjects across the curriculum. This approach to education, which emphasizes hands-on, real-world learning experiences, increases academic achievement, helps students develop stronger ties to their community, enhances students' appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens. Community vitality and environmental quality are improved through the active engagement of local citizens, community organizations, and environmental resources in the life of the school." (*Place-Based Education Connecting Classrooms & Communities* by David Sobel, Orion Society, 2005).

The use of phenomenon is another dominant component throughout K-12, as the goal of building knowledge in science is to develop general ideas, based on evidence, that can explain phenomena. Phenomena are observable events that occur in the universe. When students are motivated to explain these observable events, the focus of learning shifts from learning about a topic to figuring out why or how something happens.

This document is a reflection of what our community values in education: high standards for all students and a deep respect for both indigenous and Western Knowledge that connects students to this unique place we call home.

Qualities Associated with Traditional Knowledge and Western Science

"Indigenous Knowledge Systems and Alaska Native Ways of Knowing," Ray Barnhardt and Angayuqaq Oscar Kawagley, Anthropology Education Quarterly, vol.36, no.1, 2005



Traditional Native Science is a universal intellect of thought that shares common organizing principles of Western Science. The use of these two knowledge systems mutually strengthen students' connection with place and understanding of local and global issues. The goal is: Wooch een yéi jidané-working together.

JSD Elementary Science Curriculum

Curriculum Organization

"Every student deserves the opportunity to learn in a world-class educational setting that is respectful and free from bias."

- JSD Board Policy 0450

The curriculum is organized for three levels of education in our district (K-5, 6-8, 9-12) and aligned with:

- Alaska Cultural Standards
- Alaska English Language Arts and Math Standards
- Alaska Science Standards
- International Standards in Technology Education (ISTE)
- Next Generation Science Standards (NGSS)

The Next Generation Science Standards, authored by a consortium of 26 states, is based on the national Framework for K-12 Science Education. Released in 2013, it was a collaborative effort to defining key elements of science and describing progressive steps that help students grow in their capacity to do science. The goal is to shift the focus of learning about a topic to figuring out why or how something happens. The NGSS promote science literacy including an appreciation of understanding how the natural world works and interfaces with the designed world.

The Science Committee worked diligently to make this curriculum relevant to Juneau students by including local phenomena, and cross-curricular, cultural, and place-based connections for each grade-level topic. We will continue to expand cultural and place-based connections over time. Live links to NGSS and other online resources are provided across the curriculum and are identified as underlined in suggested activities and cultural and place-based resources.

The NGSS are organized around three dimensions of how science is practiced:

1. Cross-cutting themes: 7 cross cutting concepts that are a way of linking across multiple content areas.
    a. Patterns, similarity and diversity
    b. Cause and effect
    c. Scale, proportion and quantity
    d. Systems and system models
    e. Energy and matter
    f. Structure and function
    g. Stability and change

2. Disciplinary Core Ideas: 4 key domains of science.
    a. Physical science
    b. Life science

   c. Earth and space science
   d. Engineering, technology and science applications

3. Science & Engineering Practices: Practices for students to think and act like scientists and engineers across all domains.
   a. Asking questions and defining problems
   b. Developing and using models
   c. Planning and carrying out investigations
   d. Analyzing and interpreting data
   e. Using math and computational thinking
   f. Constructing explanations and designing solutions
   g. Engaging in argument from evidence
   h. Obtaining, evaluating and communicating information

The NGSS includes learning goals related to engineering, technology, and applications of science across the K-12 span. These goals highlight a focus on engaging students in the science and engineering practices - all essential components of Science, Technology, Engineering, and Math (STEM). It is also intended to educate learners for civic engagement and personal fulfillment connecting student experiences to societal or personal concerns that require scientific or technological knowledge. STEM and NGSS are complementary and provide the vision for our curriculum to prepare our students to address the challenges and opportunities of the future.

Elementary Curriculum

The Elementary curriculum **i**s organized by the following three domains, with specific topics at each grade level.

1. Earth Science
2. Physical Science
3. Life Science

Performance expectations develop ideas and skills that allow students to explain complex phenomena in the four disciplines as they progress to middle school and high school. Students develop an understanding of the four disciplinary core ideas, beginning with

recognizing patterns and formulating answers to questions about the world around them. By the end of fifth grade, students are able to demonstrate grade-appropriate proficiency in gathering, describing, and using information about the natural and designed world(s).

Students will participate in hands on learning experiences and investigations. They will use critical thinking and problem solving skills to explore the world. This document is inspired by cultural and place based phenomena. (*Topic Arrangements* of the Next Generation Science Standards Achieve, Inc. 2013)

JSD Elementary Science Curriculum

Middle School Curriculum

Students continue to develop understanding of the three core branches of science: Earth and Space, Physical and Life. The Performance Expectations blend the core ideas with Scientific and Engineering Practices and Crosscutting Concepts to support students in developing useable knowledge across the science disciplines.

Each year, students will explore the Nature of Science to provide a foundation in reasoning, thinking, and methodology so that they graduate seeing themselves as scientifically literate.

The goal for middle school students is to have more experience in engineering design by defining problems more precisely, conducting a more thorough process of choosing the best solution, and optimizing the final design. (*Topic Arrangements of the Next Generation Science Standards*, Achieve, Inc. 2013)

Middle School is organized by topic and grade:

<u>Grade 6 Physical Science</u>

- Nature of Science
- Matter and Energy
- Chemical Reactions
- Forces and Interactions

<u>Grade 7/8 Life Science</u>

- Nature of Science
- Cells
- Body Systems
- Heredity, Evolution
- Ecosystems

<u>Grade 7/8 Earth and Space Science</u>

- Nature of Science
- Space Systems
- History of Earth
- Earth's Systems
- Weather and Climate

JSD Elementary Science Curriculum

High School Curriculum

High School students continue to build upon their middle school learning about the nature of science, physical, life, and earth sciences. The required courses for graduation, Physical Science and Biology, include the most fundamental concepts of chemistry, physics, and life science and are intended to leave room for further study in upper level high school courses.

Physical Science topics include: Nature of Science, Matter and Interactions, Motion and Stability (Forces and Interactions), Energy, Waves and their application in Technology for Information Transfer. Physical Science topics engage students in more in-depth phenomena central to the physical sciences. The physical science performance expectations focus on scientific practices including: developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, and constructing explanations; and using these practices to demonstrate understanding of core ideas. Students are also expected to demonstrate understanding of several engineering practices including design and evaluation. *(Topic Arrangements of the Next Generation Science Standards, Achieve, Inc. 2013).*

Life Science/Biology ideas build upon students' science understanding and address life science topics: Nature of Science, Photosynthesis/Cellular Respiration, Genetics, Evolution, Ecology and Anatomy and Physiology. The performance expectations for high school life science blend core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge that can be applied across the science disciplines. *(Topic Arrangements of the Next Generation Science Standards, Achieve, Inc. 2013).*

High School Courses are sequenced with the two required courses (2 credits) to meet district graduation requirements, Physical Science and Biology, and require students to take a third credit of science from the elective science options.

Elective course options include Honors and AP courses which students may take as advanced learning options and courses connected to dual credit opportunities and Alaska's high demand career pathways in Health Sciences, Marine Biology, and STEM.

- Honors and AP course options include:
    - Honors Biology, Honors Physical Science, Honors Chemistry, AP Biology, AP Environmental Science, AP Physics.
- Elective science course options include:
    - Applied Science-STEM, Earth Science, EMT, ETT, Fisheries Tech I and II, Forensic Science, Geology, Human Anatomy and Physiology, Introduction to Chemistry, Introduction to Engineering Design, Introduction to Health Sciences, Marine Biology, Oceanography, Outdoor Biology, Physics, Principles of Engineering.

Course descriptions and syllabi are provided for all these course offerings, and the curriculum defines the content for the required Physical Science and Biology courses.

JSD Elementary Science Curriculum

Community Connections

There has been active community involvement throughout 2016-17 in revising the science curriculum. Community members are excited about the adoption of NGSS and its focus on inquiry-based, cross-disciplinary, and place-based learning. The Committee has used the JSD STEM Coalition Database, suggestions from committee members, and community networking events to develop links to specific Juneau and Alaska-based science experiences. Ongoing work is needed to organize ideas for resources so that they are 1) continually kept up to date and 2) easily and usefully accessed by a wide range of teachers. JSD will coordinate that organizing work with the Juneau STEM Coalition and other community partners including local Native organizations.

Science Committee Members 2016-2017

Elementary Teachers
Amy Jo Meiners, AB
Brittany Howell Gladsjo, MRCS
Jennifer Thompson, HBV
Joanna Hinderberger, GAST
Julie Leary HBV
Kimberly Frangos, GV
Lisa Mitchell, MRCS
Marnita Coenraad, RVB
Sarah Satre, AB
Shawna Puustinen, RB
Shgen George, HBV
Tina Peyerk, GV

Secondary Teachers
Dianne Zemanek, DHMS
Henry Hopkins, JDHS
James White, DHMS
Jessica Cobley, FDMS
Jonathan Smith, JDHS
Kathleen Galau, TMHS
Kristen Wells, TMHS
Rebecca Farrell, FDMS
Ryia Waldern, YDHS
Ruby Hughes, Cultural ParaEducator, DHMS/JDHS
Topaz Shryock, TMHS

District Administrators
Barbara Cadiente-Nelson, K-12 Native Students Success Coordinator, Teaching & Learning Support
Kristy Dillingham, Principal, Mendenhall River Community School
Haifa Sadighi, Assistant Principal, Floyd Dryden Middle School

Parents/Community Members

Angie Lunda, Science Educator, faculty, UAS School of Education
Bjorn Wolter, Parent, Science Educator, Alaska Department of Education & Early Development
Bonita Nelson, Biologist, NOAA
Brenda Taylor, Parent, Math Teacher, Juneau Community Charter School
David Katzeek, Cultural Knowledge Bearer, Chair, Juneau Indian Studies Program
Elissa Borges, Consultant, Juneau Indian Studies Program
Kelly Sorenson, Educator, Discovery Southeast
Kristen Romanoff, Parent, Science Educator, Alaska Department of Fish and Game
Lori Buzzell, Parent, Administrative Assistant, Teaching & Learning Support
Marilyn Sigman, Science Educator, Alaska Sea Grant
Norma Shorty, Curriculum Specialist Contractor, Juneau Indian Studies Program
Paul Berg, Curriculum Specialist, Goldbelt Heritage Foundation
Peggy Cowan, Science Consultant, Alaska Sea Grant
Rebecca Soza, STEM, Juneau Economic Development Council
Sarah King, Parent, Administrative Assistant, Teaching & Learning Support
Stephanie Hoag, Science Educator

Facilitators

Carin Smolin, Curriculum Coordinator, Teaching & Learning Support
Pam Garcia, Instructional Coach, Teaching & Learning Support
Ted Wilson, Director, Teaching & Learning Support

JSD Elementary Science Curriculum

K-12 Science Curriculum: Scope and Sequence

Grade	Life	Physical	Earth	Other
Elementary School				
K	Interdependent Relationships in Ecosystems, Plants, and their Environment	Forces and Interactions: Pushes and Pulls	Weather and Climate	
1	Structure, Function, and Information Processing	Waves: Light and Sound	Space Systems: Patterns and Cycles	
2	Interdependent Relationships in Ecosystems	Structure and Properties of Matter	Earth's Systems: Processes that Shape the Earth	
3	Interdependent Relationships in Ecosystems Inheritance and Variation of Traits	Forces and Interactions	Weather and Climate	
4	Structure, Function, and Information Processing	Energy Waves: Waves and Information	Earth's Systems: Processes that Shape the Earth	
5	Matter and Energy in Organisms and Ecosystems	Structure and Properties of Matter	Earth's Systems Space Systems: Stars/Solar System	
Middle School				
	Life	**Physical**	**Earth**	**Other**
6		QA=Nature of Science QB= Matter & Energy QC=Chemical Reactions QD=Forces and Interactions		
7 Rotating in DZ	Nature of Science Q1 = Cells Q2 = Body Systems Q3= Heredity, Evolution Q4= Ecosystems		Nature of Science Q1 = Space Systems Q2 = History of Earth Q3 = Earth Systems Q4 = Weather and Climate	
8 Rotating in DZ	Nature of Science Q1 = Cells Q2 = Body Systems Q3= Heredity, Evolution Q4= Ecosystems		Nature of Science Q1 = Space Systems Q2 = History of Earth Q3 = Earth Systems Q4 = Weather and Climate	

JSD Elementary Science Curriculum

High School				
	Life	**Physical**	**Earth**	**Engineering**
9		Physical Science/Honors ● Nature of Science ● Matter & Interaction ● Motion & Stability ● Energy ● Waves & their applications in technologies for info transfer	Physical Science/Honors ● Nature of Science ● The universe and stars ● Earth and solar system ● Weather and Climate ● Natural Resources	
10	Biology/Honors ● Nature of Science ● Photosynthesis/Cellular Respiration ● Genetics ● Evolution ● Ecology ● Anatomy and Physiology		Biology/Honors ● Nature of Science ● Weather & Climate ● Biogeology ● Human Impact - Earth's Systems ● Global Climate Change	
High School Electives (offered depending on school, staff, resources, student demand) (* = CTE courses, # = UAS Dual Credit)				
	*Outdoor Biology	Intro Chemistry	*Geology, .5 credit	*Intro to Eng Design
	#*Marine Biology	Honors Chemistry	*Earth Science, 1 credit	*Principles of Engineering
	*Human Anatomy and Physiology	Physics		*Applied Science -STEM, .5 credit
	#*Intro Health Sciences, .5 credit	AP Physics		
	AP Biology	#*Forensic Science, .5 credit		
	#*ETT, .5 credit	#*Oceanography		
	#*EMT	AP Environmental Science		
	#*Fisheries Tech I, .5 credit			
	#*Fisheries Tech II, .5 credit			

Alaska Cultural Resources

The following are additional cultural resources and references to support the science curriculum. Some have already been cited in specific grade-level topics in which they align to.

Cultural Tool Kit

- **http://www.ankn.uaf.edu/publications/knowledge.html (Guidelines for Respecting Cultural Knowledge)**
- **http://www.ankn.uaf.edu/publications/Knowledge.pdf (Guidelines for Respecting Cultural Knowledge)**
- **http://www.goldbeltheritage.org/wp-content/uploads/2016/09/GHF-Elder-Culture-Bearer-Request.pdf**
- How to **prepare your students for an elder visit** by Roby Littlefield
- **Tlingit Elders Traditional Education Checklist**
- Email **isp@juneauschools.org** for support in developing or delivering culturally relevant, place-based curricula - Elder Support
- **Indigenous Knowledge Systems/Alaska Native Ways of Knowing** - Venn diagram comparing Traditional Knowledge and Western Science
- **https://drive.google.com/file/d/1XNx2og-mbN7m0yrFgUGq9JaOUXimp7TN/preview (Tlingit Ecological Knowledge / Traditional Oral Narratives: Lecture by Dr. Daniel Monteith**
- **https://vimeo.com/47734749 "Our Grandparents' Names on the Land" - "Our names are science," D. Katzeek**
- Oral Narratives protocols [work in progress - Indian Studies Program, Juneau School District]
- **http://tlingitlanguage.com/media/Nyman_1993.pdf** (Juneau place-based resource)
- **https://trt.geolive.ca/stories.html** (Yanyeidi Clan History of T'aaku Kwaan as told by Yanyeidi Elder (Canadian):
- **http://tlingitlanguage.com/wp-content/uploads/2015/01/Dauenhauer-1987-Haa-Shuk%C3%A1.pdf ("Our Science is our Stories - D. Katzeek")**
- **http://tlingitlanguage.com/media/Dauenhauer-Beginning-Tlingit.pdf**
- **Dictionary of Tlingit by Keri Edwards**
- **http://www.goldbeltheritage.org/wp-content/uploads/2014/02/Tlingit-Dictionary-GHF-UAS-and-Twitchell.pdf**
- **http://www.sealaskaheritage.org/sites/default/files/BeginningTlingitWorkbook.pdf**
- **http://www.sealaskaheritage.org/programs/Language%20Resources/Tlingit_dictionary_web.pdf**
- **https://www.sharingourknowledge.org/program_pdfs/2009_program.pdf**
- **https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd475457.pdf** (Our Food is our Way of Life)

Ways to Include Alaska Culture in the Classroom

- Utilize Juneau School District- Indian Studies Program, Goldbelt Heritage Foundation, Sealaska Heritage Foundation, Douglas Indian Association (a.k.a. T'aaku Kwaan Tribal Government), and Tlingit & Haida Central Council for cultural resources, elders and place based curriculum
- Email JSD Indian Studies (isp@juneauschools.org) or speak to your school's cultural expert on content, protocols, narratives, etc.
- Consider bringing students' summer camp projects from local tribal organizations into the classroom; Héen Latínee Outdoor Classroom - a curriculum guide including Glacier Migration, Stream Ecology & the Story of Soil. *(Proposing a collaborative project between Goldbelt, Fisheries, Marine Biology, UAS and Juneau School District)*.
- Give cultural examples when describing frequent science terms: Phenomena Observations- for example, up in Yukon, white fish come in when the buds come in on plants. Also, take students outside and explore the land at the start. Honing their observation skills.
- --->Scientific Investigations - based around traditional knowledge (for example, Alaska Native Science Fair)

Alaska Cultural Resources Relevant to Teaching Science

- **http://www.ankn.uaf.edu/curriculum/Tlingit/Salmon/axehand.html (Axe Handle Curricula Framework for Place-Based Education)**
- **http://nsgl.gso.uri.edu/aku/akue99001.pdf (Sun, Moon, Tide by Dolly Garza)**
- **http://www.ankn.uaf.edu/publications/handbook/handbook.pdf**
- **http://www.ankn.uaf.edu/publications/VS/toteacher.html Village Science by Alan Dick**
- **http://www.goldbeltheritage.org/elementary-resources/science-units-elementary**
- **http://www.goldbeltheritage.org/middle-school/science-units-middle-school**
- **http://www.goldbeltheritage.org/high-school/science-units-high-school**
- **https://drive.google.com/file/d/0BykCjaiQvmszRnM2ZGw4WE9hQmc/preview (High School Héen Latínee Outdoor Classroom - a curriculum guide including Glacier Migration, Stream Ecology & the Story of Soil)**
- Sealaska Heritage Foundation Middle School Science Curriculum (Developmental Language Process Resource): **http://www.sealaskaheritage.org/institute/education/resources/sciencems**
- Sealaska Heritage Foundation Grade 6 Science (Developmental Language Process Resources)
- Grade 6 Book One: **http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20Unit%201.pdf**
- Grade 6 Book Two: **http://www.sealaskaheritage.org/sites/default/files/science_6_book_2_web.pdf**
- UNIT 1 A–1: Science as Inquiry Process: **http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20Unit%201.pdf**
- UNIT 2 A–1: Science as Inquiry Process: **http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20Unit%202.pdf**
- UNIT 3 B–1: Concepts of Physical Science:**http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20UNIT%204.pdf**
- UNIT 4 B–1: Concepts of Physical Science:**http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20UNIT%204.pdf**

- UNIT 5 C–1: Concepts of Life Science: **http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20UNIT%205.pdf**
- UNIT 6 C–1: Concepts of Life Science:**http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20UNIT%206.pdf**
- UNIT 7 D–1: Concepts of Earth Science: **http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20UNIT%207.pdf**
- UNIT 8 D–1: Concepts of Earth Science: **http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20UNIT%208.pdf**
- UNIT 9 E–1: Science and Technology; F–1: Cultural, Social, Personal Perspectives of Science; G–1: History of Science: **http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20UNIT%209.pdf**
- UNIT 10 Raven and the King Salmon: **http://www.sealaskaheritage.org/sites/default/files/Science%20Grade%206%20UNIT%2010.pdf**
- SHI Grade 7 Science (Developmental Language Process Resources)
- Grade 7 Book One: **http://www.sealaskaheritage.org/sites/default/files/Book1_Grade7.pdf**
- Grade 7 Book Two: **http://www.sealaskaheritage.org/sites/default/files/Book2_Grade7.pdf**
- UNIT 1 A–1: Science as Inquiry Process: **http://www.sealaskaheritage.org/sites/default/files/unit1_1.pdf**
- UNIT 2 A–1: Science as Inquiry Process: **http://www.sealaskaheritage.org/sites/default/files/unit2_1.pdf**
- UNIT 3 B–1: Concepts of Physical Science: **http://www.sealaskaheritage.org/sites/default/files/unit3_1.pdf**
- UNIT 4 B–1: Concepts of Physical Science: **http://www.sealaskaheritage.org/sites/default/files/unit4_1.pdf**
- UNIT 5 C–1: Concepts of Life Science: **http://www.sealaskaheritage.org/sites/default/files/unit5_1.pdf**
- UNIT 6 C–1: Concepts of Life Science: **http://www.sealaskaheritage.org/sites/default/files/unit6_1.pdf**
- UNIT 7 D–1: Concepts of Earth Science: **http://www.sealaskaheritage.org/sites/default/files/unit7_1.pdf**
- UNIT 8 D–1: Concepts of Earth Science: **http://www.sealaskaheritage.org/sites/default/files/unit8_1.pdf**
- UNIT 9 E–1: Science and Technology; F–1: Cultural, Social, Personal Perspectives of Science; G–1: History of Science:**http://www.sealaskaheritage.org/sites/default/files/unit9_1.pdf**
- GLOSSARY: **http://www.sealaskaheritage.org/sites/default/files/glossary_2.pdf**

- SHI Grade 8 Science (Developmental Language Process)
- Grade 8 Book One: **http://www.sealaskaheritage.org/sites/default/files/Book1_Science8.pdf**
- Grade 8 Book Two: **http://www.sealaskaheritage.org/sites/default/files/Book2_Science8.pdf**
- INTRODUCTION: **http://www.sealaskaheritage.org/institute/education/resources/sciencems**
- UNIT 1 A–1: Science as Inquiry Process: **http://www.sealaskaheritage.org/sites/default/files/UNIT1_0.pdf**
- UNIT 2 A–1: Science as Inquiry Process: **http://www.sealaskaheritage.org/sites/default/files/UNIT2_0.pdf**
- UNIT 3 B–1: Concepts of Physical Science: **http://www.sealaskaheritage.org/sites/default/files/UNIT3_0.pdf**
- UNIT 4 B–1: Concepts of Physical Science: **http://www.sealaskaheritage.org/sites/default/files/UNIT4_0.pdf**
- UNIT 5 C–1: Concepts of Life Science: **http://www.sealaskaheritage.org/sites/default/files/UNIT5_0.pdf**
- UNIT 6 C–1: Concepts of Life Science: **http://www.sealaskaheritage.org/sites/default/files/UNIT6_0.pdf**
- UNIT 7 D–1: Concepts of Earth Science: **http://www.sealaskaheritage.org/sites/default/files/UNIT7_0.pdf**
- UNIT 8 D–1: Concepts of Earth Science: **http://www.sealaskaheritage.org/sites/default/files/UNIT8_0.pdf**
- UNIT 9 E–1: Science and Technology; F–1: Cultural, Social, Personal Perspectives of Science;
- G–1: History of Science: **http://www.sealaskaheritage.org/sites/default/files/UNIT9_0.pdf**

- UNIT 10 Story of the Frog Crest of the Kiks.ádi of Wrangell: **http://www.sealaskaheritage.org/sites/default/files/UNIT10_1.pdf**
- GLOSSARY: **http://www.sealaskaheritage.org/sites/default/files/glossary_1.pdf**
- Soapberries - Medicinal Use (Helen Watkins - SHI Soapberry Contest with many Elders)
- **https://vimeo.com/71717**
- **89'Nothing but dinner': Seaweed on the plate** - newspaper article about Dolly Garza
- **http://www.adfg.alaska.gov/index.cfm?adfg=subsistence.main** - Subsistence in Alaska - ADF&G
- Village Science- published by Alaska Native Knowledge Network, UAF

Books:

Barnhardt, R. & Kawagley, A.O. (2011). *Alaska Native Education-Views From Within.*
Barnhardt, R. & Kawagley, A.O. (2005). ***Indigenous knowledge systems/Alaska native ways of knowing.***
Barnhardt, R. & Kawagley, A.O. (2011). *Sharing Our Pathways: Native Perspectives on Education in Alaska.*
Biggs, C. (1999). Volume 1 & 2; Wild Edible and Medicinal Plants: Alaska, Canada and Pacific Rainforest. [Resource for medicinal plants]
Garza, D. (2013). Surviving on the Foods and Water from Alaska's Southern Shores. *[Resource for traditional foods]*
Garza, D. (2011). ***Alaska Native Science: A Curriculum Guide.*** Alaska Native Knowledge Network; University of Alaska Fairbanks.
Fortuine, R (1989). Chills And Fever: Health and Disease in the Early History of Alaska. University of Alaska Press.

TRADITIONAL ECOLOGICAL KNOWLEDGE (RESEARCH)

Hunn, Eugene S., Johnson, Darryll, Russell, Priscilla, Thornton, Thomas F Glacier Bay Science Symposium on Huna Seagull Egg Harvest: **https://www.nps.gov/glba/learn/nature/upload/Hunn_etal2007_GullEggHarvests.pdf**
Langdon, Steve Herring Synthesis: Documenting and Modelling Herring Spawning Areas Within Socio-ecological Systems **http://herringsynthesis.research.pdx.edu/final_docs/HerringSynthesisFINAL102710.pdf**
Langdon, Steve (2006) Traditional Knowledge and Harvesting of Salmon by Huna and Hinyaa Tlingit: **http://www.goldbeltheritage.org/wp-content/uploads/2014/03/Fisheries-Unit-Traditional-Knowledge-Final-Report1.pdf**
Nyman, E., & Leer. J. (1993). *Gágiwduł.àt: brought forth to reconfirm: the legacy of a Taku River Tlingit clan.*
Stewart, H. (1995). *Indian Fishing: Early Methods on the Northwest Coast.* University of Washington Press.
Williams, M. (2009). *The Alaska Native Reader: History, Culture, Politics.* Duke University Press Books.
Davis, Neil. (1982) *Alaska Science Nuggets.* University of Alaska Press. [Resource filled with science relevant to Alaska]

Additional Elementary Science Resources

General State Resources - Free

Users may need sign-in credentials for these State provided databases. Contact your school librarian or the State or Public Libraries for information.

1. SLED
   - SLED, the Statewide Library Electronic Doorway, is an easy-to-use website that connects people to high quality Alaska information. Once you leave SLED's main menu, SLED cannot control the information you access.
   - SLED is brought to you by Alaskan libraries. It was developed by the Alaska State Library and Rasmuson Library, University of Alaska Fairbanks, and is currently supported by the Alaska State Library.
2. Science
3. Databases found on SLED
4. Relevant science resources for Elementary
   - Brainpop
   - Brainpop jr.
   - Brainpop Educators

EXPLORA

A dedicated, graphically oriented search for EBSCO's health and education related databases, geared towards Kindergarten through 5th grades

Worldbook online

- **Kids:** With content from the award-winning World Book *Discovery Encyclopedia*, the site offers simpler navigation, thousands of colorful illustrations, images, and maps, and dozens of activities.
- **Students:** The premier online reference source with thousands of articles, state-of-the-art multimedia, editor-reviewed websites, Behind the Headlines and Compare Places features, a How to Do Research guide, periodical content, and more!
- **Advanced:** Hundreds of thousands of primary source documents are fully integrated with encyclopedia content. Research and teaching tools include an online book archive, citation builder, and personal research accounts.

JSD Elementary Science Curriculum

State of Alaska Resources

Alaska Wildlife Notebook

- The Alaska Wildlife Notebook Series is an encyclopedia of Alaska's wildlife, ranging from little brown bats to blue whales. It is available online and in print form, as a perfect-bound, 300-page black and white book.
- The Alaska Wildlife Notebook series has long been one of the most popular publications of the Alaska Department of Fish and Game. The book was updated in 2008 and the new edition, revised by department biologists, features more than 150 different animals. Included are: big game, small game, furbearers, nongame animals, birds, fish, shellfish, reptile and amphibians. Each chapter offers insights into the life history, reproductions, feeding habits, management and conservation of Alaska's diverse wildlife.

District Resources

Users may need sign-in credentials to access these databases. Contact your school librarian for information.

Elementary

PebbleGo - Science Databases

- Animals
- Science including - Earth and Space, Physical, Life, Science and Engineering
- Dinosaurs

Other

LitSiteAlaska (not specifically science)

Welcome to LitSite Alaska, a Web community promoting literacy, cultural diversity, and well-being throughout Alaska. A gathering place for families, communities and teachers, LitSite Alaska features narratives illustrating many cultural aspects of life in Alaska. As an on-line learning tool, LitSite Alaska showcases a living archive of lesson plans used in Alaskan classrooms and an extensive collection of excellent peer work by Alaskan students.

Alaska Kids

Science For Kids

Science information, lessons, activities for Teachers

JSD Elementary Science Curriculum

Grade: Kindergarten

Earth Science

Topic: Weather and Climate

Vocab: Weather, Sunny, Cloudy, Stormy, Windy, Snowy, Sand, Soil, Rocks, Water

Pacing: Trimester

Anchor Phenomena and Essential Question
Experience weather or show a variety of pictures showcasing different weather types. ● How does knowing about the weather and weather patterns help us live our lives?

Alaska Cultural Standard to Emphasize
E. Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. 2. *Understand the ecology and geography of the bioregion they inhabit.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
K-ESS2-1: Use and share observations of local weather conditions to describe patterns over time. **Clarification Statement:** Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months. **Assessment Boundary:** Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler. **K-ESS3-2: Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to severe weather.** **Clarification Statement:** Emphasis is on local forms of severe weather. **Assessment Boundary:** none **K-PS3-1: Make observations to determine the effect of sunlight on Earth's surface.**	**PS3.B: Conservation of Energy and Energy Transfer:** Sunlight warms Earth's surface. **ESS2.D: Weather and Climate:** Weather is the combination of sunlight, wind, snow, or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. **ESS3.B: Natural Hazards:** Some kids of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. **ETS1.A: Defining and Delimiting Engineering Problems:** Asking questions, making observations, and gathering information are helpful in thinking about problems.

Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water. **Assessment Boundary:** Assessment of temperature is limited to relative measures such as warmer/cooler. **K-PS3-2: Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on an area.** **Clarification Statement:** Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun. **Assessment Boundary:** none	

Cross-Cutting Concepts	Science and Engineering Practices
● Patterns K-ESS2-1 ● Cause and Effect K-ESS3-2 , K-PS3-1, K-PS3-2	● Asking Questions and Defining Problems K-ESS3-2 ● Planning and Carrying Out Investigations K-PS3-1 ● Analyzing and Interpreting Data K-ESS2-1 ● Constructing Explanations and Designing Solutions K-PS3-2 ● Obtaining, Evaluating, & Communicating Information K-ESS3-2 ● Science Knowledge Is Based on Empirical Evidence K-ESS2-1 ● Scientific Investigations Use a Variety of Methods K-PS3-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Activities: ● Watching Weather ● Weather Patterns ● Cooler in the Shadows ● Disappearing Water ● Cloud in a Jar Observation Booklet ● Weather and Climate Basics ● Weather Walks ● Science- Weather ● About the Weather ● Activity 5: Weather: The Many Faces of Mother Nature	● Rain gauge, weather station ● NOAA Weather Service Staff ● Recess weather observations ● Repeat visits and observations of a local natural site during different seasons/weather (take photos) ● Seasonal changes (e.g., falling leaves, change in the sky, observable changes of clouds, evidence of wind, change in temperature, snowfall, icicles, flowing water, frozen water, warmth from the sun…) ● Change in weather (overnight snowfall, leaves falling) ● Concept of dressing for our local weather and understanding why that is important.

Science Kit: ● Weather (adapt for K) **Assessment Probes by Page Keeley:** ● Summer Talk ● Rainfall	● Our emotions are like the weather… (social emotional learning - feeling…) ● Sealaska Heritage Alder & Cottonwood: A tree throughout the seasons (Lesson #3) ● Sealaska Bear Barometer (Tlingit weather phrases) ● Wind- Taku Winds (Taku ooxcha- there is thunder in Taku) ● How do Tlingit people decide on the times of year to hunt? To go on the river, ocean, water? ● Qualitative Observations: descriptions of the weather ● Quantitative Observations: numbers of sunny, windy, rainy days in a month ● Patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months. ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural	A.1, A.2, A.4 D.1, D.5, E.2, and E.8	Cultural specialist and/or Native Elder in the classroom to make the connection. • What do clouds reveal? How SE Alaska indigenous people observed cloud formations to predict weather and inform decision making. • Tlingit weather stories (Sea Lion & Ptarmigan) • Tlingit perspective: hot, cold, windy, warm, super hot • Taku Winds- Taku ooxch - thunder in the Taku • Kookti- meteorology • Kaaklaheen- Raining, snow; sleet, hail
Alaska Science	SD1, SD2, and SD3	
Alaska ELA	RL.K.1, SL.K.3, W.K.7	Reading Wonders • U6W1: How are seasons different? • U6W2: What happens in different kinds of weather? Mary's Wild Winter Feast by Hannah Lindoff Science Notebooks
Alaska Math	K.CC, K.CC.A, K.MD.A.1 , K.MD.A.2 , K.MD.B.3, MP.2, MP.4	Bar graphs and picture graphs
ISTE	4A, 4D	

JSD Elementary Science Curriculum

Grade: Kindergarten
Physical Science
Topic: Forces and Interactions: Pushes and Pulls
Vocab: Object, Collide, Speed, Direction, Ramp, Fast, Slow, Stop, Slope, Roll, Slide
Pacing: Trimester

Anchor Phenomena and Essential Question
Raising a Totem Pole (video clip) ● How does push and pull help us play, work, and travel? (original inhabitants in particular)

Alaska Cultural Standard to Emphasize
D. Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. 5. *Identify and utilize appropriate sources of cultural knowledge to find solutions to everyday problems.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. **Clarification Statement:** Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other. **Assessment Boundary:** Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets. **K-PS2-2: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.** **Clarification Statement:** Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects.	**PS2.A: Forces and Motion:** Pushes and pulls can have different strengths and directions. Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **PS2.B: Types of Interactions:** When objects touch or collide, they push on one another and can change motion. **PS3.C: Relationship Between Energy and Forces:** A bigger push or pull makes things speed up or slow down more quickly. **ETS1.A: Defining and Delimiting Engineering Problems:** A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions.

Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn. **Assessment Boundary:** Assessment does not include friction as a mechanism for change in speed.	

Cross-Cutting Concepts	Science and Engineering Practices
● Cause and Effect K-PS2-1, K-PS2-2	● Planning and Carrying Out Investigations K-PS2-1 ● Analyzing and Interpreting Data K-PS2-2 ● Scientific Investigations Use a Variety of Methods K-PS2-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Activities: ● Push Pull-Changing Direct ● Invent a Backscratcher from Everyday Materials ● Physical Education Meets Physical Science ● Ramps 2: Ramp Builder ● Catch Me If You Can! ● Understanding Energy ● Just For Kicks ● Watching the Wind: The Wind Moves Things ● Engineering Encounters ● Turn, Turn: A Simple Assessment ● How Does Your Garden Grow **JSD Science Kit:** ● Balance and Motion (Investigation 3- adapt for K) **Engineering Kit:** ● Marvelous Machines **Assessment Probe by Page Keeley:** ● Pushes and Pulls **(need form)**	● Ice skating ● Boats, paddle canoe, ramps ● Sealaska Heritage Canoe Unit: Lesson 3: Friction At Work and Lesson 4: Force As A Push - Paddles and Sails ● Sealaska Heritage Totem Poles Unit: Lesson 4 Getting A Tree ● Avalanches, rock falls, glacial movement, glaciers push rocks as they flow down a slope ● Change in Direction (sledding- body goes one way; sled goes the other way) ● Speed (water splashing in the river) ● Carving ● Tool making- simple such as digging sticks ● Observe how things move (rolling, sliding, slow, fast, slope) ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural	D1, D.5, E2, E.4	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Wooch'een (Working Together) ● Push and pull, wooch'een and Totem pole raising.

Alaska Science	SB.1, SB.2, & SB.4	
Alaska ELA	RI.K.1, SL.K3, W.K.7	No Reading Wonders stories align Science Notebooks
Alaska Math	K.MD.1, K.MD.2,	
ISTE	4A, 4D	

JSD Elementary Science Curriculum

Grade: Kindergarten
Life Science
Topic: Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment
Vocab: Habitat, Environment, Relationship, Plants, Animals, Living v. Nonliving
Pacing: Trimester

Anchor Phenomena and Essential Question
Eagle perched on top of a spruce (photo) • Why do animals and plants live where they do?

Alaska Cultural Standard to Emphasize
E. Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. 2. *Understand the ecology and geography of the bioregion they inhabit.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
K-ESS2-2: Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. **Clarification Statement:** Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete. **Assessment Boundary:** none **K-ESS3-1: Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.** **Clarification Statement:** Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system. **Assessment Boundary:** none **K-ESS3-3: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.**	**LS1.C: Organization for Matter and Energy Flow in Organisms:** All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. **ESS2.E: Biology:** Plants and animals can change their environment. **ESS3.A: Natural Resources:** Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. **ESS3.C: Human Impacts on Earth Systems:** Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. **ETS1.B: Developing Possible Solutions:** Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles. **Assessment Boundary:** none **K-ESS2-1: Use observations to describe patterns of what plants and animals (including humans) need to survive.** **Clarification Statement:** Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water. **Assessment Boundary:** none	

Cross-Cutting Concepts	Science and Engineering Practices
● Patterns K-LS1-1 ● Cause and Effect K-ESS3-3 ● Systems and System Models K-ESS2-2, K-ESS3-1	● Developing and Using Models K-ESS3-1 ● Analyzing and Interpreting Data K-LS1-1 ● Engaging in Argument from Evidence K-ESS2-2 ● Obtaining, Evaluating, and Communicating Information K-ESS3-3 ● Science Knowledge Is Based on Empirical Evidence K-LS1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Activities: ● The Needs of Living Things ● Designing Possible Solutions: Oil Spill Clean-up ● Who Needs What? /Light Plants and Dark Plants, Wet Plants and Dry Ones ● Wild Kratts: Creaturepedia ● The Poetry of Plants ● PictureSTEM: Designing Hamster Habitats ● What's Your Habitat **Alaska Dept. of Fish and Game** ● Bear Kit ● Skull Kit	● Go blueberry picking ● Smoke salmon ● Field Trip to DIPAC in Fall for Salmon Education Program ● Dissect herring ● Glacier Field Trip to observe how beavers change the environment ● Go for a walk at a local natural area and look for squirrel middens, woodpecker drills in trees, plants angling towards sunlight…… ● Plant a class/school garden ● Indian Studies K Unit: Our Southeast Environment ● Sealaska Heritage Plant Unit: Lesson 1, Lesson 2, Lesson 3 ● Sealaska Heritage Spruce Trees Unit

JSD Elementary Science Curriculum

Energy Smart Lesson: • Thick Coats and Sleeping Bears: How Alaskan Animals Stay Warm During the Winter **Alaska Seas and Watershed Curriculum** • Investigation 3: Living and Nonliving Things in the Water **Assessment Probes by Page Keeley:** • Is it Living?	• Sealaska Heritage Hemlock Unit: Lesson 1, Lesson 3, Lesson 4 • Sealaska Heritage Herring Unit: Herring food chain (activity #1), a herring's life is dangerous (activity #4) • Seasonal changes (e.g. different soils, different foods for animals at different seasons) • Habitat/shelter (hibernating, safety, food, beaver dams, how salmon fry (tuyeigwaa) hide from predators in the roots of a river side tree) • Plants - noticing changes over the seasons, growth, fall leaves/ • Migration: salmon, deer, humpback whales, geese • SeaWeek Field Trip Lesson Plans • STEM Database link

Standards		**Cross-Curricular Connections**
Alaska Cultural	A4, A5, B2, C1, D1, D2, D5, & E2	Cultural specialist and/or Native Elder in the classroom to make the connection. • Respect yourself • Respect our environment • What foods did/do the T'aaku and A'akw Kwaan harvest? • How do harvesting methods reflect respect for environment?
Alaska Science	SA3, SC1, SC2, SE1, SG4,	
Alaska ELA	RI.K.1, SL.K.5, W.K.1, W.K.2, W.K. 7	Reading Wonders • U7W3: Where do animals live? The Giving Tree by Shel Silverstein Science Notebooks
Alaska Math	K.CC, K.MD.2, MP.2, MP.4	Calendar: Seasons
ISTE	3A, 6A	

JSD Elementary Science Curriculum

Grade: 1
Earth Science
Topic: Space Systems: Patterns and Cycles
Vocab: Sun, Moon, Stars, Night, Day, Daylight, Spring, Summer, Fall, Winter, Tides
Pacing: Trimester

Anchor Phenomena and Essential Question
Sun, Moon, and Stars together (photo) ● What patterns can we predict using our observations of the sun, moon, and stars?

Alaska Cultural Standard to Emphasize
A. Culturally-knowledgeable students are well grounded in the cultural heritage and traditions of their community. *3. Acquire and pass on traditions of their community through oral and written history.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
1-ESS1-2: Make observations at different times of year to relate the amount of daylight to the time of year. **Clarification Statement:** Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall. **Assessment Boundary:** Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight. **1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.** **Clarification Statement:** Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day. **Assessment Boundary:** Assessment of star patterns is limited to stars being seen at night and not during the day.	**ESS1.A: The Universe and Its Stars:** Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. **ESS1.B: Earth and the Solar System:** Seasonal patterns of sunrise and sunset can be observed, described, and predicted.

Cross-Cutting Concepts	**Science and Engineering Practices**
● Patterns 1-ESS1-1, 1-ESS1-2 ● Natural Systems 1-ESS1-1	● Planning and Carrying Out Investigations 1-ESS1-2

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Activities: ● Morning and Evening Star ● Our Super Star ● Patterns of Daylight ● Observing the Sun ● Space: Patterns in the Sky ● Sky 1: Objects in the Sky ● Sky 4: The Moon ● Bill Nye Explains the Seasons **Starry Night painting Vincent van Gogh** **Assessment Probes by Page Keeley:** ● Darkness at Night ● When is the Next Full Moon?	● Planetarium ● Docks & harbors - tidal observations ● Low tide beach combing ● High tide vs. low tide videos ● Tlingit Raven and the Sun (art kit and story) ● Box of Daylight ● Filipino Folktale Sun and the Moon ● Sealaska Heritage Hooligan Unit Lesson 1: When are the Hooligan Coming? ● Sealaska Heritage Beach Unit Lesson 1: The Old Woman and the Tides ● The Man Who Ordered the Tide (Goldbelt Heritage Foundation Oral Narrative) ● Go outside on a sunny day to observe shadows ● Repeat observations of change and patterns (seasons, sunrise, sunset, where sun is in the sky early and late in the day, night, daylight, moon phases) ● Keep a Moon Journal ● Sea Week Field Trip Lesson Plans ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural	A.3, B.1, C.1, E.7	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Kaacaaxgook illustrates how observation of sun and stars (patterns) help survival /navigation when lost at sea/in strange new land. ● Sun: gagaan; moon: dís; star: kutx.ayanahá.
Alaska Science	SD2, SD3, SF2, SF3, SG4	
Alaska ELA	W.1.7, W.1.8	Reading Wonders • U5W2: What can you see in the sky? Science Notebooks Flat Stanley seasonal observations (send Flat Stanley to other places and have them record the daylight, seasons, moon drawing, etc. of the place)

Alaska Math	1.MD.C.4, 1.OA.A.1, MP.2, MP.4, MP.5	Math in Focus; Chapter 11: Bar Graphs & Picture Graphs
ISTE	3A	

JSD Elementary Science Curriculum

Grade: 1
Physical Science
Topic: Waves: Light and Sound
Vocab: Sound, Vibration, Light, (ideas of Illumination, transparency, opacity, translucent, reflective - kids use their own language to describe), Communication, Signals, Material
Pacing: Trimester

Anchor Phenomena and Essential Questions
Demonstrate a still drum, beat a drum upside down while on a table, and beat a drum right side up. ● What is the relationship between sound and vibration? Use mirrors with lights on and then off in the classroom. ● How can we change how we see things?

Alaska Cultural Standard to Emphasize
E. Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. 4. *Demonstrate an understanding of the relationship between world view and the way knowledge is formed and used.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
1-PS4-1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Clarification Statement:** Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork. **Assessment Boundary:** none **1-PS4-2: Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.** **Clarification Statement**: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light. **Assessment Boundary:** none	**PS4.A: Wave Properties:** Sound can make matter vibrate, and vibrating matter can make sound. **PS4.B: Electromagnetic Radiation:** Objects can be seen if light is available to illuminate them or if they give off their own light. Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. **PS4.C: Information Technologies and Instrumentation:** People also use a variety of devices to communicate (send and receive information) over long distances.

1-PS4-3: Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light. **Clarification Statement:** Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror). **Assessment Boundary:** Assessment does not include the speed of light. **1-PS4-4: Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.** **Clarification Statement:** Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats. **Assessment Boundary:** Assessment does not include technological details for how communication devices work.	

Cross-Cutting Concepts	Science and Engineering Practices
● Cause and Effect 1-PS4-1, 1-PS4-2, 1-PS4-3 ● Influence of Science, Engineering, and Technology on Society and the Natural World 1-PS4-4	● Planning and Carrying Out Investigations 1-PS4-1, 1-PS4-3 ● Constructing Explanations and Designing Solutions 1-PS4-2, 1-PS4-4 ● Scientific Investigations Use a Variety of Methods. 1-PS4-1 1-PS4-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● Telephones ● What Makes Sound? ● Science of Light ● Flashlight Investigation ● Assessing the Unseen ● Sound Vibrations ● Waves: Light and Sound ● Listen! Listen! Listen! ● Visibility of Light	● Traditional AK Native drums/drum construction ● Create a hydrophone; Bring NOAA or UAS guest speakers to discuss hydrophones ● Local Animal Sounds (birds, whales…) ● Local Lighthouses ● City Museum & State Museum ● Refractive nature of water investigations ● Playing with prisms ● Sound demonstrations, Sound travels ● Sealaska Heritage Canoe Unit Lesson 5: Force at Work With

● Investigating Sound ● Firefly, Firefly ● Sounds Abound ● Assessing Light Knowledge **Assessment Probes by Page Keeley:** ● Making Sound ● Can It Reflect Light?	Fishing Nets and Lesson 6: Vibrations & Sounds ● Observe something moving because of the vibration ● Observe objects in dark and light ● Observe how light travels through objects made of different materials ● Go outdoors and observe how much sunlight passes through a tree trunk, devil's club leaf... ● Mirrors (reflect or redirect) ● Using a plastic bin, wax paper, cardboard and mirror: have students look through each type of material; what are their observations? ● Sit in a dark room. Use a flashlight, lantern, or sunshine to illuminate a variety of classroom items. ● Talk about light and dark in Alaska. How do Alaskans adapt to the extreme variability of light between summer and winter? ● STEM Database link

Standards		**Cross-Curricular Connections**
Alaska Cultural Standards	B.2, D.1, D.4, E.7	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Importance of sound and light in survival situations. ● How did first people adapt to variability of light between summer and winter?
Alaska Science Standards	SA1, SB2, SB3, SE.1, SE.2, SE.3, SG1, & SG4	
Alaska ELA Standards	SL.1.1, W.1.2, W.1.7, W.1.8	Reading Wonders ● U5W4: What sound can you hear? Science Notebooks
Alaska Math Standards	1.MD.1, 1.MD.2, MP.5	
ISTE	4A, 4D	

JSD Elementary Science Curriculum

Grade: 1
Life Science
Topic: Structure, Function, and Information Processing
Vocab: Plants, Animals, Parents, Observations, Patterns, Same, Different, Similar, Characteristics
Pacing: Trimester

Anchor Phenomena and Essential Question
Devil's club and black bear (photos) ● How do animals and plants use their bodies or parts to survive?

Alaska Cultural Standard to Emphasize	
E. Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. 1. *Understand the ecology and geography of the bioregion they inhabit.*	
NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. **Clarification Statement:** Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears. **Assessment Boundary:** none **1-LS1-2: Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.** **Clarification Statement:** Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring). **Assessment Boundary:** none	**LS1.A: Structure and Function:** All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. **LS1.B: Growth and Development of Organisms:** Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. **LS1.D: Information Processing:** Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. **LS3.A: Inheritance of Traits:** Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents. **LS3.B: Variation of Traits:** Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

1-LS3-1: Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. **Clarification Statement:** Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same. **Assessment Boundary:** Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.	

Cross-Cutting Concepts	Science and Engineering Practices
● Patterns 1-LS1-2, 1-LS3-1 ● Structure and Function 1-LS1-1 ● Influence of Science, Engineering, and Technology on Society and the Natural World 1-LS1-1	● Constructing Explanations and Designing Solutions 1-LS3-1, 1-LS1-1 ● Obtaining, Evaluating, and Communicating Information 1-LS1-2 ● Science Knowledge Is Based on Empirical Evidence 1-LS1-2

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● Leaf It to Me ● Penguin Parent Patrol ● Chip Off The Old Block ● Why So Yummy ● Eat Like A Bird ● The Purpose of Parts ● The Emperor Penguin's Eggs ● Animal Horns ● Ultimate Animal Moms **Alaska Dept. of Fish and Game:** ● Skulls Kit Furs Kit ● Animal Tracks Kit	● Field Trip to AK State Museum ● Sealaska Heritage Salmon- Lesson 6: Internal Parts of a Salmon ● Sealaska Heritage Plants Unit ● Indigenous animals and plants ● Historical indigenous clothing for survival ● Forest Service Science Lab (by the university) ● Field Trip to DIPAC in Fall for Salmon Education Program ● Pictures of families (when appropriate)-link to social studies curriculum ● School Gardens ● Sea Week Field Trip Lesson Plans ● Walk in your local forest site and look for a nurse log to compare a baby spruce tree to a nearby adult spruce tree, young alder/adult alder ● Deer with fawn, Sow with cubs (Nature Bob photos) ● STEM Database link

● Alaska Wildlife Curriculum: ▪ *Alaska's Wetlands & Wildlife*: Are you me? Section III ▪ *Alaska's Tundra & Wildlife*: Life Forms & Adaptations: Section III **Alaska Seas & Watershed Curriculum:** ● **Activity 2A:** Shells: Take a Closer Look ● **Activity 3D**: High-Tide, Low-Tide Game **Science Kits:** ● Animals 2 x 2 ● Organisms ● Trees **Assessment Probes by Page Keeley:** ● Is It An Animal? ● Baby Mice	

Standards		Cross-Curricular Connections
Alaska Cultural Standards	B2, B3, C1, D1, D4, E1, & E2	Cultural specialist and/or Native Elder in the classroom to make the connection.
Alaska Science Standards	SA3, SC.1, SA2, SF1, SF3, SG3, SG4	
Alaska ELA Standards	RI.1.1, R1.1.10, RI.1.2, W.1.7, W.1.8	Reading Wonders ● U3W2: How do plants change? ● U4W1: How do animals' bodies help them? ● U4W2: How do animals help each other? ● U4W3: How do animals survive in nature? ● U4W4: How are insects alike and different? Science Notebooks
Alaska Math Standards	1.MD.1, 1.NBT.3, 1.NBT.4, 1.NBT.5, 1.NBT.6, MP.2, MP.5	
ISTE	3A, 4A	

JSD Elementary Science Curriculum

Grade: 2

Earth Science

Topic: Earth's Systems: Processes that Shape the Earth

Vocab: Erosion, Dikes, Windbreaks, Earthquakes, Volcanoes, Landforms, Glaciation

Pacing: Trimester

Anchor Phenomena and Essential Question
Look at the Mendenhall Glacier and Lake (or show a photo) ● How do processes shape the Earth?

Alaska Cultural Standard to Emphasize
E. Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. 3. *Demonstrate Understanding of the relationship between world view and the way knowledge is formed and used.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
2-ESS1-1: Use information from several sources to provide evidence that Earth events can occur quickly or slowly. **Clarification Statement:** Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly, and erosion of rocks, which occurs slowly. **Assessment Boundary:** Assessment does not include quantitative measurements of timescales. **2-ESS2-1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.** **Clarification Statement:** Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land. **Assessment Boundary:** none **2-ESS2-2: Develop a model to represent the shapes and kinds of land and bodies of water in an area.** **Clarification Statement:** none **Assessment Boundary**: Assessment does not include quantitative scaling in models.	**ESS1.C: The History of Planet Earth:** Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. **ESS2.A: Earth Materials and Systems:** Wind and water can change the shape of the land. **ESS2.B: Plate Tectonics and Large-Scale System Interactions:** Maps show where things are located. One can map the shapes and kinds of land and water in any area. **ESS2.C: The Roles of Water in Earth's Surface Processes:** Water is found in the ocean, rivers, lakes, ponds and glaciers. Water exists as solid ice and in liquid form. **ETS1.C: Optimizing the Design Solution:** Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

2-ESS2-3: Obtain information to identify where water is found on Earth and that it can be solid or liquid. **Clarification Statement:** none **Assessment Boundary:** none	

Cross-Cutting Concepts	Science and Engineering Practices
● Patterns 2 ESS2-2, 2-ESS2-3 ● Stability and Change 2-ESS1-1, 2-ESS2-1 ● Influence of Science, Engineering, and Technology on Society and the Natural World 2-ESS1-1 ● Science Addresses Questions About the Natural and Material World 2-ESS2-1	● Developing and Using Models 2-ESS2-2 ● Constructing Explanations and Designing Solutions 2-ESS2-1 ● Obtaining, Evaluating, and Communicating Information 2-ESS2-3

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● Sand Dune Erosion in a Box ● How Can Water Change the Shape of the Land? ● How Can Wind Change the Shape of the Land? ● How Do Glaciers Change the Shape of the Land? ● Finding Erosion At Our School ● Planning a Landform Model ● Let's Get Carried Away ● There's a Whole Lotta Shakin' Goin' On! ● Let's Compare Erosion Design Solutions ● BrainPop Weathering video ● STEM in a Box: Shakin' Up the Classroom **Science Kit:** ● Pebbles, Sand, and Silt **Assessment Probes from Page Keeley:** ● Mountain Age ● Beach Sand	● Field Trip to Glacier for I.C.E. (Investigate, Create, Explore) Program ● Rivers & stream erosion ● Succession at Auke Rec ● Local faults : Gastineau Channel/Lynn Canal ● Riprap in harbors (breakwater), seawalls ● Snowdrifts ● Local Landforms: islands, hills, mountains, lake/ponds, rivers, moraines ● Egan Dr. ● Access and observe local natural area ● Any flooded area ● Video of earthquake damage or erosion ● Erosion phenomena on playground ● The Stikine Migration Story from 2nd grade Indian Studies p. 147-158 ● Video: Time Lapse of Mendenhall Glacier ● STEM Database link

JSD Elementary Science Curriculum

Standards		Cross-Curricular Connections
Alaska Cultural Standards	B.4, D1, D5, E2, E4	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Raven's Foot Prints (Yakutat land formation seen from sky links to description in an oral narrative) ● Raven and the Whale (Yakutat land formations explained in oral narrative)
Alaska Science Standards	SA1, SD2, SE1, SE2, SG4	
Alaska ELA Standards	RI.2.1, RI.2.3, RI.2.9, SL.2.2, SL2.5, W.2.6, W.2.7, W.2.8	Reading Wonders ● U3W4: How does weather affect us? ● U4W2: How does the Earth change? Science Notebooks
Alaska Math Standards	2.MD.5, 2.NBT.1, 2.NBT.3, MP.2, MP.4, MP.5	
ISTE	3A, 3D, 7A, 7B, 7D	

JSD Elementary Science Curriculum

Grade: 2
Physical Science
Topic: Structure and Properties of Matter
Vocab: Patterns, Solid, Liquid, Temperature, Color, Shape, Texture, Size, Weight (not quantitative), Materials, Compare
Pacing: Trimester

Anchor Phenomena and Essential Question
Show students a traditional Tlingit drum (borrow one from cultural specialist or SLAM) ● How do the properties of materials relate to their use?

Alaska Cultural Standard to Emphasize
D. Culturally knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. 2. *Participate in and make constructive contributions to the learning activities associated with a traditional camp environment.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. **Clarification Statement:** Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share. **Assessment Boundary:** none **2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.** **Clarification Statement:** Examples of properties could include: strength, flexibility, hardness, texture, and absorbency. **Assessment Boundary:** Assessment of quantitative measurements is limited to length. **2-PS1-3: Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.** **Clarification Statement:** Examples of pieces could include: blocks, building bricks, or other assorted small objects. **Assessment Boundary:** none	**PS1.A: Structure and Properties of Matter:** Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. Different properties are suited to different purposes. A great variety of objects can be built up from a small set of pieces. **PS1.B: Chemical Reactions:** Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.

2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. **Clarification Statement:** Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include: cooking an egg, freezing a plant leaf, and heating paper. **Assessment Boundary:** none	

Cross-Cutting Concepts	Science and Engineering Practices
● Patterns 2-PS1-1 ● Cause and Effect 2-PS1-2 ● Energy and Matter 2-PS1-3	● Planning and Carrying Out Investigations 2-PS1-1 ● Analyzing and Interpreting Data 2-PS1-2 ● Constructing Explanations and Designing Solutions 2-PS1-3 ● Engaging in Argument from Evidence 2-PS1-4

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● Identifying Your Soil ● A House for Chase the Dog ● Take it Apart, Put it Together ● Properties of Materials and Their Everyday Uses ● Observable Properties of Matter ● Matter and Heat/Irreversible Changes ● Melting and Freezing ● Let Go of My Lego ● Thousands of Tiny Pieces Can Create Something Big ● Properties of Materials Game ● Exploring Reversible and Irreversible Changes of State **Science Kit:** ● Solids and Liquids **Engineering Kit:** ● Solid as A Rock **Assessment Probe by Page Keeley:** ● Is It Matter? ● Where Did the Water Come From?	● AK State Museum (look at clothing, tools, and other artifacts) ● Freezing & thawing of bodies of water (Mendenhall Lake, Twin Lakes, nearby streams) ● Play outside in the snow and ice and observe changes ● Go to a local natural site to observe how berries and leaves change with the varying temperatures (natural, freeze and thaw) ● Sealaska Heritage Berries Unit: Lesson 8 (making blueberry fruit leather) ● Local materials used for tools or products ● Materials used in both modern and traditional: subsistence activities, clothing, shelters, art, transportation ● Traditional Drum info (SLAM-Artifact of the Month) ● Field Trip to Glacier for I.C.E. (Investigate, Create, Explore) Program ● Freezing water or snow; melting ice ● Properties of playground equipment ● STEM Database link

Alaska Resource Education • "Rock Hunt" lesson • "Paste With A Taste" lesson	

Standards		Cross-Curricular Connections
Alaska Cultural Standards	C1, D1, D5, E2	Cultural specialist and/or Native Elder in the classroom to make the connection. ● What local materials were used to make baskets, canoes, snow shoes, drums, etc.? Why are these resources best suited (properties of resources)? ● Tlingit Technology (Goldbelt Heritage Foundation ppt)
Alaska Science Standards	SA1, SD2, SE1, SE2, SG3, SG4	
Alaska ELA Standards	RI.2.1, 2.3, 2.8	No Reading Wonders units align Science Notebooks
Alaska Math Standards	2.MD.10, MP.2, MP.4, MP.5	
ISTE	3A, 3D	

JSD Elementary Science Curriculum

Grade: 2
Life Science
Topic: Interdependent Relationships in Ecosystems
Vocab: Pollinate, Differences, Habitat, Balance, Survive, Life
Pacing: Trimester

Anchor Phenomena and Essential Question
Show a photo of bear scat with berries in it ● How do plants and animals depend on each other?

Alaska Cultural Standard to Emphasize
E. Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. *2. Understand the ecology and geography of the bioregion they inhabit.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
2-LS2-1: Plan and conduct an investigation to determine if plants need sunlight and water to grow. **Clarification Statement:** none **Assessment Boundary:** Assessment is limited to testing one variable at a time. **2-LS2-2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.** **Clarification Statement:** none **Assessment Boundary:** none **2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.** **Clarification Statement:** Emphasis is on the diversity of living things in each of a variety of different habitats. **Assessment Boundary:** Assessment does not include specific animal and plant names in specific habitats.	**LS2.A: Interdependent Relationships in Ecosystems:** Plants depend on water and light to grow. Plants depend on animals for pollination or to move their seeds around. **LS4.D: Biodiversity and Humans:** There are many different kinds of living things in any area, and they exist in different places on land and in water. **ETS1.B: Developing Possible Solutions:** Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Cross-Cutting Concepts	Science and Engineering Practices
● Cause and Effect 2-LS2-1 ● Structure and Function 2-LS2-2	● Developing and Using Models 2-LS2-2 ● Planning and Carrying Out Investigations 2-LS2-1, 2-LS4-1 ● Science Knowledge Is Based on Empirical Evidence 2-LS4-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● Who Needs What? ● Do Plants Need Sunlight? ● Creating Animals That Disperse Seeds ● A Sticky Situation ● Two Scoops Are Better Than One ● I Scream You Scream, We All Scream for Vanilla Ice Cream ● The Bug Chicks Mission: Pollination ● Invent an Insect ● Habitat in a Bucket ● Exploring Micro-habitats :Life Under Logs **Science Kit:** ● Insect and Plants **Engineering Kit:** ● The Best of Bugs: Designing Hand Pollinators **Assessment Probe by Page Keeley:** ● Habitat Change	● Field Trip to DIPAC in Fall for Salmon Education Program ● Field Trip to DIPAC in Spring for Sea Week Program ● Sea Week Field Trip Lesson Plans ● School site and community garden plots: plant growth experiments, compost bins ● Compare habitats near school site ● Set up trail cameras to record wildlife interactions and habitat use: ADF&G Trail Camera Kits ● Study of indigenous plants and animals ● Goldbelt Heritage Unit: Living by the Seasons ● Sealaska Heritage: Plant Unit ● Observe birds and small mammals gathering food (small midden) ● Plant care over time (light vs. no light, water vs. no water) ● Go out and observe what is living in local natural area, draw/diagram and label what is observed. ● Make observations of forest canopy in local forested area. Trees compete for light. How does forest change when a tree falls and opens up the canopy? ● Use materials with different textures to move things (velcro, fuzzy socks to move small seeds or other small items) around the room (like animals pollinating and distributing seeds) ● Biodiversity of a Quadrat ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural Standards	B.2, D.2, D.5, E2	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Seasonal foods; respectful harvesting ● Tlingit Biology: Tidelands (Goldbelt Heritage Foundation ppt)
Alaska Science Standards	SA3, SC2, SE1, SE2, SG4	

Alaska ELA Standards	SL.2.5, W.2.7, W.2.8,	Reading Wonders ● U2W1: How do animals survive? ● U2W3: What are features of different animal habitats? ● U4W1: What makes different parts of the world different? ● U6W1: What do myths help us understand? Science Notebooks
Alaska Math Standards	2.MD.D.10, MP.2, MP.4, MP.5	
ISTE	3A, 4A, 4D	

JSD Elementary Science Curriculum

Grade: 3

Earth Science

Topic: Weather and Climate

Vocab: Climate, Weather, Natural Hazard (tornado, hail storm, blizzard, lightning, flood, hurricane, avalanche), Precipitation, Polar, Subarctic, Temperate, Desert, Tropical, Elevation, Terrain

Pacing: Integrated in math throughout the year

Anchor Phenomena and Essential Question
Thane Avalanche (watch without sound) ● How does knowing about our weather help us make decisions?

Alaska Cultural Standard to Emphasize
E. Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. 2. *Understand the ecology and geography of the bioregion they inhabit.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. **Clarification Statement:** Examples of data could include: average temperature, precipitation, and wind direction. **Assessment Boundary:** Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change. **3-ESS2-2: Obtain and combine information to describe climates in different regions of the world.** **Clarification Statement:** none **Assessment Boundary:** none **3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.** **Clarification Statement:** Examples of design solutions to weather-related hazards could include: barriers to prevent flooding, wind resistant roofs, and lightning rods. **Assessment Boundary:** none	**ESS2.D: Weather and Climate:** Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. **ESS3.B: Natural Hazards:** A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

Cross-Cutting Concepts	Science and Engineering Practices
● Patterns 3-ESS2-1, 3-ESS2-2 ● Cause and Effect 3-ESS3-1 ● Influence of Science, Engineering, and Technology on Society and the Natural World 3-ESS3-1 ● Science Is a Human Endeavor 3-ESS3-1	● Analyzing and Interpreting Data 3-ESS2-1 ● Engaging in Argument from Evidence 3-ESS3-1 ● Obtaining, Evaluating, and Communicating Information 3-ESS2-2

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● Differences Between Climate and Weather ● My NASA Data Lesson: Climate Graphs ● Waterproof the Roof ● Tacoma Narrows Bridge Phenomenon ● Climate Postcards **Assessment Probe by Page Keeley:** ● Rainfall	● River flooding ● Breakwaters, dams ● Discovery Southeast Nature Studies ● Thermometer outside that students check, along with online data and webcams for a city in a different region (graph) ● Go outside during different weather, record conditions and personal experience of being out in that weather ● Heavy rain or snow and strong winds (Taku winds) ● Juneau Ice Field ● Compare Juneau weather patterns to weather patterns in other parts of Alaska ● Identifying the world climate zones and corresponding weather-related hazards. ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural Standards	D.1, D5, E2	Cultural specialist and/or Native Elder in the classroom to make the connection. ● How did the T'aaku and A'akw Kwaan's knowledge of weather patterns influence their decision to settle in this area? Their clothing, shelters? ● How did the T'aaku and A'akw Kwaan's observation and interpretation of environmental cues help them to predict weather and make safe decisions: Safe to take canoe? Safe to hunt? Visibility (fog, snow) and safety issues in environment. Avalanche ● How did Tlingit people historically determine typical weather patterns?

		● Why is it important to observe your environment and interpret what you see? ● *Haa kaa gaa kuwatee*—It's good weather for us. ● Kaaklaheen- Raining, snow, sleet, hail
Alaska Science Standards	SA1, SA3, SD1, SE1, SE2, SG3, SG4	
Alaska ELA Standards	RL.3.9 W.3.7	Reading Wonders ● U6W2: How can weather affect us? Expository/Informative Writing Ideas: ● Cause and Effect expository writing on how to prevent the effects of weather-related hazards. ● Climate in Juneau compared to different parts of the world. Science Notebooks
Alaska Math Standards	3.MD.4, MP.2, MP.4	Making a graph to represent the weather data collected (tables, bar graph, line graphs)
ISTE	3A, 3B, 3D	

JSD Elementary Science Curriculum

Grade: 3
Physical Science
Topic: Forces and Interactions
Vocab: Balanced force, Magnets, Unbalanced force, Positive charge, Motion, Negative charge, Attract, Electricity, Repel, Magnetism, Power
Pacing: Trimester

Anchor Phenomena and Essential Question
Static Electricity (video) ● In what ways do objects move?

Alaska Cultural Standard to Emphasize
E: Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. *4. Determine how ideas and concepts from one knowledge system relate to those derived from other knowledge systems.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
3-PS2-1: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. **Clarification Statement:** Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all. **Assessment Boundary:** Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down. **3-PS2-2: Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.** **Clarification Statement:** Examples of motion with a predictable pattern could include: a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw. **Assessment Boundary:** Assessment does not include technical terms such as period and frequency.	**PS2.A: Forces and Motion:** Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces is used at this level.) The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) **PS2.B: Types of Interactions**: Objects in contact exert forces on each other. Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.

3-PS2-3: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. **Clarification Statement:** Examples of an electric force could include: the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include: the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include: how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force. **Assessment Boundary:** Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity. **3-PS2-3: Define a simple design problem that can be solved by applying scientific ideas about magnets.** **Clarification Statement:** Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other. **Assessment Boundary:** none	

Cross-Cutting Concepts	Science and Engineering Practices
● Patterns 3-PS2-2 ● Cause and Effect 3-PS2-3. 3-PS2-1 ● Interdependence of Science, Engineering, and Technology 3-PS2-4	● Asking Questions and Defining Problems 3-PS2-4, 3-PS2-3 ● Planning and Carrying Out Investigations 3-PS2-1, 3-PS2-2 ● Science Knowledge Is Based on Empirical Evidence 3-PS2-2 ● Scientific Investigations Use a Variety of Methods 3-PS2-1

JSD Elementary Science Curriculum

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● Investigating the Magnetic Force Field ● Investigating Motion: What Causes Objects to Move ● Collision Zone ● Scampering into Engineering ● Force and Motion Investigation ● Attraction with Static Electricity ● Designing a Hovercraft ● Rocket Activity ● Invisible Forces Mystery 3 ● Integrating STEM Through Tumblewing Gliders **JSD Material Check Out:** ● Classroom Set of Magnets **Engineering Kits:** ● The Attraction is Obvious: Designing Maglev Systems ● Designing Bridges **3rd Grade Magnets Unit** **Picture Perfect Science Lessons K-4** by Ansberry & Morgan (in school library) ● Ch. 13: The Magnetic Dog (p 123) ● Ch. 14: Roller Coasters (p 133) **Assessment Probes by Page Keeley:** ● Rolling Marbles ● Magnets in Water **Alaska Resource Education** ● "Fossil Fuel Hunt" lesson	● Canoeing: Impacts of wind/tide (forces) on canoe travel (motion) as related to safety and survival issues. ● Totem pole raising ● Compass: introduce magnetic poles and basic orienteering exercises outside ● Sealaska Heritage Canoe Unit ● Yupik yoyos ● Magnets on the whiteboard, Magnetic doodle board ● Balance scales (balanced and unbalanced) ● Go outside on a windy day and observe effect of wind force on trees ● Playground- teeter totter, swinging… ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural Standards	D.1, D5, E.3, E4	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Wooch'een importance & forces and motion in canoeing as related to safety and survival. ● Wooch'een and forces and motion in canoe racing (recreation). Working together=stronger force=speed
Alaska Science Standards	SA1, SB4, SE1, SE2, SE3, SF3, SG1, SG4	

Alaska ELA Standards	RL.3.1, SL.3.3	Reading Wonders ● U4W4: How are people able to fly? Science Notebooks
Alaska Math Standards	MP.2, MP.5	
ISTE	4A, 4D	

JSD Elementary Science Curriculum

Grade: 3
Life Science
Topic: Interdependent Relationships in Ecosystems
Vocab: Environment, Habitat, Organisms, Ecosystem, Living/Nonliving
Pacing: Trimester

Anchor Phenomena and Essential Question
Sitka Black-Tailed Deer ● How can a change in the environment change the survival strategies of its plants and animals?

Alaska Cultural Standard to Emphasize
E. Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationship and processes of interaction of all elements in the world around them. 1. *Understand the ecology and geography of the bioregion they inhabit.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
3-LS2-1: Construct an argument that some animals form groups that help members survive. **Clarification Statement:** none **Assessment Boundary:** none **3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.** **Clarification Statement:** Examples of evidence could include: needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other. **Assessment Boundary:** none **3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.** **Clarification Statement:** Examples of environmental changes could include: changes in land characteristics, water distribution, temperature, food, and other organisms.	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience:** When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. **LS2.D: Social Interactions and Group Behavior:** Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. **LS4.C: Adaptation:** For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. **LS4.D: Biodiversity and Humans:** Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.	

Cross-Cutting Concepts	Science and Engineering Practices
● Cause and Effect 3-LS2-1, 3-LS4-3 ● Systems and System Models 3-LS4-4 ● Interdependence of Science, Engineering, and Technology 3-LS4-4	● Analyzing and Interpreting Data 3-LS4-1 ● Engaging in Argument from Evidence 3-LS2-1, 3-LS4-3, 3-LS4-4

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● Bird Beaks ● Animal Groups: Benefits and Disadvantages ● Ingenius Bubble Net Fishing Phenomenon ● Ecosystems and Biological Evolution ● Nature Works Adaptation Video ● Fossilization and Adaptation ● Muskox Maneuvers ● Wild Kratts Creaturepedia and Animal Adaptations **Science Kits:** ● Habitats and Soil ● Aquatic Ecosystems **Alaska Dept. of Fish and Game:** ● Raptors of Alaska Kit ● Aquatic Ecosystems Kit ● Alaska Wildlife Curriculum ▪ *Alaska's Wetlands & Wildlife*: Energy Flow in an Alaska Wetland: Section II ▪ *Alaska's Forests & Wildlife*: Succession Story and Animal Adaptations for Succession: Section IV. **Assessment Probes by Page Keeley:** ● Adaptation ● Habitat Change	● Discovery Southeast Nature Studies ● How do animals cope with winter? Hibernate, Migrate, or Deal with It? ● Field Trip to DIPAC in Fall for Salmon Education Program ● Sea Week Field Trip Lessons Plans ● Field Trip to Glacier for I.C.E. (Investigate, Create, Explore) Program ● ADF&G and NOAA-guests: fisheries in changing ocean ● Wastewater treatment facilities: microbes thrive in waste. ● Raptor Center: live bird visit, rehab. Most often related to human impacts. ● Intertidal & Stream investigations ● How climate change impacted the settlement and migration of local native groups. ● Look Out! Glacier Construction Ahead @ Mendenhall Glacier (hands-on program) ● Glacial/Plant succession ● Show pictures or videos of different groups of animals ● Observe organisms in local habitat ● Use videos or pictures of animals in other habitats ● Oral Narrative: Tree People ● STEM Database link

JSD Elementary Science Curriculum

Standards		Cross-Curricular Connections
Alaska Cultural Standards	A4, D.1, E1, E2, E5	Cultural specialist and/or Native Elder in the classroom to make the connection. • (ecosystems) Why is it important to respect non-living things? Spirit in all things is different from the Western science classification of living /non-living things. Rocks deserve same respect as birds. They are all part of the ecosystem. Respect for all things. • Forestry Natural Resources (Goldbelt Heritage Foundation ppt) • (change in environment/human impact) Importance of respecting salmon spawning streams. How did local Kwaans historically treat the streams and spawning salmon?
Alaska Science Standards	SA2, SA3, SC1, SE2	
Alaska ELA Standards	RL.3.1 W.3.2 W.3.7	Reading Wonders • U2W4: How can people help animals survive? • U4W3: How do animals adapt to challenges in their habitat? Expository/Informative/Report writing ideas: ● Connect one of the Performance Expectations to an animal and create an informative piece of writing or a report. Science Notebooks
Alaska Math Standards	MP.2	
ISTE	3A, 6A, 6C, 6D	

JSD Elementary Science Curriculum

Grade: 3
Life Science
Topic: Inheritance and Variation of Traits
Vocabulary: Traits, Adaptations, Environment, Offspring
Pacing: Trimester

Anchor Phenomena and Essential Questions
Look at a tree(s) growing in different conditions ● How does a change in the environment affect the traits that an organism develops?

Alaska Cultural Standard to Emphasize
E. Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. 2. *Understand the ecology and geography of the bioregion they inhabit.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. **Clarification Statement:** Changes organisms go through during their life form a pattern. **Assessment Boundary:** Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction. **3-LS3-1: Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.** **Clarification Statement:** Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans. **Assessment Boundary:** Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples. **3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.**	**LS1.B: Growth and Development of Organisms:** Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. **LS3.A: Inheritance of Traits:** Many characteristics of organisms are inherited from their parents. Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. **LS3.B: Variation of Traits:** Different organisms vary in how they look and function because they have different inherited information. The environment also affects the traits that an organism develops. **LS4.B: Natural Selection:** Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

Clarification Statement: Examples of the environment affecting a trait could include: normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight. **Assessment Boundary:** none **3-LS4-2: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.** **Clarification Statement:** Examples of cause and effect relationships could include: plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring. **Assessment Boundary:** none	

Cross-Cutting Concepts	Science and Engineering Practices
● Patterns 3-LS1-1, 3-LS3-1 ● Cause and Effect 3-LS3-2, 3-LS4-2	● Developing and Using Models 3-LS1-1 ● Analyzing and Interpreting Data 3-LS3-1 ● Constructing Explanations and Designing Solutions 3-LS3-2, 3-LS4-2 ● Science Knowledge Is Based on Empirical Evidence 3-LS1-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● What is a Life Cycle? **Science Kit:** ● Life Cycles **Science Materials Check Out** ● Incubator **Assessment Probe by Page Keeley:** ● Does It Have a Life Cycle? (article and handout)	● Discovery Southeast Nature Studies ● Sea Week Tide-pooling: observe how traits of various organisms may differ ● Visit a local natural area to make observations of plants. Are some different because of varying conditions? ● Study/observe local animals or plants ● Observe organisms in various stages of life ● Pictures of offspring with parents (connect to similar traits they have with their parents) ● Effects of environment on classroom plants (too much water, not enough, fertilizer)

	● Sealaska Heritage Herring Unit: Lesson # 3 Herring Life Cycle ● Sealaska Heritage Salmon II Unit: Lesson #2 Salmon Life Cycle ● Raven, King Salmon, and the Birds (Goldbelt Heritage Foundation Oral Narrative) ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural Standards	A2, D1, D4	Cultural specialist and/or Native Elder in the classroom to make the connection. ● How do you determine when it is time to harvest local medicinal plants/berries? ● How do you harvest to ensure the plants/berries return the following season? ● Why are there no longer any clams to harvest from Sandy beach?
Alaska Science Standards	SA2, SA3, SC1, SC2	
Alaska ELA Standards		Reading Wonders • U3W1: What makes different animals unique? • U6W4: How can learning about animals help you respect them? Scholastic Resources Science Notebooks
Alaska Math Standards	3.MD.4, 3.MD.5, 3.NBT, 3.NF, MP.2, MP.4	
ISTE	3A	

JSD Elementary Science Curriculum

Grade: 4

Earth Science

Topic: Earth's Systems: Processes that Shape the Earth

Vocabulary: Fossil, Sediments, Weathering, Erosion, Deposition, Geology, Meteorologist, Glacier, Pressure, Plate Tectonics, Earthquakes, Volcanoes, Tsunami, Flood

Pacing: Trimester

Anchor Phenomena and Essential Question
Visit a local natural area to observe evidence of erosion and deposition caused by water (rivers-alluvial fans, oxbow, trail erosion, beach berms created by heavy wave action depositing gravel above high tide ● How do natural processes shape the Earth?

Alaska Cultural Standard to Emphasize	
E. Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. 2. *Understand the ecology and geography of the bioregion they inhabit.*	
NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time. **Clarification Statement:** Examples of evidence from patterns could include: rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock. **Assessment Boundary:** Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time. **4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation**.	**ESS1.C: The History of Planet Earth:** Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. **ESS2.A: Earth Materials and Systems:** Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. **ESS2.B: Plate Tectonics and Large-Scale System Interactions:** The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. **ESS2.E: Biology:** Living things affect the physical characteristics of their regions.

Clarification Statement: Examples of variables to test could include: angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow. **Assessment Boundary:** Assessment is limited to a single form of weathering or erosion. **4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features.** **Clarification Statement:** Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes. **Assessment Boundary:** none **4-ESS3-2: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.** **Clarification Statement:** Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity. **Assessment Boundary:** Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.	**ESS3.B: Natural Hazards:** A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. **ETS1.B: Developing Possible Solutions:** Testing a solution involves investigating how well it performs under a range of likely conditions.(secondary to 4-ESS3-2)

Cross-Cutting Concepts	Science and Engineering Practices
• Patterns 4-ESS1-1 • Cause and Effect 4-ESS2-1, 4-ESS3-2 • Connections to Engineering, Technology, and Applications of Science 4-ESS3-2 • Connections to Nature of Science 4-ESS1-1	• Planning and Carrying Out Investigations 4-ESS2-1 • Analyzing and Interpreting Data 4-ESS2-2 • Constructing Explanations and Designing Solutions 4-ESS1-1, 4-ESS3-2

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: • There's A Glacier in my Classroom • Engineering for the Three Little Pigs • Glaciers, Water, and Wind, Oh My! • Bill Nye Video-Erosion • Earthquakes in the Classroom	• Discovery Southeast Nature Studies • Jokulhlaups - Mendenhall • Field Trip to Glacier for I.C.E. (Investigate, Create, Explore) Program • Glacial striations on rocks, moraines…. • Lituya Bay (tsunami)

● Weathering and Erosion: A Comprehension Instructional Sequence (CIS) ● Tsunami Survival ● Save Our City! ● Weathering, Erosion, and Deposition **Science Kit:** ● Land and Water **Assessment Probes by Page Keeley:** ● Mountain Top Fossil	● Shore Zones/Google Earth ● Look at a nearby Storm drain ● Juneau Trails Project (2nd photo) ● Uplift ● Tlingit Petroglyphs ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural Standards	A3, A4, A5, A7, B2, B4, D1, D5, E2, E3	Cultural specialist and/or Native Elder in the classroom to make the connection. Tlingit Oral Narratives: ● Taku Mountains Fighting ● Lake, No Lake (Taku Inlet) ● Glacier Bay/Natives move to Hoonah
Alaska Science Standards	SA1, SA3, SB1, SB3, SB4, SD2 SE2, SE3, SF1, SF2, SF3, SG3, SG4	
Alaska ELA Standards	RI.4.1, RI.4.7, RI4.9, RW.4.7, W.4.8, W.4.9	Reading Wonders • U1W3: How do people respond to disasters? Science Notebooks Gary's Sand Journal
Alaska Math Standards	4.MD.A.1, 4.MD.A.2, 4.OA.A.1, MP.2, MP.4, MP.5	
ISTE	3D, 4A, 4D, 5B, 7D	
Social Studies		Alaska Social Studies - maps and cultural ● Who are the native groups of Alaska and how are each of them influenced by the resources, climate, and geography in their region historically and presently? ● How are geographic features and climates of Alaska impacted by the dramatic differences of latitude and longitude? ● How have Alaska's natural resources influenced economic development and the economy of the state? ● How has changing technology over time influenced Alaska?

JSD Elementary Science Curriculum

Grade: 4
Physical Science
Topic: Energy
Vocab: Energy, Resource, Force, Collision, Friction, Renewable vs. Nonrenewable, Fossil Fuels, Transfer
Pacing: Trimester (shared with Waves)

Anchor Phenomena and Essential Question
Show a picture of a fire ● How does energy get transferred from place to place?

Alaska Cultural Standard to Emphasize
A. Culturally-knowledgeable students are well grounded in the cultural heritage and traditions of their community *4. Practice their traditional responsibilities to the surrounding environment.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object. **Clarification Statement:** none **Assessment Boundary**: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy. **4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.** **Clarification Statement:** none **Assessment Boundary**: Assessment does not include quantitative measurements of energy. **4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide.** **Clarification Statement**: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact. **Assessment Boundary:** Assessment does not include quantitative measurements of energy.	**PS3.A: Definitions of Energy:** The faster a given object is moving; the more energy it possesses. Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **PS3.B: Conservation of Energy and Energy Transfer:** Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. Light also transfers energy from place to place. Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. **PS3.C: Relationship Between Energy and Forces:** When objects collide, the contact forces transfer energy so as to change the objects' motions.

4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. * **Clarification Statement**: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device. **Assessment Boundary:** Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound. **4-ESS3-1: Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.** **Clarification Statement:** Examples of renewable energy resources could include: wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include: loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels. **Assessment Boundary:** none	**PS3.D: Energy in Chemical Processes and Everyday Life:** The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. **ESS3.A: Natural Resources:** Energy and fuels that humans use is derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. **ETS1.A: Defining Engineering Problems:** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary to 4-PS3-4)

Cross-Cutting Concepts	Science and Engineering Practices
● Cause and Effect 4-ESS3-1 ● Energy and Matter 4-PS3-1, 4-PS3-2, 4-PS3-3, 4-PS3-4 ● Connections to Engineering, Technology, and Applications of Science 4-ESS3-1 ● Connections to Nature of Science: Science is a Human Endeavor 4-PS3-4	● Asking Questions and Defining Problems 4-PS3-3 ● Planning and Carrying Out Investigations 4-PS3-2 ● Constructing Explanations and Designing Solutions 4-PS3-1 ● Apply scientific ideas to solve design problems 4-PS3-4 ● Obtaining, Evaluating, and Communicating Information 4-ESS3-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● Cooking with the Sun ● The Life of Environments ● Energy Makes Things Happen: The Boy Who Harnessed the Wind	● Geothermal heat at swim pool ● Snettisham/Salmon Creek Dam ● Dorothy Lake Project ● Wind turbine at Coast Guard station downtown ● Solar panels

● Sled Wars: Gizmos ● Electric Messages: Then and Now ● Design a Lunar Thermos ● Circuits and Electric Light ● Squishy Circuits ● Feel the Heat ● Speedometry **Engineering Kits:** ● Catching the Wind: Wind as Energy ● Now You're Cooking: Designing Solar Ovens ● An Alarming Idea ● Designing Alarm Circuits **AK Energy Smart Lessons 3-5** ● Energy Efficient House Activity (web-based engineering) ● Energy's Pathways Reader's Theater ● My Electric Footprint (math focus) ● Energy Conservation-Energy Efficiency ● Modern Technology in our Daily Lives (integrates with social studies) ● Reading Your Electric Meter (math focus) ● K-2 Alaska Energy Map **Assessment Probes by Page Keeley:** ● Where Does Oil Come From? **Alaska Resource Education** ● "The Sun's Energy" lesson **Art Kits** ● Rachel Carson's Silent Spring	● Warmth of sun on different colors ● Walking uphill or downhill ● Wind power on different days ● Covered area/canyon echoes ● Power of wind on tree growth (mountaintops) ● Look at deposition zones- sorted or unsorted? Look at dynamics of force from stream that sorted it there ● Northwest Coast basketry: red-hot rocks were placed in a water-filled basket, bringing the water to boil and cooking the contents. (heat energy transfer) ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural Standards	A.1, A.4, A.5, A.6, A.7, B.2, B.4, C.3, D.1, D.5, E.2, E.5	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Use of sails on canoes (harnessing energy = more energy, more speed) ● Use of steam/heated rocks in water to change wood properties - making it bendable (bentwood box) more pliant (stretching canoe)
Alaska Science Standards	SA1, SA2, SA3, SB2, SB3, SB4, SD1,	

	SD3, SE1, SE3, SG1, SG2, SG3,	
Alaska ELA Standards	RI.4.1 RI.4.3 RI.4.9, W.4.2, W.4.7,W.4.8, W.4.9	Reading Wonders • U1W4: How can science help us understand how things work? • U5W3: How can inventions solve problems? • U6W3 Resources: How have our energy sources changed over the years?
Alaska Math Standards	4.OA.A.1, 4.OA.A.3, MP.2, MP.4	
ISTE	3D, 4A, 4D, 7D,	
Alaska Health Standards		How do our activities impact the air and water? • Explore topics related to air pollution, i.e. ozone layer/UV hazards, acid rain, CO2 emissions, and, relationship to chronic diseases
Social Studies		Resources of Alaska ● How have Alaska's natural resources influenced economic development and the economy of the state? ● How has changing technology over time influenced Alaska?

JSD Elementary Science Curriculum

Grade: 4
Physical Science
Topic: Waves: Waves and Information
Vocab: Waves, Amplitude, Wavelength, Transmit (transmission)
Pacing: Trimester (shared with Energy)

Anchor Phenomena and Essential Question
Observe and create waves in water ● How do waves differ, and what are some things they can do?

Alaska Cultural Standard to Emphasize
E. Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. 2. *Understand the ecology and geography of the bioregion they inhabit*.

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
4-PS4-1: Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. **Clarification Statement:** Examples of models could include: diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves. **Assessment Boundary**: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength. **4-PS4-3: Generate and compare multiple solutions that use patterns to transfer information.** **Clarification Statement**: Examples of solutions could include: drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text. **Assessment Boundary:** none	**PS4.A: Wave Properties:** Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). **PS4.C: Information Technologies and Instrumentation:** Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. **ETS1.C: Optimizing the Design Solution:** Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (secondary to 4-PS-3)

JSD Elementary Science Curriculum

Cross-Cutting Concepts	STEM: Science and Engineering Practices
• Patterns 4-PS4-1, 4-PS4-3 • Connections to Engineering, Technology, and Applications of Science 4-PS4-3	• Developing and Using Models 4-PS4-1 • Constructing Explanations and Designing Solutions 4-PS4-3 • Connections to Nature of Science 4-PS4-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Lessons: ● Bite Size Physics: Energy and Waves Bite ● Morse Code Messaging ● Simon Says Big Amplitude, Small Wavelength! ● What Are Waves? ● Pop Bottle Waves and Hair Dryer Ripple ● Sound Energy Unit ● Speaking in Phases ● Electric Messages: Then and Now **Engineering Kit:** ● Sounds Like Fun: Seeing Animal Sounds **Art Kits** ● Water Dance **Assessment Probe by Page Keeley:** ● Do the Waves Move the Boat?	● Native Drumming ● Whale songs ● Field trip to beach or any shore to observe waves out in the ocean or coming onto shore, creating waves by throwing a rock onto water, splashing, ... ● Field trip to Swimming Pool (during swim lessons) ● Goldbelt Heritage Foundation Cultural Unit for Waves ● Sealaska Heritage Unit: Sea Mammals- Lesson #9 ● Alive in the Eddy (Goldbelt Heritage Foundation Oral Narrative) ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural Standards	B2, C4, D1, D2	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Wave types/size and safety/survival. Canoes/fishing.
Alaska Science Standards	SA3, SB2, SF1, SG4	
Alaska ELA Standards	RI.4.1, RI.4.9, SL.4.	No Reading Wonders units align
Alaska Math Standards	4.G.1, MP.4	
ISTE	6A, 6B	

JSD Elementary Science Curriculum

Grade: 4
Life Science
Topic: Structure, Function, and Information Processing
Vocab: Structure, Adaptation, Survival, Behavior, Reflection, Internal, External, Reproduction, Function, Nervous System
Pacing: Trimester

Anchor Phenomena and Essential Question
Mountain goat (photo) ● How do the structures of plants and animals support their survival?

Alaska Cultural Standard	
E. Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. *2. Understand the ecology and geography of the bioregion they inhabit.*	
NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. **Clarification Statement:** none **Assessment Boundary**: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works. **4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** **Clarification Statement:** Examples of structures could include: thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin. **Assessment Boundary:** Assessment is limited to macroscopic structures within plant and animal systems. **4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.** **Clarification Statement:** Emphasis is on systems of information transfer.	**PS4.B: Electromagnetic Radiation:** An object can be seen when light reflected from its surface enters the eyes. **LS1.A: Structure and Function:** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. **LS1.D: Information Processing:** Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.

Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.	

Cross-Cutting Concepts	Science and Engineering Practices
● Cause and Effect 4-PS4-2 ● Systems and System Models 4-LS1-1, 4-LS1-2	● Developing and Using Models 4-PS4-2, 4-LS1-2 ● Engaging in Argument from Evidence 4-LS1-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Activities: ● Create Your Own Insect ● Pinhole Cameras and Eyes ● Camouflage, Countershading, and Adaptations ● The Life of Environments ● Time to Think? ● Animal Mouth Structures ● Feeding Frenzy ● Bringing Your Classroom to Life ● Seed Dispersal ● Animal Mouth Structures ● Designer Ears: Biology & Perception Science Activity **Science Kits:** ● Birds ● Animal Studies **Engineering Kit:** ● Just Passing Through: Designing Model Membrane ● No Bones About It **Alaska Dept. of Fish and Game:** ● Birds ● Furs ● Skulls ● Tracking ● Alaska Wildlife Curriculum: ▪ *Alaska's Wetland & Wildlife:* Wetland Inhabitants: Section III.	● Discovery Southeast Nature Studies ● Field Trip to DIPAC in Fall for Salmon Education Program ● Sea Week Field Trip Lesson Plans ● Field Trip to Glacier for I.C.E. (Investigate, Create, Explore) Program ● Adaptations for winter survival ● Aquatic insects, salmon, porcupine/quills, animal furs and skulls, slug slime, bird beak/feet/wings- for food sources/survival ● The Tlingit Way: How to Treat Salmon (book from Goldbelt Heritage) ● Woochkaduhaa story (Goldbelt Heritage Foundation ppt) ● Go to a local natural area to observe and sketch the structure of a plant, compare to others in same area (leaves, stem, flowers, roots, spines). ● Raven That Flew into the Whale 1 (Goldbelt Heritage Foundation Oral Narrative) ● Nature Bob photos ● STEM Database link

▪ *Alaska's Tundra & Wildlife*: Tundra adaptations stations: Section III **Assessment Probe by Page Keeley:** ● Is It Made of Parts?	
Art Kits ● Bird Drawings with Bill Barry ● Drawing from Observation: Aquatic Insects ● Butterfly Sculptures ● Book Bindings: Nature Books ● Caribou on the Tundra ● Ocean Life Diorama ● Raven Sculptures with John Hoover ● Salmon Summer in Kodiak ● Shells with Georgia O'Keefe ● Sitka Spruce and Hemlock	

Standards		Cross-Curricular Connections
Alaska Cultural Standards	A5, A6, D1, E1, E2, E3	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Discuss how all parts (internal and external) of animal are/were used for survival/living/health. ● Medicinal plants: external physical structure AND internal components resulting in health/healing for human external and internal health.
Alaska Science Standards	SC2, SF1, SF3, SG1	
Alaska ELA Standards	SL.4.5, W.4.1	Reading Wonders • U2W4: What helps an animal survive? • U3W5: In what ways can advances in science be helpful or harmful?
Alaska Math Standards	4.G.A.1, 4.G.A.3, MP.4	
ISTE	5C	
Alaska Health Standards		**How does our nervous system help us to live and learn?** • Explain the function of the nervous system and its various parts (1.3) (Sci) • Propose ways to protect the brain and nervous system (1.1)(3.1)(3.4)(Sci)

JSD Elementary Science Curriculum

Grade: 5
Earth Science
Topic: Earth's Systems
Vocabulary: Geosphere, Atmosphere, Hydrosphere, Biosphere
Pacing: Trimester

Anchor Phenomena and Essential Question
Juneau (photo) or go outside ● How do the four spheres of the Earth interact?

Alaska Cultural Standard to Emphasize
E. Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them *3. Demonstrate an understanding of the relationship between worldview and the way knowledge is formed and used.*

NGSS Performance Expectations (PEs)	NGSS Disciplinary Core Ideas (DCIs)
5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. **Clarification Statement:** Examples could include: the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system. **Assessment Boundary:** Assessment is limited to the interactions of two systems at a time. **5-ESS2-2: Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.** **Clarification Statement:** none **Assessment Boundary:** Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.	**ESS2.A: Earth Materials and Systems:** Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. **ESS2.C: The Roles of Water in Earth's Surface Processes:** Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. **ESS3.C: Human Impacts on Earth Systems:** Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. **Clarification Statement:** none **Assessment Boundary:** none	

Cross-Cutting Concepts	Science and Engineering Practices
• Scale, Proportion, and Quantity 5-ESS2-2 • Systems and System Models 5-ESS2-1, 5-ESS3-1 • Science Addresses Questions About the Natural and Material World 5-ESS3-1	• Developing and Using Models 5-ESS2-1 • Using Mathematics and Computational Thinking 5-ESS2-2 • Obtaining, Evaluating, and Communicating Information 5-ESS3-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Activities: • NOAA What-a-Cycle • Global Water Distribution • Shower Curtain Watershed • Simulating an Oil Spill to Understand Environmental Impact • Earth's Water: A Drop in Your Cup • Clean Enough to Drink **Engineering Kits:** • A Slick Solution: Cleaning an Oil Spill • Water Water Everywhere **Assessment Probe by Page Keeley:** • Is It A System?	• Discovery Southeast Nature Studies • Contrast weather patterns between Downtown and Valley. Why do they differ? (mountains) • Field Trip to Glacier for I.C.E. (Investigate, Create, Explore) Program • NOAA • Water Treatment • Mendenhall Valley (created by glacier) • Alluvial fans (result of water moving rock material downhill) • River bars, cutbanks, and deltas • Construction projects (roads, building sites, ….) • Logging • Tlingit canoe represents man's connection with the ocean (video from Smithsonian) • White Raven and Water (Goldbelt Heritage Foundation Oral Narrative) • Raven and Petrel's Water (Goldbelt Heritage Foundation Oral Narrative) • How does the geology and hydrology affect what grows in an area? • STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural Standards	A1, A4, A6, B2, B3, B4, C1, D1, D3, D5, D6, E1, E2, E6, E7, E8	Cultural specialist and/or Native Elder in the classroom to make the connection. ● How did indigenous peoples of SE Alaska help protect (through actions and values) local resources and environments in past and now? (fish traps, tidal/beach fish traps/ escapement etc.)
Alaska Science Standards	SB3, SC3, SD1, SD2, SE1,SE2, SE3, SF3, SG3, SG4	
Alaska ELA Standards	RI.5.1, RI.5.7, RI.5.9, SL.5.5, W.5.8, W.5.9	Reading Wonders • U1W3: How can experiencing nature affect the way you think about it? • U4W4: Why are natural resources valuable? • U5W3: What changes in the environment affect living things? • U6W4: What impact do our actions have on our world?
Alaska Math Standards	5.G.A.2, MP.2, MP.4	
ISTE	3A, 3C, 3D, 5C, 6C, 7A, 7B, 7D	

JSD Elementary Science Curriculum

Grade: 5
Earth Science
Topic: Space Systems: Stars and the Solar System
Vocabulary: Gravity, Force, Star, System, Shadow
Pacing: Integrate throughout

Anchor Phenomena and Essential Question
Earth, Moon, Sun, and Stars (photo) or Lunar Eclipse video ● What kinds of patterns do we see on Earth and the Solar System?

Alaska Cultural Standard to Emphasize
D. Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. *4. Gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down. **Clarification Statement:** "Down" is a local description of the direction that points toward the center of the spherical Earth. **Assessment Boundary:** Assessment does not include mathematical representation of gravitational force. **5-ESS1-1.** Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth. **Clarification Statement:** none **Assessment Boundary**: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage). **5-ESS1-2.** Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. **Clarification Statement**: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.	**PS2.B: Types of Interactions:** The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. **ESS1.A: The Universe and its Stars:** The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. **ESS1.B: Earth and the Solar System:** The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.

Assessment Boundary: Assessment does not include causes of seasons.	

Cross-Cutting Concepts	Science and Engineering Practices
● Patterns 5- ESS1-2 ● Cause and Effect 5-ESS1- 1 ● Scale, Proportion, and Quantity 5-ESS1-1	● Analyzing and Interpreting Data 5-ESS1-2 ● Engaging in Argument from Evidence 5- PS2-1, 5-ESS1-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Activities: ● Kinesthetic Astronomy - Sky Time Lesson ● Journey North Mystery Class – What Makes Day and Night ● Journey North Mystery Class – Photoperiod ● All About the Sun: Sun and Stars ● Motion of the Sun Simulator ● How Big, How Far, How Hot, How Old? ● Como Planetarium: The Sun's Path ● Como Planetarium: Night and Day ● Scale Model of Sun and Earth ● Defining Gravity: Crash Course for Kids **Science Kits:** ● Sun, Moon, and Stars ● Planets and Moons **Assessment Probes from Page Keeley:** ● What Causes Day and Night? ● Talking about Gravity ● No Shadow	● Planetarium ● Science on a Sphere at AK State Museum ● Tlingit Moon and Tide by Dolly Garza ● Box of Daylight story ● Track sun's elevation ● Go outside and observe shadows ● STEM Database link

Standards		Cross-Curricular Connections
Alaska Cultural Standards	D4, E8	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Kaach'aaxgook story and science explained. He observed the length of days by tracking sun and shadows over time. He used this information to determine safest time to return and find his way home.
Alaska Science Standards	SD2, SD3	

Alaska ELA Standards	RI.5.1, RI.5.7, RI.5.8, RI.5.9, SL.5.5, W.5.1	Reading Wonders • U5W4: How can scientific knowledge change over time?
Alaska Math Standards	5.G.A.2, 5.NBT.A.2, MP.2, MP.4	
ISTE	3A, 6A, 6C	

JSD Elementary Science Curriculum

Grade: 5
Physical Science
Topic: Structure and Properties of Matter
Vocabulary: Matter, Phase(s), Weight, Volume, Properties, Expansion, Compression
Pacing: Trimester

Anchor Phenomena and Essential Question
Present 1 glass of tap water and 1 glass of salt water ● How can we prove something is made up of particles even when we can't see them?

Alaska Cultural Standard to Emphasize
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. *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.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. **Clarification Statement**: Examples of evidence could include: adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water. **Assessment Boundary**: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles. **5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.** **Clarification Statement:** Examples of reactions or changes could include: phase changes, dissolving, and mixing that forms new substances. **Assessment Boundary:** Assessment does not include distinguishing mass and weight. **5-PS1-3**. **Make observations and measurements to identify materials based on their properties.**	**PS1.A: Structure and Properties of Matter:** Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model shows that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects. The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) **PS1.B: Chemical Reactions:** When two or more different substances are mixed, a new substance with different properties may be formed. No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.)

Clarification Statement: Examples of materials to be identified could include: baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property. **Assessment Boundary**: Assessment does not include density or distinguishing mass and weight. **5-PS1-4**. **Conduct an investigation to determine whether the mixing of two or more substances results in new substances.**	

Cross-Cutting Concepts	Science and Engineering Practices
● Cause and Effect 5-PS1-4 ● Scale, Proportion, and Quantity 5-PS1-1, 5-PS1-2, 5-PS1-3 ● Connections to Nature of Science: Scientific Knowledge Assumes an Order and Consistency in Natural Systems 5-PS1-2	● Developing and Using Models 5-PS1-1 ● Planning and Carrying Out Investigations 5-PS1-4, 5-PS1-3 ● Using Mathematics and Computational Thinking 5-PS1-2

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Activities: ● Water, A Liquid ● Modeling Particles of Matter ● Mystery Powders ● Now You See it Now, Now You Don't ...Dissolving Matter ● Clean It Up ● The Amazing Elephant Toothpaste ● Inflate the Balloon ● Taking the Mystery Out of Argumentation **Science Kit:** ● Designing Mixtures **Assessment Probe by Page Keeley:** ● Is It Matter? ● Is It Melting?	● Tlingit use of materials to make watertight baskets ● Tlingit use animal parts- such as urine for dye, brain for tanning. Changes of substances with different applications ● State changes of water, evaporation of salt water, hoar frost ● Look at properties of materials used to make Alaska Native items in Artifact of the Month and look at artifacts at SLAM (Alaska State Museum) ● STEM Database link

JSD Elementary Science Curriculum

Standards		Cross-Curricular Connections
Alaska Cultural Standards	B1, B2, C4, D1, D6, E3	Cultural specialist and/or Native Elder in the classroom to make the connection.
Alaska Science Standards	SB1, SB2, SB3, SC3, SG3	
Alaska ELA Standards	RI.5.7 W.5.7, W.5.8, W.5.9	Reading Wonders: No units align
Alaska Math Standards	5.MD.A.1, 5.MD.C.3, 5.MD.C.4, 5.NBT.A.1, 5.NF.B.7,MP.2, MP.4 MP.5	
ISTE	4A, 5B, 5C, 6C, 7C	

JSD Elementary Science Curriculum

Grade: 5
Life Science
Topic: Matter and Energy in Organisms and Ecosystems
Vocabulary: Ecosystem, Energy, Matter, Organisms
Pacing: Trimester

Anchor Phenomena and Essential Question
Salmon in the Trees (photo) ● How do matter and energy cycle through ecosystems?

Alaska Cultural Standard to Emphasize
E. Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. *2. Understand the ecology and geography of the bioregion they inhabit.*

NGSS Performance Expectations (PEs)	**NGSS Disciplinary Core Ideas (DCIs)**
5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water. **Clarification Statement:** Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil. **Assessment Boundary:** none **5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.** **Clarification Statement:** Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth. **Assessment Boundary:** Assessment does not include molecular explanations. **5-PS3-1 Use models to describe that that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.** **Clarification Statement:** Examples of models could include diagrams, and flowcharts. **Assessment Boundary**: none	**PS3.D: Energy in Chemical Processes and Everyday Life:** The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). **LS1.C: Organization for Matter and Energy Flow in Organisms:** Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1) Plants acquire their material for growth chiefly from air and water. **LS2.A: Interdependent Relationships in Ecosystems:** The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs

	in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems:** Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.

Cross-Cutting Concepts	Science and Engineering Practices
● Systems and System Models 5-LS2-1 ● Energy and Matter 5-PS3-1, 5-LS1-1	● Developing and Using Models 5-LS2-1, 5-PS3-1 ● Engaging in Argument from Evidence 5-LS1-1 ● Connections to Nature of Science: Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena 5-LS2-1

Suggested Activities/Resources	Suggested Cultural & Place-Based Connections
NGSS Activities: ● Weaving the Web ● Bottle Biology Terrarium ● Wetlands Are Wonderlands ● Dissecting an Owl Pellet ● Experiment with Ecosystems ● Biodomes Engineering Design Project ● Water Movement Through Plants ● Where Do Plants Get the Material They Need? ● Soil Biosolarization: Sustainable Weed Killer **ADF&G Alaska Ecology Cards** **Alaska Wildlife Curriculum: Alaska's Ecology:** ● *Spinning a Yarn about Ecosystems: Section IV.* ● *Who Eats Whom? Section III* ● *What's for Dinner? Section III* **Alaska's Wetlands & Wildlife:** ● *Energy Flow in an Alaska Wetland: Section II.*	● Discovery SE Nature Studies ● Field Trip to DIPAC in Fall for Salmon Education Program ● Sea Week Field Trip Lesson Plans ● Sealaska Heritage Salmon II: Lesson 3- Salmon Food Web ● Rainforest & salmon stream investigations- nurse logs, "salmon in the trees", mycorrhizal fungi, etc. ● Field Trip to Glacier for I.C.E. (Investigate, Create, Explore) Program ● Hydroponic growing systems- artificial ecosystems. Local contact- Trevor Kirchhoff, Get Growing ● Have students examine where humans interact with local wetlands, ocean and intertidal ecosystems through interviews with family members. ● Integrated Lessons for Bears of SE Alaska ● STEM Database link

Alaska Wildlife for the Future: ● *Mapping Nearby Nature, Schoolyard Biodiversity Investigation: Section I* ● *How many bears can live in the forest?: Section II* **Science Kit:** ● Composting Kit **School Trails Curriculum** (GV, AB, Gast) ● *The Case of the Mummified Pigs: "A Sense of Wonder" Ch. 20 from More Picture Perfect Science: Lessons K-4* **Alaska Sea & Watershed Curriculum, Grade 4:** ● Investigation 1 - The Missing Sea Otters **AK Energy Smart** ● Energy from the Sun ● Energy Flow Worksheet **Assessment Probes by Page Keeley:** ● Earth's Mass ● Is it Food for Plants? ● Ecosystem Cycles	

Standards		Cross-Curricular Connections
Alaska Cultural Standards	D1, D3, D4, E2	Cultural specialist and/or Native Elder in the classroom to make the connection. ● Historically, what did the indigenous people of SE Alaska do with the parts of plants and animals they could not use? (Fish and seal parts are returned to the water for example). ● Respect for ecosystem/cycles of energy transfer.
Alaska Science Standards	4 SA3.1, 4 SC1.1, 4 SC2.1, 4 SC2.2, 4 SC3.1, 4 SC3.2	
Alaska ELA Standards	RI.5.1, RI.5.7, RI.5.9, SL.5.5, W.5.1	Reading Wonders ● U5W5: How do natural events and human activities affect the environment?
Alaska Math Standards	5.MD.A.1, MP.2, MP.4, MP.5	
ISTE	3A, 3B, 3D, 4D, 5B, 5C, 6A, 6D, 7C	

JSD Elementary Science Curriculum

Appendices

- **Alaska Cultural Standards**
- **Alaska Science Standards**
- **ISTE Standards**

Cultural Standards for Students

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 responsibility for their role in relation to the well-being of the cultural community and their life-long 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.
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;
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;
3. attain a healthy lifestyle through which they are able to maintain their own social, emotional, physical, intellectual and spiritual well-being;
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:

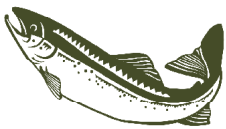
1. acquire in-depth cultural knowledge through active participation and meaningful interaction with Elders;
2. participate in and make constructive contributions to the learning activities associated with a traditional camp environment;
3. interact with Elders in a loving and respectful way that demonstrates 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;
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 inter-relationships 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;
8. identify and appreciate who they are and their place in the world.



Alaska Science Performance Standards

Specific expectations by grade band may be found on pages 105-132 of the Content and Performance Standards for Alaska Students (4th edition).

SCIENCE AS INQUIRY & PROCESS

SA1. Investigate problems, design and conduct experiments, and scientific argumentation

SA2. Reasoning, skepticism, openness, dialog, & review

SA3. Local history, knowledge, and interaction

PHYSICAL SCIENCE

SB1. Properties of matter, structure, behavior

SB2. Energy forms, transformation, transference, and conservation

SB3. Matter & energy: physical, chemical, nuclear changes, effects on systems

SB4. Motion & force: characteristics, relationships, natural forces

LIFE SCIENCE

SC1. Change over time/evolution

SC2. Structure & function, development, life cycles, biodiversity

SC3. Transfer and transformation of energy and matter.

EARTH SCIENCE

SD1. Geochemical cycles

SD2. Earth origins, processes, and forces

SD3. Earth & the solar system, energy flow & cycle from sun

SD4. Cosmic evolution

SCIENCE & TECHNOLOGY

SE1. Science, technology, & everyday life

SE2. Problem-solving

SE3. Technology innovation and advances

CULT., SOCIAL, PERSONAL PERSPECTIVES, & SCIENCE

SF1. Relationships between individuals, culture, society, people, & science.

SF2. Alternate world-views

SF3. Recording & validating cultural knowledge

HISTORY & NATURE OF SCIENCE

SG1. Scientific knowledge evolves

SG2. Parameters for scientific advancement

SG3. The role of evidence in science

SG4. Science based on curiosity, creativity, & imagination

ISTE® Standards

International Society for Technology in Education

ISTE Standards Students

1. Creativity and innovation

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

a. Apply existing knowledge to generate new ideas, products, or processes

b. Create original works as a means of personal or group expression

c. Use models and simulations to explore complex systems and issues

d. Identify trends and forecast possibilities

2. Communication and collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media

b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats

c. Develop cultural understanding and global awareness by engaging with learners of other cultures

d. Contribute to project teams to produce original works or solve problems

3. Research and information fluency

Students apply digital tools to gather, evaluate, and use information.

a. Plan strategies to guide inquiry

b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media

c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks

d. Process data and report results

4. Critical thinking, problem solving, and decision making

Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

a. Identify and define authentic problems and significant questions for investigation

b. Plan and manage activities to develop a solution or complete a project

c. Collect and analyze data to identify solutions and/or make informed decisions

d. Use multiple processes and diverse perspectives to explore alternative solutions

5. Digital citizenship

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

a. Advocate and practice safe, legal, and responsible use of information and technology

b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity

c. Demonstrate personal responsibility for lifelong learning

d. Exhibit leadership for digital citizenship

6. Technology operations and concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations.

a. Understand and use technology systems

b. Select and use applications effectively and productively

c. Troubleshoot systems and applications

d. Transfer current knowledge to learning of new technologies