

Southwest Montana Science Partnership: Content Standard and Benchmarks

SMSP Purpose:

This project utilizes the environment as an integrating context for teaching inquiry-based science content correlated to Montana standards. The project team, utilizing the expertise of its members, implements and assesses professional development that incorporates a highly interactive online learning community and face-to-face workshops, connecting teachers, STEM and Education faculty to improve student achievement in math and science.

Overall Goals of the project:

- **Increase teacher content knowledge relevant to Montana Science Standards and Benchmarks**
- **Increase teacher knowledge of inquiry and associated pedagogical strategies**
- **Assist teachers with the development of relevant, place-based inquiry science lessons**
- **Increase student achievement in science in grades 3 through 6**
- **Assist teachers and administrators with the creation of professional learning communities**
- **Provide a minimum of 4 graduate credits for teachers participating in the project that are directly applicable to graduate programs**
- **Creation of an online community that will continue to be a resource for content learning and provide a forum for exchange of ideas for science educators in Montana**

Content Standard and Benchmarks Grade 4*	Main Elements of Activity that Apply to the Standards
Standard: Benchmark 1:1, 1:2, 1:3, 1:4, 1:5 <i>modify for 1:6</i>	<p>Students collaborate on designing and conducting data collection for field map construction. The maps students create in the field and view on Google Earth are 2-dimensional models of the 4-dimensional world. Students use rulers and measuring tapes to make metric measurements in the field and using Google Earth. Measurements are used to create a field map scale for interpreting map data or validating the map scale using Google Earth tools. Students evaluate if their own map achieved the purpose of creating a field map that could be used to communicate results of future investigations. Students compare validity of field maps made by different groups and utility of field mapping versus using Google Earth as a mapping tool.</p> <p><i>With modification, teachers could include discussion about how American Indians would have used observations to discuss trade routes, hunting grounds, winter camping sites, food gathering sites, and aboriginal territory.</i></p>
3:4	<p>Students document living (biotic) and non-living (abiotic) components of the area they are mapping both in the field and using Google Earth. Students brainstorm how these components interact. During the field portion of the activity, students observe behavior of living organisms. Students hypothesize how organisms respond to changes in the environment driven by time of day, season, and human influence.</p>
4:1, 4:2, 4:5	<p>Students describe and map the location of natural and anthropogenic earth features, including rocks and water. Students brainstorm how these features provide resources for organisms living in the map area. Students identify seasons that influence map features.</p>
5:1, 5:3, 5:4	<p>Students are able to describe how the map will be used in future science studies at the field site. Students explain how they use Google Earth to view the map area. Students work in collaboration, conducting mapping in pairs or small groups and comparing maps as a single large group. Students use their maps to identify environmental problems and propose solutions.</p>
6:3	<p>Students continue to use maps for other field investigations in an ongoing scientific process. Students recognize how they use maps in their daily lives and thus identify mapping as a shared human endeavor.</p>

*Complete descriptions of standards and benchmarks listed below.

The content standards that are addressed in the module are the following:

Content Standard 1: Students through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.

Benchmarks (End of Grade 4)

1. Develop the abilities necessary to safely conduct scientific inquiry, including (a step-by-step sequence is not implied): (a) asking questions about objects, events, and organisms in the environment, (b) planning and conducting simple investigations.
2. Select and use appropriate tools including technology to make measurements (including metric units) and represent results of basic scientific investigations.
3. Use data to describe and communicate the results of scientific investigations.
4. Use models that illustrate simple concepts and compare those models to the actual phenomenon.
5. Identify a valid test in an investigation.

Activities can be modified to include: 6. Identify how observations of nature form an essential base of knowledge among the Montana American Indian.

Content Standard 3: Students, through the inquiry process, demonstrate knowledge of characteristics, structures and functions of living things, the process and diversity of life, and how living organisms interact with each other and their environment.

Benchmarks (End of Grade 4)

4. Explain cause and effect relationships between nonliving and living components within ecosystems; and explain individual response to the changes in the environment.

Content Standard 4: Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.

Benchmarks (End of Grade 4)

1. Describe and give examples of earth's changing features.
2. Describe and measure the physical properties of earth's basic materials (including soil, rocks, water and gases) and the resources they provide.
5. Identify seasons.

Content Standard 5: Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.

Benchmarks (End of Grade 4)

1. Describe and discuss examples of how people use science and technology.
3. Simulate scientific collaboration by sharing and communicating ideas to identify and describe problems.
4. Use scientific knowledge to make inferences and propose solutions for simple environmental problems.

Can be modified to include: 5. Identify how the knowledge of science and technology influences the development of the Montana American Indian cultures.

Content Standard 6: Students understand historical developments in science and technology.

Benchmarks (End of Grade 4)

3. Describe science as a human endeavor and an ongoing process.

The grade level expectations for each standard further break down the curriculum goal. This module meets the following grade level expectations: *Items noted in italics are items that the module does not directly address, but which could be adapted using the content in this module.*

(Grade 3)

1. With direction, safely completes a simple investigation (direct inquiry) by asking questions with identified variables using appropriate tools, and communicates results. *Identifies that observation is a key inquiry process used by American Indians.*
4. Recognizes and describes Earth's features, illustrates changes of those features. Recognizes and describes changes in weather and seasons.
5. A. Recognizes how technology, science and society are connected; *recognizes Montana American Indian contributions.*
B. Recognizes that science can help us understand our local problems.

(Grade 4)

1. With direction, safely completes a simple investigation (direct inquiry) by asking questions with identified variables, using appropriate tools, and communicates results with appropriate data. *Identifies that observation is a key inquiry process used by Montana American Indians.*
3. Identifies attributes of living (biotic) things and non-living (abiotic) objects.
4. Identifies and accurately illustrates Earth's features, locating several observable changes of those features (e.g. erosion, weathering). Observes and records changes in weather (e.g. water cycle).
5. A. Identifies interactions among technology, science, and society; *recognizes Montana American Indian contributions.*
B. Discusses and explains how scientific information is related to current events and local problems.

(Grade 5)

1. Identifies a testable question, safely plans and conducts experimental investigations, and communicates results. *Recognizes that observation is the key inquiry process for Montana American Indians.*
4. Identifies and accurately illustrates Earth's features, locating several observable changes of those features, identifies the causes of those changes, and applies the knowledge. Recognize how wind, water, time, and geological shifts affect the earth's surface.
5. A. Explains how technology, science, and society are connected; *relates how science and technology are utilized by Montana American Indians.*
B. Observes and discusses scientific information related to current events and local problems.

(Grade 6)

1. Student safely conducts and evaluates a simple investigation; identifies variables and controls, and communicates results with appropriate data. *Identifies that observation is the key inquiry process used by Montana American Indians.*
4. a. Identifies the structure and processes of the Earth.
5. A. Identifies connections and interactions between technology science, and societies.
B. Identifies scientific information related to current events.
C. Identifies how science and technology have impacted Montana American Indians.
6. *Identifies examples of how science and technology are the results of human activity throughout history, including Montana American Indian contributions.*