

Content and Performance Standards for Science

Kindergarten

Course Content Identification Numbers:

The first symbol represents the grade level, the second symbol is the number of the state standard being addressed, the third number is the state benchmark being addressed and the decimal number is for the course content that addresses that specific standard and benchmark.

Example: K23.1 K=grade level 2= standard 2 3=benchmark 1= the first course content skill

The Essential Vocabulary is based on OPI's recommended vocabulary though ACE has often expanded the list of terms. **The vocabulary words in bold, are OPI suggested vocabulary and may well be used in MontCAS testing.**

ACE Course Abilities for Kindergarten to be applied to Content Standards as appropriate to grade level:

Develop abilities in science.

- A. Higher thinking (analyze, evaluate, classify, predict, decide, estimate, generalize, solve, compare, simplify).
- B. Communications (present, persuade, collaborate, explain, recommend).
- C. Goal setting/attainment (brainstorm, envision, research, plan, organize, persist).
- D. The quality process (plan, draft, analyze, and revise when producing products).

Apply science knowledge and skills to a variety of purposes.

- A. Solve problems using the scientific method (research, hypothesis, experimentation, analysis, conclusion).
- B. Conduct research (field research, library research, experimentation, technological research).
- C. Use scientific equipment appropriately (safely, effectively, efficiently, accurately).
- D. Preserve the earth (reuse, reduce, recycle, refuse).
- E. Possess technical skills:
 - listen/read/dictate/write/present: instructions, chart, report, proposal, letter of request, summary.
 - technology: word processing, Internet, PowerPoint, smartboard, digital equipment, current technology.
 - measurement practice in standard and metric.
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Demonstrate and apply the scientific method

- A. Identify a question and formulate a hypothesis
- B. Identify variables involved with an experiment
- C. Carry out a designed experiment based on a hypothesis
- D. Observe and collect data related to the hypothesis
- E. Show results by creating graphs and data tables.
- F. Analyze data and formulate a conclusion.

Kindergarten Course Content For Science

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

ESSENTIAL VOCABULARY: observe, scientist, same/different, color, size, sight, sound, touch, taste, smell, sort, record, question, experiment, clock, thermometer, magnifying glass, ruler, scale, beaker, nature, environment, scientific method (***Bold Vocabulary found on OPI's SCIENCE Vocabulary for K-garten Grade***)

K11.0 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).

- .1 Make observations using the five senses
- .2 Record observations by drawing or orally explaining
- .3 Ask a question based on their observations
- .4 Follow appropriate safety rules
- .5 Conduct teacher guided scientific inquiry

Voc: observe, scientist, same/different, color, size, sight, sound, touch, taste, smell, sort, record, question, experiment, scientific method

K12.0 Select and use appropriate tools including technology to make measurements (including metric units) and represent results of basic scientific investigations

- .1 Identify measurement tools
- .2 Choose the appropriate tool to measure time, temperature, mass, length, and liquid volume

Voc.: clock, thermometer, magnifying glass, ruler, scale, beaker

K13.0 Use data to describe and communicate the results of scientific investigations

- .1 Communicate observations made during inquiry process.

Voc.: nature, environment, scientific method

K14.0 Use models that illustrate simple concepts and compare those models to the actual phenomenon

Benchmark is addressed in grade 2

K15.0 Identify a valid test in an investigation

Benchmark is addressed in grade 3

Kindergarten Course Content (cont.)

K16.0 Identify how observations of nature form an essential base of knowledge among the Montana American Indians

(go to www.opi.mt.gov/IndianEd for Science Model Lessons)

- .1 Identify objects found in nature
- .2 Make observations of objects found in nature
- .3 Identify examples of Montana American Indians making use of nature

CONTENT STANDARD 2. Students, through the inquiry process, demonstrate the knowledge of properties, forms, changes and interactions of physical and chemical systems.

ESSENTIAL VOCABULARY: color, shape, size, group, light, dark, shadow, motion, magnet, magnetism, liquid, solid, gas
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for K-garten Grade)

K21.0 Create mixtures and separate them based on different physical properties (e.g., salt and sand, iron filings and soil, oil and water)

Benchmark is addressed in grade 2

K22.0 Examine, measure, describe, compare and classify objects in terms of common physical properties

- .1 Identify objects based on their color, shape and size
- .2 Sort objects based on their color, shape, and size

Voc.: color, shape, size, group

K23.0 Identify the basic characteristics of light, heat, motion, magnetism, electricity, and sound

- .1 Identify light vs. dark
- .2 Identify the different ways in which objects move (such as zig zag, round and round, back and forth, and fast and slow)
- .3 Identify objects that are attracted by a magnet
- .4 Describe the basic characteristics of light, magnetism, and motion

Voc.: light, dark, shadow, motion, magnet, magnetism

K24.0 Model and explain that matter exists as solids, liquids, and gases and can change from one form to another

- .1 Identify liquids, solids, and gases.

Voc.: solid, liquid, gas

Kindergarten Course Content (cont.)

K25.0 Identify that the position of an object can be described by its location relative to another object and its motions described, and measured by external forces action upon it

Benchmark is addressed in grade 3

K26.0 Identify, build, and describe mechanical systems and the forces acting within those systems

Benchmark is addressed in grade 2 and 4

K27.0 Observe, measure and manipulate forms of energy: sound, light, heat, electrical, magnetic.

Benchmark is addressed in grade 3

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

ESSENTIAL VOCABULARY: plant, animal, living, nonliving, life cycle, food, energy, change, make new ones (reproduce), make waste (respire, excrete), respond, classify, similar, different (***Bold Vocabulary found on OPI's SCIENCE Vocabulary for K-garten Grade***)

K31.0 Identify that plants and animals have structures and systems that serve different functions for growth, survival, and reproduction.

- .1 List characteristics of living things
- .2 List characteristics of nonliving things
- .3 Compare living and nonliving things

Voc.: plant, animal, living, nonliving, life cycle, food, energy, change, make new ones (reproduce), make waste (respire, excrete), respond

K32.0 Identify, measure, and describe basic requirements of energy and nutritional needs for an organism.

Benchmark is addressed in grade 1

K33.0 Describe and use models that trace the life cycles of different plants and animals and discuss how they are differ from species to species.

Benchmark is addressed in grade 2

K34.0 Explain cause and effect relationships between nonliving and living components with ecosystems; and explain individual response to the changes in the environment including identifying differences between inherited, instinctual, and learned behaviors.

Benchmark is addressed in grade 4

Kindergarten Course Content (cont.)

K35.0 Create and use a classification system to group a variety of plants and animals according to their similarities and differences

- .1 Identify similarities and differences among a group of objects
- .2 Group objects using a simple classification system

Voc: classify, similar, different

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.

ESSENTIAL VOCABULARY: mountain, lake, hill, valley, volcano, ocean, land, water, planet (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for K-garten Grade*)

K41.0 Describe and give examples of earth's changing features.

- .1 Define Earth as a planet
- .2 List earth's features
- .3 Identify local land and water features
- .4 Construct a teacher-guided model of a local earth feature

Voc.: mountain, lake, hill, valley, volcano, ocean, land, water, planet

K42.0 Describe and measure the physical properties of earth's basic materials (including soil, rocks, water and gases) and the resources they provide.

Benchmark is addressed in grade 2

K43.0 Investigate fossils and make inferences about life, the plants, animals, and the environment at that time.

Benchmark is addressed in grade 2

K44.0 Observe and describe the water cycle and the local weather and demonstrate how weather conditions are measured.

Benchmark is addressed in grade 1

K45.0 Identify seasons and explain the difference between weather and climate.

Benchmark is addressed in grade 2

K46.0 Identify objects (e.g., moon, stars, meteors) in the sky and their patterns of movement and explain that light and heat comes from a star called the sun.

Benchmark is addressed in grade 1

Kindergarten Course Content (cont.)

K47.0 Identify technology and methods used for space exploration (e.g., star patterns, space shuttles, telescopes).

Benchmark is addressed in grade 1

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

ESSENTIAL VOCABULARY: technology, tool (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for K-garten Grade*)

K51.0 Describe and discuss examples of how people use science and technology.

- .1 Identify examples of technology (products and processes)
- .2 Demonstrate uses of technology
- .3 Identify tools as a form of technology

Voc.: technology

K52.0 Describe a scientific or technological innovation that impacts communities, cultures, and society.

Benchmark is addressed in grade 3

K53.0 Simulate scientific collaboration by sharing and communicating ideas to identify and describe problems.

Benchmark is addressed in grade 4

K54.0 Use scientific knowledge to make inferences and propose solutions for simple environmental problems.

Benchmark is addressed in grade 1

K55.0 Identify how the knowledge of science and technology influences the development of the Montana American Indian cultures.

(go to www.opi.mt.gov/IndianEd for Science Model Lessons)

- .1 Identify examples of tools that have been influenced by Montana American Indian culture.
- .2 Identify examples of tools that have been developed or are being developed by Montana American Indians

Voc.: tool

Kindergarten Course Content (cont.)

CONTENT STANDARD 6. Students understand historical developments in science and technology.

ESSENTIAL VOCABULARY: question, observe, knowledge, senses, sight, touch, taste, smell, hearing, natural world
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for K-garten Grade)

K61.0 Give historical examples of scientific and technological contributions to communities, cultures and societies, including Montana American Indian examples. (go to www.opi.mt.gov/IndianEd for Science Model Lessons)

Benchmark is addressed in grade 3

K62.0 Describe how scientific inquiry has produced much knowledge about the world and a variety of contributions toward understanding events and phenomenon within the universe.

.1 Recognize that knowledge is gained through questioning and observations

Voc. question, observe, knowledge

K63.0 Describe science as a human endeavor and an ongoing process.

.1 Recognize that humans use their senses to learn about the natural world

Voc.: senses, sight, touch, taste, smell, hearing, natural world

Content and Performance Standards for Science

First Grade

Course Content Identification Numbers:

The first symbol represents the grade level, the second symbol is the number of the state standard being addressed, the third number is the state benchmark being addressed and the decimal number is for the course content that addresses that specific standard and benchmark.

Example: 123.1 1 =grade level 2= standard 2 3=benchmark 1= the first course content skill listed

The Essential Vocabulary is based on OPI's recommended vocabulary though ACE has often expanded the list of terms. **The vocabulary words in bold, are OPI suggested vocabulary and may well be used in MontCAS testing.**

ACE Course Abilities for First Grade to be applied to Content Standard as appropriate to grade level:

Develop abilities in science.

- A. Higher thinking (analyze, evaluate, classify, predict, decide, estimate, generalize, solve, compare, simplify).
- B. Communications (present, persuade, collaborate, explain, recommend).
- C. Goal setting/attainment (brainstorm, envision, research, plan, organize, persist).
- D. The quality process (plan, draft, analyze, and revise when producing products).

Apply science knowledge and skills to a variety of purposes.

- A. Solve problems using the scientific method (research, hypothesis, experimentation, analysis, conclusion).
- B. Conduct research (field research, library research, experimentation, technological research).
- C. Use scientific equipment appropriately (safely, effectively, efficiently, accurately).
- D. Preserve the earth (reuse, reduce, recycle, refuse).
- E. Possess technical skills:
 - listen/read/dictate/write/present: instructions, chart, report, proposal, letter of request, summary.
 - technology: word processing, Internet, PowerPoint, smartboard, digital equipment, current technology.
 - measurement practice in standard and metric.

Understand and apply the scientific method.

- A. Identify a question and formulate a hypothesis.
- B. Identify variables involved with an experiment.
- C. Carry out a designed experiment based on a hypothesis.
- D. Observe and collect data related to the hypothesis.
- E. Show results by creating graphs and data tables.
- F. Analyze data and formulate a conclusion.

First Grade Course Content

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

ESSENTIAL VOCABULARY: procedure, question, testable, observation, investigation, experiment, metric, length, temperature, mass, volume, beaker, ruler, scale, thermometer, clock, natural resources, natural world, scientific method, inquiring process
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for First Grade)

111.0 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 simple investigations).

- .1 Record observations using the five senses
- .2 Write a testable question with teacher guidance
- .3 Follow appropriate safety rules
- .4 Follow step-by-step directions in a simple guided investigation
- .5 Identify the purpose of the investigation

Voc.: procedure, question, testable, observation, investigation, experiment, scientific method, inquiry process

112.0 Select and use appropriate tools including technology to make measurements (including metric units) and represent results of basic scientific investigations.

- .1 Identify differences and similarities between customary and metric measuring tools
- .2 Use tools to measure time, mass, volume, length, and temperature

Voc.: metric, length, temperature, mass, volume, beaker, ruler, scale, thermometer, clock

113.0 Use data to describe and communicate the results of scientific investigations

- .1 Communicate observations made during inquiry process

114.0 Use models that illustrate simple concepts and compare those models to the actual phenomenon

Benchmark is addressed in grade 2

115.0 Identify a valid test in an investigation

Benchmark is addressed in grade 3

116.0 Identify how observations of nature form an essential base of knowledge among the Montana American Indians.

(go to www.opi.mt.gov/IndianEd for Science Model Lessons)

- .1 Identify examples of Montana American Indians making use of natural resources.
- .2 Discuss Montana American Indians' explanations of the natural world

Voc.: natural resources, natural world

First Grade Course Content (cont.)

CONTENT STANDARD 2. Students, through the inquiry process, demonstrate the knowledge of properties, forms, changes and interactions of physical and chemical systems.

ESSENTIAL VOCABULARY: texture, weight, bent (refraction), bounced (reflection), shadow, mirror, prism, magnifying lens, scale, balance, thermometer, beaker, measuring tape, ruler (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for First Grade*)

121.0 Create mixtures and separate them based on different physical properties (e.g., salt and sand, iron filings and soil, oil and water).

Benchmark is addressed in grade 2

122.0 Examine, measure, describe, compare and classify objects in terms of common physical properties.

- .1 Identify objects based on color, shape, size, texture, weight
- .2 Describe objects based on their physical properties
- .3 Sort objects based on their physical properties

Voc.: texture, weight

123.0 Identify the basic characteristics of light, heat, motion, magnetism, electricity, and sound.

- .1 Observe and describe the behavior of light (refraction and reflection)
- .2 Conduct simple experiments with light (shadows)

Voc.: bent (refraction), bounced (reflection), shadow, mirror, prism, magnifying lens

124.0 Model and explain that matter exists as solids, liquids, and gases and can change from one form to another.

- .1 Define measurement
- .2 Recognize simple measurement tools
- .3 Select appropriate tools for measurement of matter
- .4 Manipulate tools for measurement of matter

Voc.: scale, balance, thermometer, beaker, measuring tape, ruler

125.0 Identify that the position of an object can be described by its location relative to another object and its motions described, and measured by external forces action upon it.

Benchmark is addressed in grade 3

126.0 Identify, build, and describe mechanical systems and the forces acting within those systems.

Benchmark is addressed in grade 2 and 4

First Grade Course Content (cont.)

127.0 Observe, measure and manipulate forms of energy: sound, light, heat, electrical, magnetic.

Benchmark is addressed in grade 3

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

VOCABULARY: food chain, herbivore, carnivore (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for First Grade*)

131.0 Identify that plants and animals have structures and systems that serve different functions for growth, survival, and reproduction.

Benchmark is addressed in Kindergarten and grade 2

132.0 Identify, measure, and describe basic requirements of energy and nutritional needs for an organism.

- .1 Define herbivore and carnivore
- .2 Classify herbivore/carnivore
- .3 Define a food chain
- .4 Illustrate a food chain

Voc.: food chain, herbivore, carnivore

133.0 Describe and use models that trace the life cycles of different plants and animals and discuss how they are different from species to species.

Benchmark is addressed in grade 2

134.0 Explain cause and effect relationships between nonliving and living components with ecosystems; and explain individual response to the changes in the environment including identifying differences between inherited, instinctual, and learned behaviors.

Benchmark is addressed in grade 4

135.0 Create and use a classification system to group a variety of plants and animals according to their similarities and differences.

Benchmark is addressed in grade 2

First Grade Course Content (cont.)

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.

ESSENTIAL VOCABULARY: Earth, planet, star, sun, land, water, lake, pond, river, mountain, desert, valley, volcano, ocean, weather, temperature, wind, rain, snow, clouds, star, moon, planet, day, night, rotate, light, dark, sky, Earth, sun, star, constellation, pattern, Big Dipper, North Star, telescope, satellite, space shuttle, star chart, elements
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 1st Grade)

141.0 Describe and give examples of earth's changing features.

- .1 Identify examples of land features
- .2 Identify examples of water features

Voc.: Earth, planet, star, sun, land, water, lake, pond, river, mountain, desert, valley, volcano, ocean

142.0 Describe and measure the physical properties of earth's basic materials (including soil, rocks, water and gases) and the resources they provide.

Benchmark is addressed in grade 2

143.0 Investigate fossils and make inferences about life, the plants, animals, and the environment at that time.

Benchmark is addressed in grade 2

144.0 Observe and describe the water cycle and the local weather and demonstrate how weather conditions are measured.

- .1 Identify elements of weather
- .2 Observe daily weather conditions

Voc.: weather, temperature, wind, rain, snow, clouds

145.0 Identify seasons and explain the difference between weather and climate

Benchmark is addressed in grade 2

146.0 Identify objects (e.g., moon, stars, meteors) in the sky and their patterns of movement and explain that light and heat come from a star called the sun.

- .1 Identify that there are objects in the sky, including stars, moon, and planets
- .2 Identify the sun as a star
- .3 Describe the cause of day and night as a result of the sun shining on Earth as it rotates
- .4 Define a constellation as a group of stars that form a pattern
- .5 Identify shapes of common constellations

Voc.: star, moon, planet, day, night, rotate, light, dark, sky, Earth, sun, star, constellation, pattern, Big Dipper, North Star

First Grade Course Content (cont.)

147.0 Identify technology and methods used for space exploration (e.g., star patterns, space shuttles, telescopes).

- .1 Identify types of technology used to observe objects in space.

Voc.: telescope, satellite, space shuttle, star chart

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

ESSENTIAL VOCABULARY: technology, environment, issue, problem, process *(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 1st Grade)*

151.0 Describe and discuss examples of how people use science and technology.

- .1 Identify technology as the knowledge, processes and products used to solve problems and make lives easier
- .2 Identify technology in the school
- .3 Explain how technology is used in the school

Voc.: technology

152.0 Describe a scientific or technological innovation that impacts communities, cultures, and society.

Benchmark is addressed in grade 3

153.0 Simulate scientific collaboration by sharing and communicating ideas to identify and describe problems.

Benchmark is addressed in grade 4

154.0 Use scientific knowledge to make inferences and propose solutions for simple environmental problems.

- .1 Identify an environmental problem
- .2 Discuss the scientific issues relevant to the environmental problem

Voc.: environment, issue, problem

155.0 Identify how the knowledge of science and technology influences the development of the Montana American Indian cultures.

(go to www.opi.mt.gov/IndianEd for Science Model Lessons)

- .1 Identify that a process can be a form of technology
- .2 Identify examples of processes used by Montana American Indians that served as technology

Voc.: process, technology

First Grade Course Content (cont.)

CONTENT STANDARD 6. Students understand historical developments in science and technology.

ESSENTIAL VOCABULARY: question, observe, knowledge (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 1st Grade*)

161.0 Give historical examples of scientific and technological contributions to communities, cultures and societies, including Montana American Indian examples. (go to www.opi.mt.gov/IndianEd for Science Model Lessons)

Benchmark is addressed in grade 3

162.0 Describe how scientific inquiry has produced much knowledge about the world and a variety of contributions toward understanding events and phenomenon within the universe.

.1 Identify that knowledge is gained through questioning and observations

Voc.: question, observe, knowledge

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

.1 Identify that everybody can do science

Content and Performance Standards for Science

Second Grade

Course Content Identification Numbers:

The first symbol represents the grade level, the second symbol is the number of the state standard being addressed, the third number is the state benchmark being addressed and the decimal number is for the course content that addresses that specific standard and benchmark.

Example: 223.1 2=grade level 2= standard 2 3=benchmark 1= the first course content skill listed

The Essential Vocabulary is based on OPI's recommended vocabulary though ACE has often expanded the list of terms. **The vocabulary words in bold, are OPI suggested vocabulary and may well be used in MontCAS testing.**

ACE Course Abilities for Second Grade to be applied to Content Standards as appropriate to grade level:

Develop abilities in science.

- A. Higher thinking (analyze, evaluate, classify, predict, decide, estimate, generalize, solve, compare, simplify).
- B. Communications (present, persuade, collaborate, explain, recommend).
- C. Goal setting/attainment (brainstorm, envision, research, plan, organize, persist).
- D. The quality process (plan, draft, analyze, and revise when producing products).

Apply science knowledge and skills to a variety of purposes.

- A. Solve problems using the scientific method (research, hypothesis, experimentation, analysis, conclusion).
- B. Conduct research (field research, library research, experimentation, technological research).
- C. Use scientific equipment appropriately (safely, effectively, efficiently, accurately).
- D. Preserve the earth (reuse, reduce, recycle, refuse).
- E. Possess technical skills:
 - listen/read/dictate/write/present: instructions, chart, report, proposal, letter of request, summary.
 - technology: word processing, Internet, PowerPoint, smartboard, digital equipment, current technology.
 - measurement practice in standard and metric.

Understand and apply the scientific method.

- A. Identify a question and formulate a hypothesis.
- B. Identify variables involved with an experiment.
- C. Carry out a designed experiment based on a hypothesis.
- D. Observe and collect data related to the hypothesis.
- E. Show results by creating graphs and data tables.
- F. Analyze data and formulate a conclusion.

Second Grade Course Content

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

ESSENTIAL VOCABULARY: procedure, question, investigation, experiment, time, metric, length, temperature, mass, volume, beaker, ruler, scale, thermometer, bar graphs, line graphs, data, model, nature, natural world (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 2nd Grade*)

211.0 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).

- .1 Use observations to ask questions about objects, events and organisms in the environment.
- .2 Identify what's being measured in a simple investigation
- .3 Identify what's staying the same in a simple investigation, with guidance
- .4 Follow appropriate safety rules
- .5 Follow step-by-step directions to conduct a simple guided investigation using controls and variables

Voc.: procedure, question, investigation, experiment

212.0 Select and use appropriate tools including technology to make measurements (including metric units) and represent results of basic scientific investigations.

- .1 Use tools to measure time, mass, volume, length, and temperature
- .2 Record measurements
- .3 Display measurement using graphs

Voc.: time, metric, length, temperature, mass, volume, beaker, ruler, scale, thermometer, bar graphs, line graphs

213.0 Use data to describe and communicate the results of scientific investigations.

- .1 Define data
- .2 Present data graphically
- .3 Explain how the data addresses the scientific investigation question

Voc.: data

214.0 Use models that illustrate simple concepts and compare those models to the actual phenomenon.

- .1 Define a model as a representation of an actual object
- .2 Match models to real life examples

Voc.: model

Second Grade Course Content (cont.)

215.0 Identify a valid test in an investigation.

Benchmark is addressed in grade 3

216.0 Identify how observations of nature form an essential base of knowledge among the Montana American Indians.

- .1 Identify examples of Montana American Indians making use of natural resources
- .2 Explain Montana American Indians' explanations of the natural world

Voc.: nature, natural world

CONTENT STANDARD 2. Students, through the inquiry process, demonstrate the knowledge of properties, forms, changes and interactions of physical and chemical systems.

ESSENTIAL VOCABULARY: mixture, separate, physical properties, size, measure, compare, similarities, differences, tools, work
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 2nd Grade)

221.0 Create mixtures and separate them based on different physical properties (e.g., salt and sand, iron filings and soil, oil and water).

- .1 Create a mixture
- .2 Separate a mixture
- .3 Explain what constitutes a mixture

Voc.: mixture, separate

222.0 Examine, measure, describe, compare and classify objects in terms of common physical properties.

- .1 List physical properties of common objects
- .2 Measure linear size of common objects
- .3 Compare objects based on their similarities and differences

Voc.: physical properties, size, measure, compare, similarities, differences

223.0 Identify the basic characteristics of light, heat, motion, magnetism, electricity, and sound.

Benchmark is addressed in grades 1, 3 and 4

224.0 Model and explain that matter exists as solids, liquids, and gases and can change from one form to another

Benchmark is addressed in grades K, 1, 3 and 4

Second Grade Course Content (cont.)

225.0 Identify that the position of an object can be described by its location relative to another object and its motions described, and measured by external forces action upon it.

Benchmark is addressed in grade 3

226.0 Identify, build, and describe mechanical systems and the forces acting within those systems

.1 Identify simple tools

.2 Explain how simple tools make “work” easier

Voc.: tools, work

227.0 Observe, measure and manipulate forms of energy: sound, light, heat, electrical, magnetic

See Benchmark 3 Essential Learning Expectations

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

VOCABULARY: life cycle, seed, egg, reproduce, adult, grow, change, development, plant, animal, characteristics, classify, classification system (*Bold Vocabulary found on OPI’s SCIENCE Vocabulary for 2nd Grade*)

231.0 Identify that plants and animals have structures and systems that serve different functions for growth, survival, and reproduction.

Benchmark is addressed in grades 3, 4, and 5

232.0 Identify, measure, and describe basic requirements of energy and nutritional needs for an organism.

Benchmark is addressed in grade 1, 3, and 4

233.0 Describe and use models that trace the life cycles of different plants and animals and discuss how they are differ from species to species.

.1 Describe a plant life cycle (seed to plant to flower)

.2 Describe an animal life cycle

.3 Identify the stages of the life cycle (birth, growth, reproduction, death)

.4 Compare and contrast plant and animal life cycles

Voc.: life cycle, seed, egg, reproduce, adult, grow, change, development, plant, animal

Second Grade Course Content (cont.)

234.0 Explain cause and effect relationships between nonliving and living components with ecosystems; and explain individual response to the changes in the environment including identifying differences between inherited, instinctual, and learned behaviors.

Benchmark is addressed in grade 4

235.0 Create and use a classification system to group a variety of plants and animals according to their similarities and differences.

.1 Use a simple classification system for plants and animals

Voc.: characteristics, classify, classification system

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.

ESSENTIAL VOCABULARY: Earth, land, water, lake, pond, river, mountain, desert, valley, volcano, ocean, soil, rock, classify, texture, color, fossil, plant, animal, evidence, extinct, precipitation, weather, water, rain, snow, temperature, wind, fall, autumn, winter, spring, summer, season, scientific method, omnivore (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 2nd Grade*)

241.0 Describe and give examples of earth's changing features.

.1 Compare and contrast the characteristics of earth's natural features

.2 Make a model of a variety of earth's features (land and water)

Voc: Earth, land, water, lake, pond, river, mountain, desert, valley, volcano, ocean

242.0 Describe and measure the physical properties of earth's basic materials (including soil, rocks, water and gases) and the resources they provide.

.1 Identify that soil is made from rocks

.2 Identify that different rocks exist (color, texture)

.3 Compare and classify rocks based on color and texture

Voc: soil, rock, classify, texture, color

243.0 Investigate fossils and make inferences about life, the plants, animals, and the environment at that time.

.1 Recognize that there are a variety of fossil types

.2 Recognize that some kinds of plants and animals that once lived on earth have completely disappeared

.3 Define a fossil as physical evidence of past life

Voc: fossil, plant, animal, evidence, extinct

Second Grade Course Content (cont.)

244.0 Observe and describe the water cycle and the local weather and demonstrate how weather conditions are measured.

- .1 Recognize that all types of precipitation are different forms of water
- .2 Identify characteristics of different types of weather conditions

Voc: precipitation, weather, water, rain, snow, temperature, wind

245.0 Identify seasons and explain the difference between weather and climate.

- .1 List the four seasons
- .2 Identify characteristics of each season
- .3 Compare/contrast the seasons

Voc: fall, autumn, winter, spring, summer, season

246.0 Identify objects (e.g., moon, stars, meteors) in the sky and their patterns of movement and explain that light and heat come from a star called the sun.

Benchmark is addressed in grades 1, 3, and 4

247.0 Identify technology and methods used for space exploration (e.g., star patterns, space shuttles, telescopes).

Benchmark is addressed in grades 1 and 3

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

ESSENTIAL VOCABULARY: tools, processes, environment, issue, problem, technology, tools, community (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 2nd Grade*)

251.0 Describe and discuss examples of how people use science and technology.

- .1 Identify technology as the knowledge, processes and products used to solve problems and make lives easier
- .2 Identify various technologies in our community
- .3 Explain how various technologies are used in the community

Voc.: technology, tools, community

252.0 Describe a scientific or technological innovation that impacts communities, cultures, and society.

Benchmark is addressed in grade 3

Second Grade Course Content (cont.)

253.0 Simulate scientific collaboration by sharing and communicating ideas to identify and describe problems.

Benchmark is addressed in grade 4

254.0 Use scientific knowledge to make inferences and propose solutions for simple environmental problems.

- .1 Identify an environmental problem
- .2 Discuss the scientific issues relevant to the environmental problem

Voc.: environment, issue, problem

255.0 Identify how the knowledge of science and technology influences the development of the Montana American Indian cultures.

(go to www.opi.mt.gov/IndianEd for Science Model Lessons)

- .1 Identify how tools may be used for a specific process
- .2 Identify examples of tools, their uses, and how they have been developed and are being developed by Montana American Indians

Voc.: tools, process

CONTENT STANDARD 6. Students understand historical developments in science and technology.

ESSENTIAL VOCABULARY: question, observe, knowledge (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 2nd Grade*)

261.0 Give historical examples of scientific and technological contributions to communities, cultures and societies, including Montana American Indian examples. (go to www.opi.mt.gov/IndianEd for Science Model Lessons)

Benchmark is addressed in grade 3

262.0 Describe how scientific inquiry has produced much knowledge about the world and a variety of contributions toward understanding events and phenomenon within the universe.

- .1 Demonstrate that knowledge is gained through questioning and observations
- .2 Identify examples of tools that enhance observations

Voc.: question, observe, knowledge

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

- .1 Identify examples of science as a human process

Content and Performance Standards for Science

Third Grade

Course Content Identification Numbers:

The first symbol represents the grade level, the second symbol is the number of the state standard being addressed, the third number is the state benchmark being addressed and the decimal number is for the course content that addresses that specific standard and benchmark: Example: 323.1 3=grade level 2= standard 2 3=benchmark 1= the first course content skill listed

The Essential Vocabulary is based on OPI's recommended vocabulary though ACE has often expanded the list of terms. **The vocabulary words in bold, are OPI suggested vocabulary and may well be used in MontCAS testing.**

ACE Course Abilities for Third Grade to be applied to Content Standards as appropriate to grade level:

Develop abilities in science.

- A. Higher thinking (analyze, evaluate, classify, predict, decide, estimate, generalize, solve, compare, simplify).
- B. Communications (present, persuade, collaborate, explain, recommend).
- C. Goal setting/attainment (brainstorm, envision, research, plan, organize, persist).
- D. The quality process (plan, draft, analyze, and revise when producing products).

Apply science knowledge and skills to a variety of purposes.

- A. Solve problems using the scientific method (research, hypothesis, experimentation, analysis, conclusion).
- B. Conduct research (field research, library research, experimentation, technological research).
- C. Use scientific equipment appropriately (safely, effectively, efficiently, accurately).
- D. Preserve the earth (reuse, reduce, recycle, refuse).
- E. Possess technical skills:
 - listen/read/dictate/write/present: instructions, chart, report, proposal, letter of request, summary.
 - technology: word processing, Internet, PowerPoint, smartboard, digital equipment, current technology.
 - measurement practice in standard and metric.

Understand and apply the scientific method.

- A. Identify a question and formulate a hypothesis.
- B. Identify variables involved with an experiment.
- C. Carry out a designed experiment based on a hypothesis.
- D. Observe and collect data related to the hypothesis.
- E. Show results by creating graphs and data tables.
- F. Analyze data and formulate a conclusion.

Third Grade Course Content

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

ESSENTIAL VOCABULARY: infer, hypothesis, conclusion, scientific method, physical change, **procedure, investigation, testable question, measure, observation, tables, metric system, volume (milliliter, liter), mass (gram, kilogram), distance (centimeter, meter), time (seconds), graph, graduated cylinder, meter stick, thermometer (Celsius), data results, model, valid**
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 3rd Grade)

311.0 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).

- .1 Use observations to ask questions about objects, events and organisms in the environment
- .2 Identify testable questions
- .3 Follow appropriate safety rules
- .4 Design the steps of a simple investigation, with guidance
- .5 Follow scientific method to conduct a simple investigation

Voc.: procedure, investigation, testable question, measure, observation, scientific method, infer, hypothesis, conclusion, physical change, transpiration

312.0 Select and use appropriate tools including technology to make measurements (including metric units) and represent results of basic scientific investigations.

- .1 Select appropriate tools for an investigation
- .2 Demonstrate proper use of tools
- .3 Recognize and use metric measurements
- .4 Display measurements using simple tables and graphs

Voc.: tables, metric system, volume (milliliter, liter), mass (gram, kilogram), distance (centimeter, meter), time (seconds), graph, graduated cylinder, meter stick, thermometer (Celsius)

313.0 Use data to describe and communicate the results of scientific investigations.

- .1 Share results with classmates
- .2 Compare the results to the testable question

Voc.: data results

Third Grade Course Content (cont.)

314.0 Use models that illustrate simple concepts and compare those models to the actual phenomenon.

- .1 Match models to actual phenomenon
- .2 Use models to demonstrate understanding of simple concepts (i.e., Model of Earth and sun to show day/night)

Voc.: model

315.0 Identify a valid test in an investigation.

- .1 Define valid
- .2 Identify components of an investigation that make it valid

Voc.: invalid

316.0 Identify how observations of nature form an essential base of knowledge among the Montana American Indians.

- .1 Identify ways that some American Indians used observation for survival (i.e. natural phenomenon, animal and insect behaviors, weather changes)

CONTENT STANDARD 2. Students, through the inquiry process, demonstrate the knowledge of properties, forms, changes and interactions of physical and chemical systems.

ESSENTIAL VOCABULARY: mixture, filtering, evaporation, physical properties, classify, physical properties, mass, texture, energy, light, heat, motion, magnetism, electricity, sound, balance, scale, graduated cylinder, beaker, gram weights, thermometer, solid, liquid, gas, matter, melting, freezing, evaporation, boiling, force, motion, push, pull, change in motion (***Bold Vocabulary found on OPI's SCIENCE Vocabulary for 3rd Grade***)

321.0 Create mixtures and separate them based on different physical properties (e.g., salt and sand, iron filings and soil, oil and water).

- .1 Define a mixture
- .2 Identify basic physical properties (size, shape, color)
- .3 Make a mixture
- .4 Identify methods used to separate mixtures (filtering, manual and evaporation)
- .5 Separate a mixture

Voc.: mixture, filtering, evaporation, physical properties

Third Grade Course Content (cont.)

322.0 Examine, measure, describe, compare and classify objects in terms of common physical properties.

- .1 Describe objects according to common physical properties
- .2 Classify objects according to their physical properties. i.e., size, shape, color, texture, mass

Voc.: classify, physical properties, mass, texture

323.0 Identify the basic characteristics of light, heat, motion, magnetism, electricity, and sound.

- .1 Identify energy as the ability to cause change
- .2 List examples of energy (light, heat, motion, magnetism, electricity, sound)

Voc.: energy, light, heat, motion, magnetism, electricity, sound

324.0 Model and explain that matter exists as solids, liquids, and gases and can change from one form to another.

- .1 Classify tools that measure states of matter. i.e., balance scale, graduated cylinders, beakers, gram weights
- .2 Describe the three states of matter i.e., solid, liquid, and gas
- .3 Describe the physical changes in matter, i.e., ice to water; water to vapor
- .4 Observe and record the processes of changing states of matter (heating and cooling)

Voc.: balance, scale, graduated cylinder, beaker, gram weights, thermometer, solid, liquid, gas, matter, melting, freezing, evaporation, boiling

325.0 Identify that the position of an object can be described by its location relative to another object and its motions described, and measured by external forces action upon it.

- .1 Identify a force as a push or a pull
- .2 Observe changes in speed or direction of motion are caused by forces
- .3 Investigate how the amount of the force affects the change in motion

Voc.: force, motion, push, pull, change in motion

326.0 Identify, build, and describe mechanical systems and the forces acting within those systems.

Benchmark is addressed in grades 2 and 4

327.0 Observe, measure and manipulate forms of energy: sound, light, heat, electrical, magnetic.

See Benchmark 3 (323.0)

Third Grade Course Content (cont.)

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

VOCABULARY: living, plant, animal, reproduction, habitat, nutrients, air, energy, solar energy, life cycle, animal kingdom, species, organism, plant kingdom (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 3rd Grade*)

331.0 Identify that plants and animals have structures and systems that serve different functions for growth, survival, and reproduction.

- .1 List the five basic needs of plants and animals (habitat, reproduction, water, nutrients, air)
- .2 Identify plant and animal structures, i.e., plants: root, stem, leaf. animal: bones, skin

Voc.: living, plant, animal, energy, habitat, nutrients, air

332.0 Identify, measure, and describe basic requirements of energy and nutritional needs for an organism.

- .1 Identify that from food, animals obtain energy and materials for body repair and growth
- .2 Identify that solar energy is the primary source of energy for plants
- .3 Describe how and why energy sources are needed to sustain life

Voc.: energy, solar energy

333.0 Describe and use models that trace the life cycles of different plants and animals and discuss how they are different from species to species.

- .1 Define species
- .2 Compare and contrast the life cycle of two different organisms in the animal kingdom.
- .3 Compare and contrast the life cycle of two different plant species

Voc.: life cycle, animal kingdom, species, organism, plant kingdom

334.0 Explain cause and effect relationships between nonliving and living components within ecosystems; and explain individual responses to the changes in the environment including identifying differences between inherited, instinctual, and learned behaviors.

Benchmark is addressed in grade 4

35.0 Create and use a classification system to group a variety of plants and animals according to their similarities and differences.

Benchmark is addressed in grade 4

Third Grade Course Content (cont.)

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.

ESSENTIAL VOCABULARY: erosion, weathering, soil, rock, water, air, melting, freezing, evaporation, condensation, precipitation, water cycle, thermometer, rain gauge, temperature, local weather, precipitation, climate, weather, seasons, fall, autumn, winter, spring, summer, solar system, planets, sun, moon (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 3rd Grade*)

341.0 Describe and give examples of earth's changing features.

- .1 Identify examples of Earth's features, i.e., rocks and soil
- .2 List materials that make up soil, i.e., weathered rock, humus, water, and air
- .3 Describe the steps that rocks go through in weathering
- .4 Identify causes of erosion

Voc.: erosion, weathering, soil, rock, water, air

342.0 Describe and measure the physical properties of earth's basic materials (including soil, rocks, water and gases) and the resources they provide.

Benchmark addressed in grade 4

343.0 Investigate fossils and make inferences about life, the plants, animals, and the environment at that time.

Benchmark addressed in grade 4

344.0 Observe and describe the water cycle and the local weather and demonstrate how weather conditions are measured.

- .1 Differentiate between melting, freezing, evaporation, condensation, and precipitation
- .2 Illustrate or create a model of the water cycle
- .3 Explain the changes that occur to water as it moves through the cycle
- .4 Identify the instruments used for measuring temperature and precipitation
- .5 Record local temperature and precipitation
- .6 Describe local weather using recorded data

Voc.: melting, freezing, evaporation, condensation, precipitation, water cycle, thermometer, rain gauge, temperature, local weather, precipitation

345.0 Identify seasons and explain the difference between weather and climate.

- .1 Distinguish between weather and climate
- .2 Describe local climate conditions for each season

Voc.: climate, weather, seasons, fall, autumn, winter, spring, summer

Third Grade Course Content (cont.)

346.0 Identify objects (e.g., moon, stars, meteors) in the sky and their patterns of movement and explain that light and heat come from a star called the sun.

- .1 Recognize that planets can have moons
- .2 Identify the planets in our solar system
- .3 Identify the relative location of planets and the sun

Voc.: solar system, planets, sun, moon

347.0 Identify technology and methods used for space exploration (e.g., star patterns, space shuttles, telescopes).

- .1 Identify the current types of technology and methods being used for space exploration
- .2 Identify the types of information that can be learned from these methods

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

ESSENTIAL VOCABULARY: technology, knowledge, society, processes, products, impact, discovery, environment, problem, solution, tool, culture (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 3rd Grade*)

351.0 Describe and discuss examples of how people use science and technology.

Benchmark is addressed in grades 1, 2, and 4

352.0 Describe a scientific or technological innovation that impacts communities, cultures, and society.

- .1 Identify technology as the knowledge, processes and products used to solve problems and make lives easier
- .2 Define and discuss what constitutes a society
- .3 Identify examples of scientific or technological discoveries that impact societies

Voc.: technology, knowledge, society, processes, products, impact, discovery

353.0 Simulate scientific collaboration by sharing and communicating ideas to identify and describe problems.

Benchmark is addressed in grade 4

354.0 Use scientific knowledge to make inferences and propose solutions for simple environmental problems.

- .1 List and discuss environmental problems and concerns.
- .2 Propose solutions for environmental problems using scientific knowledge

Voc.: environment, problem, solution

Third Grade Course Content (cont.)

355.0 Identify how the knowledge of science and technology influences the development of the Montana American Indian cultures.

(go to www.opi.mt.gov/IndianEd for Science Model Lessons)

- .1 Identify how tools for a specific use have changed over time.
- .2 Identify how the change in tools have influenced Montana American Indian cultures
- .3 Research local American Indian people who have made notable contributions
- .4 Discuss how these works contributed to communities and society at large

Voc.: tool, culture

CONTENT STANDARD 6. Students understand historical developments in science and technology.

ESSENTIAL VOCABULARY: society, contribution, historical, technology, impact, scientific inquiry, natural world

361.0 Give historical examples of scientific and technological contributions to communities, cultures and societies, including Montana American Indian examples (go to www.opi.mt.gov/IndianEd for Science Model Lessons).

- .1 Define and discuss what constitutes a community
- .2 Identify historical examples of scientific or technological contributions that impacted societies, including Montana American Indians

Voc.: society, contribution, historical, technology, impact

362.0 Describe how scientific inquiry has produced much knowledge about the world and a variety of contributions toward understanding events and phenomenon within the universe.

- .1 Identify examples where scientific inquiry is used to gain understanding of the natural world

Voc.: scientific inquiry, natural world

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

- .1 Identify examples of science as an ongoing process

Content and Performance Standards for Science

Fourth Grade

Course Content Identification Numbers:

The first symbol represents the grade level, the second symbol is the number of the state standard being addressed, the third number is the state benchmark being addressed and the decimal number is for the course content that addresses that specific standard and benchmark.

Example: 423.1 4 =grade level 2= standard 2 3=benchmark 1= the first course content skill listed

The Essential Vocabulary is based on OPI's recommended vocabulary though ACE has often expanded the list of terms. **The vocabulary words in bold, are OPI suggested vocabulary and may well be used in MontCAS testing.**

ACE Course Abilities for Fourth Grade to be applied to Content Standards as appropriate for the grade level:

Develop abilities in science.

- A. Higher thinking (analyze, evaluate, classify, predict, decide, estimate, generalize, solve, relate, interpret, simplify).
- B. Communications (present, persuade, collaborate, explain, recommend).
- C. Goal setting/attainment (brainstorm, observe, envision, research, plan, organize, retest, persist).
- D. The quality process (plan, draft, analyze, and revise when producing products).
- E. Identify a valid test in an investigation.

Apply science knowledge and skills to a variety of purposes.

- A. Solve problems using the scientific method (research, hypothesis, experimentation, findings, conclusion).
- B. Conduct research (field research, library research, experimentation).
- C. Use scientific equipment appropriately (safely, effectively, efficiently, accurately).
- D. Preserve the earth (reuse, reduce, recycle, refuse).
- E. Develop technical skills ie:
 - listen/read/dictate/write/present: instructions, chart, report, proposal, letter of request, summary, models.
 - technology: word processing, Internet, current technology.
 - measurement practice in standard and metric.

Understand and apply the scientific method.

- A. Identify a question and formulate a hypothesis.
- B. Identify variables involved with an experiment.
- C. Carry out a designed experiment based on a hypothesis.
- D. Observe and collect data related to the hypothesis.
- E. Show results by creating graphs and data tables.
- F. Analyze data and formulate a conclusion.

Fourth Grade Course Content

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

ESSENTIAL VOCABULARY: procedure, materials, investigation, testable question, measure, observation, tables, metric system, volume (milliliter, liter), mass (gram, kilogram), distance (centimeter, meter), time (seconds), graph, graduated cylinder, meter stick, thermometer (Celsius), graphs, charts, diagrams, increase, decrease, data, results, scale, compare, contrast, phenomenon, legend/key, digital probe, tsunamis, scientific method, hypothesis (***Bold Vocabulary found on OPI's SCIENCE Vocabulary for 4th Grade***)

411.0 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).

- .1 Ask a testable question using observations and prior knowledge
- .2 Identify appropriate safety procedures
- .3 Identify materials needed for an investigation
- .4 Conduct a student designed simple investigation

Voc.: procedure, materials, investigation, testable question, measure, observation

412.0 Select and use appropriate tools including technology to make measurements (including metric units) and represent results of basic scientific investigations.

- .1 Use the appropriate tools to collect data, i.e., rulers, meter sticks, digital probes, thermometers, stop watches, scales, balances, beakers, graduated cylinders, etc.
- .2 Record all data in metric units (was B)
- .3 Understand and infer from recorded data
- .4. Organize data using tables
- .5 Represent data graphical

Voc.: tables, metric system, volume (milliliter, liter), mass (gram, kilogram), distance (centimeter, meter), time (seconds), graph, graduated cylinder, meter stick, thermometer (Celsius)

413.0 Use data to describe and communicate the results of scientific investigations.

- .1 Create graphs, charts, and diagrams
- .2 Present collected graphs, charts and diagrams in a written and oral format

Voc.: graphs, charts, diagrams, increase, decrease, data, results

414.0 Use models that illustrate simple concepts and compare those models to the actual phenomenon.

- .1 Identify the relative scale of a given model
- .2 Compare and contrast how a model relates to the actual phenomenon

Voc.: scale, compare, contrast, phenomenon, legend/key

Fourth Grade Course Content (cont.)

415.0 Identify a valid test in an investigation.

- .1 Identify the parts of a valid test
- .2 Identify a valid test in an investigation

416.0 Identify how observations of nature form an essential base of knowledge among the Montana American Indians.

- .1 Identify examples of Montana American Indians using observations in nature
- .2 Describe the ways that some American Indians used observation to create knowledge (i.e., for survival)

CONTENT STANDARD 2. Students, through the inquiry process, demonstrate the knowledge of properties, forms, changes and interactions of physical and chemical systems.

ESSENTIAL VOCABULARY: substance, mixture, physical properties, separate, physical property, characteristic, classify, attract, repel, magnet, magnetic field, reflect, refract, absorb, visible spectrum, prism, wave, vibration, sound, motion, speed, frequency, volume, pitch, wavelength, amplitude, electricity, energy, current, static, closed and open circuits, switch, parallel, series, battery (dry-cell vs. wet-cell), positive charge, negative charge., solid, liquid, gas, physical property, physical change, speed, direction, force, motion, simple machine, work, levers, inclined plane, wheel and axle, pulley, wedge, screw *(Bold Vocabulary found on OPP's SCIENCE Vocabulary for 4th Grade)*

421.0 Create mixtures and separate them based on different physical properties (e.g., salt and sand, iron filings and soil, oil and water).

- .1 Identify substances in a mixture
- .2 Identify examples of mixtures in everyday life.
- .3 Create a mixture with objects that have various physical properties
- .4 Identify physical properties of substances in a mixture
- .5 Separate mixtures based on different physical properties
- .6 Separate mixtures using a variety of methods.

Voc.: substance, mixture, physical properties, separate

422.0 Examine, measure, describe, compare and classify objects in terms of common physical properties.

- .1 Define physical property
- .2 Identify characteristics of a physical property (size, color, shape, texture)
- .3 Measure objects to determine differences and similarities
- .4 Classifying objects multiple times by a variety of physical properties

Voc.: physical property, characteristic, classify

Fourth Grade Course Content (cont.)

423.0 Identify the basic characteristics of light, heat, motion, magnetism, electricity, and sound.

- .1 Investigate attraction and repulsion with magnets.
- .2 Describe the effect of distance on the magnetic field
- .3 Investigate the visible spectrum
- .4 Define reflect, refract, and absorb
- .5 Classify materials as those that can reflect, refract or absorb light.
- .6 Describe and list examples of a wave.
- .7 Describe the relationship between a vibration and a sound wave.
- .8 Model wave motion (up and down, back and forth, speed)
- .9 Identify electricity as a flow of energy
- .11 Compare and contrast current electricity and static electricity.
- .12 List the safe uses of electricity.
- .13 Construct an example of an electrical circuit.

Voc.: attract, repel, magnet, magnetic field, reflect, refract, absorb, visible, spectrum, prism, wave, vibration, sound, motion, speed, frequency, volume, pitch, wavelength, amplitude, electricity, energy, current, static, closed and open circuits, switch, parallel, series, battery (dry-cell vs. wet-cell), positive charge, negative charge

424.0 Model and explain that matter exists as solids, liquids, and gases and can change from one form to another.

- .1 Differentiate between solids, liquids, and gases
- .2 Identify examples of solids, liquids, and gases
- .3 Define physical properties and physical change
- .4 List examples of physical changes
- .5 Demonstrate physical changes through investigation

Voc.: solid, liquid, gas, physical property, physical change

425.0 Identify that the position of an object can be described by its location relative to another object and its motions described, and measured by external forces action upon it.

- .1 Investigate and describe how speed, direction, and forces affect the motion of an object

Voc.: speed, direction, force, motion

426.0 Identify, build, and describe mechanical systems and the forces acting within those systems.

- .1 Explore and identify simple machines, including real life examples
- .2 Build simple machines and explain how they make work easier

Voc.: simple machine, work, levers, inclined plane, wheel and axle, pulley, wedge, screw

Fourth Grade Course Content (cont.)

427.0 Observe, measure and manipulate forms of energy: sound, light, heat, electrical, magnetic.

See Benchmark 3 (423.0)

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

ESSENTIAL VOCABULARY: stem, root, leaf, flower, stamen, sepal, pistil, pollen, ovule, petal, system, producer, consumer, decomposer, food chain, food web, herbivore, carnivore, omnivore, adaptation, survival, environment, organism, instinctual, behavior, inherited, learned, predator, prey, competition, vertebrate, invertebrate, flowering, non-flowering, classify, similarities, differences, classification system (*Bold Vocabulary found on OPI's SCIENCE Vocabulary for 4th Grade*)

431.0 Identify that plants and animals have structures and systems that serve different functions for growth, survival, and reproduction.

- .1 Identify the parts of plants. (stem, root, leaf, flower)
- .2 Identify the parts of a flower (stamen, sepal, petal, pistil, pollen, ovule)
- .3 Illustrate and label a plant and its parts
- .4 Identify that animals have systems for certain functions
- .5 Explain the relationship between basic animal systems and their functions

Voc.: stem, root, leaf, flower, stamen, sepal, pistil, pollen, ovule, petal, system

432.0 Identify, measure, and describe basic requirements of energy and nutritional needs for an organism.

- .1 Define producer, consumer, decomposer, food chain, food web
- .2 Explain the difference between a food chain and a food web
- .3 Illustrate and describe the relationships in food chains and food webs

Voc.: producer, consumer, decomposer, food chain, food web, herbivore, carnivore, omnivore

433.0 Describe and use models that trace the life cycles of different plants and animals and discuss how they are differ from species to species.

Benchmark is addressed in grade 2 and 3

434.0 Explain cause and effect relationships between nonliving and living components with ecosystems; and explain individual response to the changes in the environment including identifying differences between inherited, instinctual, and learned behaviors.

- .1 Define adaptation
- .2 Identify adaptations in a variety of organisms that are specific to survival in their environment
- .3 Define instinctual behaviors, inherited behaviors, and learned behaviors
- .4 Classify living things by instinctual, inherited, and learned behaviors
- .5 Compare and contrast the instinctual, inherited, and learned behaviors
- .6 Define predator, prey, competition
- .7 Identify examples of predator/prey relationships and competition

Voc.: adaptation, survival, environment, organism, instinctual, behavior, inherited, learned, predator, prey, competition

435.0 Create and use a classification system to group a variety of plants and animals according to their similarities and differences.

- .1 Define vertebrate and invertebrates
- .2 Identify examples of invertebrates and vertebrates
- .3 Identify characteristics of flowering and non-flowering plants
- .4 Identify rules for classification
- .5 Place organisms into groups according to the classification rules

Voc.: vertebrate, invertebrate, flowering, non-flowering, classify, similarities, differences, classification system

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.

ESSENTIAL VOCABULARY: erosion, weathering, earthquakes, volcano, glaciations, classification, igneous, metamorphic, sedimentary, pressure, deposition, fossil, body fossil, trace fossil, environment, impression, barometer, anemometer, weather vane, temperature, humidity, wind, precipitation, air pressure, patterns, trend, orbit, rotation, revolution, planets, sun, axis, moon, planet, sun, orbit, Earth, meteor, comet, asteroid, solar system *(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 4th Grade)*

441.0 Describe and give examples of earth's changing features.

- .1 Define and illustrate the following terms: erosion, weathering, volcanoes, earthquakes, glaciations
- .2 Describe the changes that occur to earth features in each event
- .3 Illustrate the effects of the changes in Earth's surface

Voc.: erosion, weathering, earthquakes, volcano, glaciations

Fourth Grade Course Content (cont.)

442.0 Describe and measure the physical properties of earth's basic materials (including soil, rocks, water and gases) and the resources they provide.

- .1 Describe the formation of the three rock types
- .2 Compare and contrast the characteristics of the three basic types of rocks: sedimentary, metamorphic and igneous
- .3 Identify specific samples of sedimentary, metamorphic and igneous rocks
- .4 Identify everyday uses of rocks
- .5 Classify rock samples by rock type

Voc.: classification, igneous, metamorphic, sedimentary, pressure, deposition

443.0 Investigate fossils and make inferences about life, the plants, animals, and the environment at that time.

- .1 Define a fossil as physical evidence of past life
- .2 Identify body fossils as those that contain plant and animal remains
- .3 Identify trace fossils as those that record an impression of past life
- .4 Explain how body and trace fossils are formed
- .5 Compare a fossil to a plant/animal living today
- .6 Infer what fossils tell us about past life and the environment

Voc.: fossil, body fossil, trace fossil, environment, impression

444.0 Observe and describe the water cycle and the local weather and demonstrate how weather conditions are measured.

- .1 Record temperature
- .2 Display data on a graph
- .3 Interpret trends and patterns of data
- .4 Identify and explain the use of a barometer, weather vane, and anemometer
- .5 Collect, record and chart data from each weather instrument
- .6 Identify the patterns
- .7 Discuss trends within the patterns

Voc.: barometer, anemometer, weather vane, temperature, humidity, wind, precipitation, air pressure, patterns, trends

445.0 Identify seasons and explain the difference between weather and climate.

Benchmark is addressed in grade 3

Fourth Grade Course Content (cont.)

446.0 Identify objects (e.g., moon, stars, meteors) in the sky and their patterns of movement and explain that light and heat come from a star called the sun.

- .1 Define and model revolution and rotation
- .2 Model the orbit of the planets around the sun
- .3 Identify the patterns of movement between a planet, its moon, and the sun.
- .4 Identify changes in the appearance of the Earth's moon over the course of a month
- .5 Identify other objects in the solar system (meteors, comets, and asteroids)
- .6 Discuss the characteristics and movements of meteors, comets, and asteroids.

Voc. meteor, comet, asteroid, solar system, moon, planet, sun orbit, Earth, rotation, revolution, sun, axis

447.0 Identify technology and methods used for space exploration (e.g., star patterns, space shuttles, telescopes).

Benchmark is addressed in grades 1 and 3

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

ESSENTIAL VOCABULARY: technology, society, environment, technology, society, environment, community, culture, environment
(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 4th Grade)

451.0 Describe and discuss examples of how people use science and technology.

- .1 Identify technology as the knowledge, processes and products used to solve problems and make lives easier
- .2 Identify examples of technology used in modern society.
- .3 Identify uses of technology in science, (i.e., probes, microscopes, lasers)
- .4 Discuss how science and technology have impacted our environment.

Voc.: technology, society, environment

452.0 Describe a scientific or technological innovation that impacts communities, cultures, and society.

- .1 Define and discuss what constitutes a community, a culture, and a society
- .2 Compare and contrast community, culture and society
- .3 Identify and discuss examples of scientific or technological discoveries that impact a community, a culture and a society

Voc.: technology, society, environment, community, culture

First Grade Course Content (cont.)

453.0 Simulate scientific collaboration by sharing and communicating ideas to identify and describe problems.

- .1 Identify a local current event or problem involving science
- .2 Research and summarize the scientific issues relevant to that local current event or problem
- .3 Present and discuss the research on the scientific issues relevant to that local current event or problem

454.0 Use scientific knowledge to make inferences and propose solutions for simple environmental problems.

- .1 List and discuss environmental problems and concerns.
- .2 Research and summarize the scientific issues relevant to environmental problems
- .3 Propose and discuss solutions for environmental problems using scientific knowledge

Voc.: environment

455.0 Identify how the knowledge of science and technology influences the development of the Montana American Indian cultures
(go to www.opi.mt.gov/IndianEd for Science Model Lessons).

- .1 Identify and discuss examples of scientific knowledge influencing the development of Montana American Indian cultures

CONTENT STANDARD 6. Students understand historical developments in science and technology.

ESSENTIAL VOCABULARY: society, culture, community, scientific inquiry, natural world, collaborate

(Bold Vocabulary found on OPI's SCIENCE Vocabulary for 4th Grade)

461.0 Give historical examples of scientific and technological contributions to communities, cultures and societies, including Montana American Indian examples (go to www.opi.mt.gov/IndianEd for Science Model Lessons).

- .1 Define and discuss what constitutes a community, a culture, and a society
- .2 Identify and discuss historical examples of scientific or technological contributions that impacted a community, a culture and a society; including Montana American Indians

Voc.: society, culture, community

462.0 Describe how scientific inquiry has produced much knowledge about the world and a variety of contributions toward understanding events and phenomenon within the universe.

- .1 Research and describe examples where scientific inquiry was used to gain understanding of the natural world
- .2 Identify and describe examples of scientific understanding that was contributed to by multiple scientists

Voc.: scientific inquiry, natural world, collaborate

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

- .1 Identify occupations that use science including Montana American Indians
- .2 Identify and describe examples of science as an ongoing process