

MSAD #34

K-12

**Science &
Technology
Curriculum**

Adopted June 22, 2004

MSAD #34

**Science
Curriculum
K-4**

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CLASSIFYING LIFE FORMS

Goal A: **The learner will understand that there are similarities within the diversity of all living things.** Modern classification systems are based on comparisons of the structure, life cycles, and behavior of organisms.

Kindergarten

- Objective 1. The learner will identify differences between living and non-living things.
- Objective 2. The learner will describe characteristics of different living things.

Grade 1

- Objective 1. The learner will describe characteristics of different living things.
- Objective 2. The learner will explain, draw, or otherwise demonstrate the life cycle of an organism.

Grade 2

- Objective 1. The learner will describe the characteristics of different living things.
- Objective 2. The learner will explain, draw, or otherwise demonstrate the life cycle of an organism.
- Objective 3. The learner will design and describe a classification system for objects.

Grade 3

- Objective 1. The learner will group the same organisms in different ways using different characteristics.
- Objective 2. The learner will design and describe a classification system for organisms.

Grade 4

- Objective 1. The learner will group the same organisms in different ways using different characteristics.
- Objective 2. The learner will design and describe a classification system for organisms.
- Objective 3. The learner will describe the different living things within a given habitat.
- Objective 4. The learner will compare and contrast the life cycles, behavior, and structure of different organisms.

ECOLOGY

Goal B: The learner will understand how living things depend on one another and on non-living aspects of the environment. Balance in ecosystems is based on an intricate web of relationships among populations of living organisms and on non-living factors such as water and temperature. Changes in specific populations or conditions affect other parts of the ecosystem. Individual systems continually change in response to human and other factors.

Kindergarten

Objective 1. The learner will describe a familiar local environment.

Grade 1

- Objective 1. The learner will identify ways that organisms depend upon their environment.
- Objective 2. The learner will describe how almost all animals' food can be traced back to plants.
- Objective 3. The learner will describe different ecological systems on earth.
- Objective 4. The learner will describe a familiar local environment.

Grade 2

- Objective 1. The learner will give examples of how one change in a system affects other parts of the system.
- Objective 2. The learner will describe different ecological systems on earth.
- Objective 3. The learner will describe a familiar local environment.

Grade 3

- Objective 1. The learner will compare and contrast physical and living components of different biomes, i.e., region characterized by their climate and plant life (e.g., tundra, rain forest, ocean, desert).

Grade 4

- Objective 1. The learner will describe a food web and the relationship within a given ecosystem.
- Objective 2. The learner will explain the difference between producers (e.g., green plants), consumers (e.g., those that eat green plants), and decomposers (e.g., bacteria that break down the "consumers" when they die), and identify examples of each.
- Objective 3. The learner will investigate the connection between major living and non-living components of a local ecosystem.

CELLS

Goal C: **The learner will understand that cells are the basic units of life.** The functions performed by organelles (specialized structures found in cells) within individual cells are also carried out by the organ system in multi-cellular organisms. This standard requires that the student be conversant with magnifying devices, cell structures and function, body system and disease causes and the body's defense against them.

Kindergarten

- Objective 1. The learner will demonstrate that living things are made up of different parts.
- Objective 2. The learner will explore magnifying devices and how they allow one to see in more detail.

Grade 1

- Objective 1. The learner will demonstrate that living things are made up of different parts.
- Objective 2. The learner will demonstrate an understanding that plants and animals need food, water, and gases to survive.

Grade 2

- Objective 1. The learner will demonstrate that living things are made up of different parts.
- Objective 2. The learner will explore magnifying devices and how they allow one to see in more detail.

Grade 3

- Objective 1. The learner will demonstrate an understanding that a cell is the basic unit of living organisms.
- Objective 2. The learner will explore how the use of a microscope allows one to see cells in a variety of organisms.

Grade 4

- Objective 1. The learner will demonstrate an understanding that a cell is the basic unit of living organisms.
- Objective 2. The learner will describe how single-celled organisms exist.
- Objective 3. The learner will explore how the use of a microscope allows one to see cells in a variety of organisms.

CONTINUITY AND CHANGE

Goal D: **The learner will understand the basis for all life and that all living things change over time.**
Fossils show past life, extinct species, and environmental changes over time. Organisms change and new species may arise due to genetically coded adaptations.

Kindergarten

Objective 1. None

Grade 1

- Objective 1. The learner will explain how fossils show the existence of past life.
- Objective 2. The learner will identify characteristics that help organisms live in their environment.
- Objective 3. The learner will draw or describe ways in which an organism can change over its lifetime, sometimes in predictable ways (e.g., butterfly, frog).
- Objective 4. The learner will describe ways in which individuals of the same species are alike and different.

Grade 2

- Objective 1. The learner will identify characteristics that help organisms live in their environment.
- Objective 2. The learner will draw or describe ways in which an organism can change over its lifetime, sometimes in predictable ways (e.g., butterfly, frog).

Grade 3

- Objective 1. The learner will identify present day organisms that have not always existed, and past life forms that have become extinct.
- Objective 2. The learner will describe how fossils form.
- Objective 3. The learner will explain how adaptations, in response to change over time, may increase a species' chances of survival.
- Objective 4. The learner will describe ways in which organisms may be similar to and different from their parent and explore the possible reasons for this.

Grade 4

Objective 1. None

STRUCTURE OF MATTER

Goal E: **The learner will understand that structure of matter and the changes it can undergo.**
Matter is made of atoms, each with characteristic properties, which can combine to form all substances in the universe. The state and properties of matter may differ when it experiences chemical, physical, and nuclear changes.

Kindergarten

- Objective 1. The learner will show that large things are made up of smaller pieces.
- Objective 2. The learner will describe some physical properties of objects.
- Objective 3. The learner will group objects based on observable characteristics (e.g., color, size, texture).

Grade 1

- Objective 1. The learner will show that large things are made up of smaller pieces.
- Objective 2. The learner will describe some physical properties of objects.
- Objective 3. The learner will group objects based on observable characteristics (e.g., color, size, texture).

Grade 2

- Objective 1. None

Grade 3

- Objective 1. None

Grade 4

- Objective 1. The learner will describe how the physical properties of objects sometimes change when one object chemically combines with another.
- Objective 2. The learner will explain how matter changes in both chemical and physical ways.

THE EARTH

Goal F: **The learner will gain knowledge about the earth and the processes that change it.** The earth's surface undergoes steady or sudden changes due to forces of wind, water, ice, volcanism, and shifting of tectonic plates.

Kindergarten

Objective 1. The learner will describe the way weather changes.

Grade 1

Objective 1. The learner will observe changes that are caused by water, snow, wind, and ice.

Grade 2

Objective 1. The learner will describe the way weather changes.

Objective 2. The learner will analyze the relationships between observable weather patterns and the cycling of the seasons.

Objective 3. The learner will observe changes that are caused by water, snow, wind, and ice.

Grade 3

Objective 1. The learner will describe the change in position of the continents over time.

Objective 2. The learner will demonstrate an understanding that many things about the earth (e.g., climate) occur in cycles that vary in length and frequency.

Objective 3. The learner will describe differences among minerals, rocks, and soils.

Objective 4. The learner will illustrate how water and other substances go through the cyclic process of change in the environment.

Grade 4

Objective 1. None

THE UNIVERSE

Goal G: **The learner will gain knowledge about the universe and how humans have learned about it, and about the principles upon which it operates.** This includes understanding the results of the relative positions and movement of the earth, moon, sun, stars, planets, and galaxies. It also entails an understanding of how scientists gather data and formulate explanations for phenomena in space.

Kindergarten

- Objective 1. The learner will explain the cycles of day/night and the seasons.
- Objective 2. The learner will demonstrate that shadows of objectives change based on where light is coming from.
- Objective 3. The learner will demonstrate an understanding that the sun is one of many stars in the universe and is the closest star to earth.

Grade 1

- Objective 1. None

Grade 2

- Objective 1. None

Grade 3

- Objective 1. The learner will illustrate the relative positions of the sun, moon, and planets.
- Objective 2. The learner will trace the sources of earth's heat and light energy to the sun.
- Objective 3. The learner will describe earth's rotation on its axis and its revolution around the sun.
- Objective 4. The learner will explore the relationship between the earth and its moon.

Grade 4

- Objective 1. None

ENERGY

Goal H: **The learner will understand concepts of energy.** Energy takes many forms that can exert forces and do work. The conversion of energy from one form to another offers useful applications and sometimes presents problems.

Kindergarten

Objective 1. The learner will demonstrate an understanding that the sun gives off light and heat energy.

Grade 1

Objective 1. None

Grade 2

Objective 1. The learner will explain why things need energy.

Grade 3

Objective 1. The learner will explain ways different forms of energy can be produced.

Grade 4

Objective 1. The learner will identify different forms of energy (e.g., light, sound, heat).

Objective 2. The learner will explain ways different forms of energy can be produced.

MOTION

Goal I: **The learner will understand the motion of objects and how forces can change that motion.**
All objects are in motion, at least at an atomic/subatomic level. By understanding how forces (e.g., gravity, friction, and magnetism) act on objects, they can predict their effects on the motion of the object.

Kindergarten

Objective 1. None

Grade 1

Objective 1. None

Grade 2

Objective 1. The learner will develop a variety of ways to describe the motion of an object.

Objective 2. The learner will demonstrate that the motion of an object can be changed.

Grade 3

Objective 1. None

Grade 4

Objective 1. The learner will describe the effects of different types of forces (e.g., mechanical, electrical, magnetic) on motion.

Objective 2. The learner will draw conclusions about how the amount of force affects the motion of more massive and less massive objects.

Objective 3. The learner will generate examples illustrating that when something is pushed or pulled, it exerts a reaction force.

INQUIRY AND PROBLEM SOLVING

Goal J: **The learner will apply inquiry and problem solving approaches in science and technology.** Scientific inquiry, problem solving, and the technological method provide insight into and comprehension of the world around us. A variety of tools, including emerging technologies, assist the inquiry processes. Models are used to understand the world.

Kindergarten

- Objective 1. The learner will make accurate observations using appropriate tools and units of measure.
- Objective 2. The learner will ask questions and propose strategies and materials to use in seeking answers to questions.
- Objective 3. The learner will use results in a purposeful way, which includes making predictions based on patterns they have observed.
- Objective 4. The learner will identify products that were invented to solve a problem.

Grade 1

- Objective 1. The learner will make accurate observations using appropriate tools and units of measure.
- Objective 2. The learner will ask questions and propose strategies and materials to use in seeking answers to questions.
- Objective 3. The learner will use results in a purposeful way, which includes making predictions based on patterns they have observed.
- Objective 4. The learner will identify products that were invented to solve a problem.

Grade 2

- Objective 1. The learner will make accurate observations using appropriate tools and units of measure.
- Objective 2. The learner will ask questions and propose strategies and materials to use in seeking answers to questions.
- Objective 3. The learner will use results in a purposeful way, which includes making predictions based on patterns they have observed.
- Objective 4. The learner will identify products that were invented to solve a problem.

Grades 3

- Objective 1. The learner will make accurate observations using appropriate tools and units of measure. (Grade 4 motion)
- Objective 2. The learner will conduct scientific investigations: make observations, collect and analyze data, and do experiments.
- Objective 3. The learner will use results in a purposeful way: design fair tests, make predictions based on observed patterns, and interpret data to make further predictions. (Grade 4 motion)
- Objective 4. The learner will design and build an invention.
- Objective 5. The learner will explain how differences in time, place or experimenter can lead to different data. (Grade 4 motion)
- Objective 6. The learner will explain how different conclusions can be derived from the same data. (Grade 4 motion)

Grade 4

- Objective 1. The learner will make accurate observations using appropriate tools and units of measure. (Grade 4 motion)
- Objective 2. The learner will conduct scientific investigations: make observations, collect and analyze data, and do experiments.
- Objective 3. The learner will use results in a purposeful way: design fair tests, make predictions based on observed patterns, and interpret data to make further predictions. (Grade 4 motion)
- Objective 4. The learner will design and build an invention.
- Objective 5. The learner will explain how differences in time, place or experimenter can lead to different data. (Grade 4 motion)
- Objective 6. The learner will explain how different conclusions can be derived from the same data. (Grade 4 motion)

SCIENTIFIC REASONING

Goal K: **The learner will learn to formulate and justify ideas and to make informed decisions.** This involves framing and supporting arguments, recognizing patterns and relationships, identifying bias and stereotypes, brainstorming alternative explanations and solutions, judging accuracy, analyzing situations, and revising studies to improve their validity.

Kindergarten

- Objective 1. The learner will examine strengths and weaknesses of simple arguments.
- Objective 2. The learner will distinguish between important and unimportant information in simple arguments.
- Objective 3. The learner will make observations.
- Objective 4. The learner will participate in brainstorming activities.
- Objective 5. The learner will use various forms of simple logic.
- Objective 6. The learner will discover relationships and patterns.

Grade 1

- Objective 1. The learner will examine strengths and weaknesses of simple arguments.
- Objective 2. The learner will distinguish between important and unimportant information in simple arguments.
- Objective 3. The learner will make observations.
- Objective 4. The learner will participate in brainstorming activities.
- Objective 5. The learner will use various forms of simple logic.
- Objective 6. The learner will discover relationships and patterns.

Grade 2

- Objective 1. The learner will examine strengths and weaknesses of simple arguments.
- Objective 2. The learner will distinguish between important and unimportant information in simple arguments.
- Objective 3. The learner will make observations.
- Objective 4. The learner will participate in brainstorming activities.
- Objective 5. The learner will use various forms of simple logic.
- Objective 6. The learner will discover relationships and patterns.

Grade 3

- Objective 1. The learner will give alternative explanations for observed phenomena.
- Objective 2. The learner will describe how feelings can distort reasoning.
- Objective 3. The learner will draw conclusions about observations.
- Objective 4. The learner will use various types of evidence (e.g., logical, quantitative) to support a claim.
- Objective 5. The learner will demonstrate an understanding that ideas are more believable when supported by good reasons.
- Objective 6. The learner will practice and apply simple logic, intuitive thinking, and brainstorming.

Grade 4

- Objective 1. The learner will give alternative explanations for observed phenomena.
- Objective 2. The learner will describe how feelings can distort reasoning.
- Objective 3. The learner will draw conclusions about observations.
- Objective 4. The learner will use various types of evidence (e.g., logical, quantitative) to support a claim.
- Objective 5. The learner will demonstrate an understanding that ideas are more believable when supported by good reasons.
- Objective 6. The learner will practice and apply simple logic, intuitive thinking, and brainstorming.

COMMUNICATION

Goal L: The learner will communicate effectively in the application of science and technology.
Clear and accurate communication employs appropriate symbols and terminology, models, and a variety of media and presentation styles. Communication includes constructing knowledge through reflection, evaluation, refocusing, and critically analyzing information from a variety of sources. Individuals and collaborative groups must communicate effectively.

Kindergarten

- Objective 1. The learner will describe and compare things in terms of number, shape, texture, size, weight, color, and behavior.
- Objective 2. The learner will read and write instructions to be followed or instructions, which explain procedures.
- Objective 3. The learner will ask clarifying questions.
- Objective 4. The learner will explain problem solving processes using verbal, pictorial, and written methods.
- Objective 5. The learner will make and read simple graphs.
- Objective 6. The learner will use objects and pictures to represent scientific and technological ideas.

Grade 1

- Objective 1. The learner will describe and compare things in terms of number, shape, texture, size, weight, color, and behavior.
- Objective 2. The learner will read and write instructions to be followed or instructions, which explain procedures.
- Objective 3. The learner will ask clarifying questions.
- Objective 4. The learner will explain problem solving processes using verbal, pictorial, and written methods.
- Objective 5. The learner will make and read simple graphs.
- Objective 6. The learner will use objects and pictures to represent scientific and technological ideas.

Grade 2

- Objective 1. The learner will describe and compare things in terms of number, shape, texture, size, weight, color, and behavior.
- Objective 2. The learner will read and write instructions to be followed or instructions, which explain procedures.
- Objective 3. The learner will ask clarifying questions.
- Objective 4. The learner will explain problem solving processes using verbal, pictorial, and written methods.
- Objective 5. The learner will make and read simple graphs.
- Objective 6. The learner will use objects and pictures to represent scientific and technological ideas.

Grade 3

- Objective 1. The learner will record results of experiments or activities (e.g., interviews, discussions, field work) and summarize and communicate what they have learned. (Grade 4 motion)
- Objective 2. The learner will ask clarifying and extending questions.
- Objective 3. The learner will reflect on work in science and technology using such activities as discussions, journals, and self-assessments. (Grade 4 motion)

- Objective 4. The learner will make and/or use sketches, tables, graphs, physical representations, and manipulatives to explain procedures and ideas. (Grade 4 motion)
- Objective 5. The learner will gather and effectively present information, using a variety of media including computers (e.g., spreadsheets, word processing, programming, graphics, modeling). (Grade 4 motion)
- Objective 6. The learner will cite examples of bias in information sources and question the validity of information from varied sources.
- Objective 7. The learner will function effectively in groups within various assigned roles (e.g., reader, recorder). (Grade 4 motion)

Grade 4

- Objective 1. The learner will record results of experiments or activities (e.g., interviews, discussions, field work) and summarize and communicate what they have learned. (Grade 4 motion)
- Objective 2. The learner will ask clarifying and extending questions.
- Objective 3. The learner will reflect on work in science and technology using such activities as discussions, journals, and self-assessments. (Grade 4 motion)
- Objective 4. The learner will make and/or use sketches, tables, graphs, physical representations, and manipulatives to explain procedures and ideas. (Grade 4 motion)
- Objective 5. The learner will gather and effectively present information, using a variety of media including computers (e.g., spreadsheets, word processing, programming, graphics, modeling). (Grade 4 motion)
- Objective 6. The learner will cite examples of bias in information sources and question the validity of information from varied sources.
- Objective 7. The learner will function effectively in groups within various assigned roles (e.g., reader, recorder). (Grade 4 motion)

IMPLICATIONS OF SCIENCE AND TECHNOLOGY

Goal M: **The learner will understand the historical, social, economic, environmental, and ethical implications of science and technology.** Scientific and technological breakthroughs are influenced by prevailing beliefs and conditions that in turn are impacted by new ideas and inventions. By assessing the impacts of technological activity on the environment, students will develop their own sense of global stewardship.

Kindergarten

- Objective 1. The learner will describe how legends, stories, and scientific explanations are different ways in which people attempt to explain the world.
- Objective 2. The learner will describe at least two inventions, what they do, how they work, and how they made life easier.
- Objective 3. The learner will identify commonly used resources, their sources, and where waste products go.
- Objective 4. The learner will demonstrate some practices for recycling and care of resources.
- Objective 5. The learner will explain how their lives would be different without specific inventions or scientific knowledge.

Grade 1

- Objective 1. The learner will describe how legends, stories, and scientific explanations are different ways in which people attempt to explain the world.
- Objective 2. The learner will describe at least two inventions, what they do, how they work, and how they made life easier.
- Objective 3. The learner will identify commonly used resources, their sources, and where waste products go.
- Objective 4. The learner will demonstrate some practices for recycling and care of resources.
- Objective 5. The learner will explain how their lives would be different without specific inventions or scientific knowledge.

Grade 2

- Objective 1. The learner will describe how legends, stories, and scientific explanations are different ways in which people attempt to explain the world.
- Objective 2. The learner will describe at least two inventions, what they do, how they work, and how they made life easier.
- Objective 3. The learner will identify commonly used resources, their sources, and where waste products go.
- Objective 4. The learner will demonstrate some practices for recycling and care of resources.
- Objective 5. The learner will explain how their lives would be different without specific inventions or scientific knowledge.

Grade 3

- Objective 1. The learner will explore how cultures have found different technological solutions to deal with similar needs or problems (e.g., construction, clothing, agricultural tools and methods).
- Objective 2. The learner will investigate and describe the role of scientists and inventors.
- Objective 3. The learner will explore how technology (e.g., transportation, irrigation) has altered human settlement.
- Objective 4. The learner will explain practices for conservation in daily life, based on a recognition that renewable and non-renewable resources have limits.

Grade 4

- Objective 1. The learner will explore how cultures have found different technological solutions to deal with similar needs or problems (e.g., construction, clothing, agricultural tools and methods).
- Objective 2. The learner will investigate and describe the role of scientists and inventors.
- Objective 3. The learner will explore how technology (e.g., transportation, irrigation) has altered human settlement.
- Objective 4. The learner will explain practices for conservation in daily life, based on a recognition that renewable and non-renewable resources have limits.