

QUICK REFERENCE: 8TH GRADE SCIENCE STANDARDS

A. SCIENCE CONNECTIONS

Content Standard

Students in Wisconsin will understand that among the science disciplines, there are unifying themes: systems, order, organization, and interactions; evidence, models, and explanations; constancy, change, and measurement; evolution, equilibrium, and energy; and form and function.

These themes relate and interconnect the Wisconsin science standards to one another. Each theme is further defined in the glossary following the science standards.

Rationale:

These unifying themes are ways of thinking rather than theories or discoveries. Students should know about these themes and realize that the more they learn about science the better they will understand how the themes organize and enlarge their knowledge. Science is a system and should be seen as a single discipline rather than a set of separate disciplines. Students will also understand science better when they connect and integrate these unifying themes into what they know about themselves and the world around them.

PERFORMANCE STANDARDS

By the end of grade 8 students will:

- A.8.1 Develop their understanding of the science themes* by using the themes to frame questions about science-related issues and problems
- A.8.2 Describe* limitations of science systems* and give reasons why specific science themes* are included in or excluded from those systems
- A.8.3 Defend explanations* and models* by collecting and organizing evidence* that supports them and critique explanations and models by collecting and organizing evidence that conflicts with them
- A.8.4 Collect evidence* to show* that models* developed as explanations* for events were (and are) based on the evidence available to scientists at the time
- A.8.5 Show* how models* and explanations*, based on systems*, were changed as new evidence* accumulated (the effects of constancy*, evolution*, change*, and measurement* should all be part of these explanations)
- A.8.6 Use models* and explanations* to predict* actions and events in the natural world
- A.8.7 Design real or thought investigations* to test the usefulness and limitations of a model*
- A.8.8 Use the themes* of evolution*, equilibrium*, and energy* to predict* future events or changes* in the natural world

B. NATURE OF SCIENCE

Content Standard

Students in Wisconsin will understand that science is ongoing and inventive, and that scientific understandings have changed over time as new evidence is found.

Rationale:

Students will realize that scientific knowledge is developed from the activities of scientists and others who work to find the best possible explanations of the natural world. Researchers and those who are involved in science follow a generally accepted set of rules to produce scientific knowledge that others can confirm through experimentation. This knowledge is public, replicable, and undergoing revision and refinement based on new experiments and data.

PERFORMANCE STANDARDS

By the of grade 8 students will:

- B.8.1 Describe* how scientific knowledge and concepts have changed over time in the earth and space, life and environmental, and physical sciences
- B.8.2 Identify* and describe* major changes that have occurred over time in conceptual models* and explanations* in the earth and space, life and environmental, and physical sciences, and identify* the people, cultures, and conditions that led to these developments
- B.8.3 Explain* how the general rules of science apply to the development and use of evidence* in science investigations, model*-making, and applications*
- B.8.4 Describe* types of reasoning and evidence* used outside of science to draw conclusions about the natural world
- B.8.5 Explain* ways in which science knowledge is shared, checked, and extended, and show* how these processes change over time
- B.8.6 Explain* the ways in which scientific knowledge is useful and also limited when applied to social issues

C. SCIENCE INQUIRY

Content Standard

Students in Wisconsin will investigate questions using scientific methods and tools, revise their personal understanding to accommodate knowledge, and communicate these understandings to others.

Rationale:

Students should experience science in a form that engages them in actively constructing ideas and explanations and enhances their opportunities to develop the skills of doing science. Such inquiry (problem solving) should include questioning, forming hypotheses, collecting and analyzing data, reaching conclusions and evaluating results, and communicating procedures and findings to others.

PERFORMANCE STANDARDS

By the end of grade 8 students will:

- C.8.1 Identify* questions they can investigate* using resources and equipment they have available
- C.8.2 Identify* data and locate sources of information including their own records to answer the questions being investigated
- C.8.3 Design and safely conduct investigations* that provide reliable quantitative or qualitative data, as appropriate, to answer their questions
- C.8.4 Use inferences* to help decide possible results of their investigations, use observations to check their inferences
- C.8.5 Use accepted scientific knowledge, models*, and theories* to explain* their results and to raise further questions about their investigations*
- C.8.6 State what they have learned from investigations*, relating their inferences* to scientific knowledge and to data they have collected
- C.8.7 Explain* their data and conclusions in ways that allow an audience to understand the questions they selected for investigation* and the answers they have developed
- C.8.8 Use computer software and other technologies to organize, process, and present their data
- C.8.9 Evaluate*, explain*, and defend the validity of questions, hypotheses, and conclusions to their investigations*
- C.8.10 Discuss the importance of their results and implications of their work with peers, teachers, and other adults
- C.8.11 Raise further questions which still need to be answered

D. PHYSICAL SCIENCE

Content Standard

Students in Wisconsin will demonstrate an understanding of the physical and chemical properties of matter, the forms and properties of energy, and the ways in which matter and energy interact.

Rationale:

Knowledge of the physical and chemical properties of matter and energy is basic to an understanding of the earth and space, life and environmental, and physical sciences. The properties of matter can be explained in terms of the atomic structure of matter. Natural events are the result of interactions of matter and energy. When students understand how matter and energy interact, they can explain and predict chemical and physical changes that occur around them.

PERFORMANCE STANDARDS**By the end of grade 8 students will:****Properties and Changes of Properties in Matter**

- D.8.1 Observe*, describe*, and measure* physical and chemical properties of elements and other substances to identify* and group* them according to properties such as density, melting points, boiling points, conductivity, magnetic attraction, solubility, and reactions to common physical and chemical tests
- D.8.2 Use the major ideas of atomic theory and molecular theory to describe* physical and chemical interactions* among substances, including solids, liquids, and gases
- D.8.3 Understand* how chemical interactions* and behaviors lead to new substances with different properties
- D.8.4 While conducting investigations*, use the science themes* to develop explanations* of physical and chemical interactions* and energy* exchanges

Motions and Forces

- D.8.5 While conducting investigations*, explain* the motion of objects by describing* the forces acting on them
- D.8.6 While conducting investigations*, explain* the motion of objects using concepts of speed, velocity, acceleration, friction, momentum, and changes over time, among others, and apply* these concepts and explanations* to real-life situations outside the classroom
- D.8.7 While conducting investigations* of common physical and chemical interactions* occurring in the laboratory and the outside world, use commonly accepted definitions of energy* and the idea of energy conservation

Transfer of Energy

- D.8.8 Describe* and investigate* the properties of light, heat, gravity, radio waves, magnetic fields, electrical fields, and sound waves as they interact* with material objects in common situations
- D.8.9 Explain* the behaviors of various forms of energy* by using the models* of energy transmission, both in the laboratory and in real-life situations
- D.8.10 Explain* how models* of the atomic structure of matter have changed over time, including historical models and modern atomic theory

E. EARTH AND SPACE SCIENCE

Content Standard

Students in Wisconsin will demonstrate an understanding of the structure and systems of the earth and other bodies in the universe and their interactions.

Rationale:

By studying the earth, its composition, history, and the processes that shape it, students gain a better understanding of the planet on which they live. Understanding these geologic, meteorological, astronomical, and oceanographic processes allows students to make responsible choices and to evaluate the consequences of their choices. In addition, all bodies in space, including the earth, are influenced by forces acting throughout the solar system and the universe. Studying the universe enhances students' understanding of the earth's origins, its place in the universe, and its future.

PERFORMANCE STANDARDS

By the end of grade 8 students will:

Structure of Earth System

- E.8.1 Using the science themes*, explain* and predict* changes* in major features of land, water, and atmospheric systems
- E.8.2 Describe* underlying structures of the earth that cause changes* in the earth's surface
- E.8.3 Using the science themes* during investigations*, describe* climate, weather, ocean currents, soil movements, and changes* in the forces acting on the earth
- E.8.4 Using the science themes*, analyze* the influence living organisms have had on the earth's systems, including their impact on the composition of the atmosphere and the weathering of rocks

Earth's History

- E.8.5 Analyze* the geologic and life history of the earth, including change* over time, using various forms of scientific evidence
- E.8.6 Describe* through investigations the use of the earth's resources by humans in both past and current cultures, particularly how changes in the resources used for the past 100 years are the basis for efforts to conserve and recycle renewable and nonrenewable resources

Earth in the Solar System

- E.8.7 Describe* the general structure of the solar system, galaxies, and the universe, explaining the nature of the evidence* used to develop current models* of the universe
- E.8.8 Using past and current models* of the structure of the solar system, explain* the daily, monthly, yearly, and long-term cycles of the earth, citing evidence* gained from personal observation* as well as evidence used by scientists

F. LIFE AND ENVIRONMENTAL SCIENCE

Content Standard

Students in Wisconsin will demonstrate an understanding of the characteristics and structures of living things, the processes of life, and how living things interact with one another and their environment.

Rationale:

Students will enhance their natural curiosity about living things and their environment through study of the structure and function of living things, ecosystems, life cycles, energy movement (transfer), energy change (transformation), and changes in populations of organisms through time. Knowledge of these concepts and processes of life and environmental science will assist students in making informed choices regarding their lifestyles and the impact they have on communities of living things in their environment.

PERFORMANCE STANDARDS

By the end of grade 8 students will:

Structure and Function in Living Things

- F.8.1 Understand* the structure and function* of cells, organs, tissues, organ systems, and whole organisms
- F.8.2 Show* how organisms have adapted structures to match their functions*, providing means of encouraging individual and group survival within specific environments
- F.8.3 Differentiate between single-celled and multiple-celled organisms (including humans) through investigations, comparing the cell functions of specialized cells for each type of organism

Reproduction and Heredity

- F.8.4 Investigate* and explain* that heredity is comprised of the characteristic traits found in genes within the cell of an organism
- F.8.5 Show* how different structures both reproduce and pass on characteristics of their group

Regulation and Behavior

- F.8.6 Understand* that an organism is regulated both internally and externally
- F.8.7 Understand* that an organism's behavior evolves through adaptation to its environment

Populations and Ecosystems

- F.8.8 Show* through investigations* how organisms both depend on and contribute to the balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system* of life on the planet

Diversity and Adaptations of Organisms

- F.8.9 Explain* how some of the changes* on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species
- F.8.10 Project how current trends in human resource use and population growth will influence the natural environment, and show how current policies affect those trends

G. SCIENCE APPLICATIONS

Content Standard

Students in Wisconsin will demonstrate an understanding of the relationship between science and technology and the ways in which that relationship influences human activities.

Rationale:

Science and technology complement each other. Science helps drive technology and technology provides science with tools for investigation, inquiry, and analysis. Together, science and technology applications provide solutions to human problems, needs, and aspirations. Students should understand that advances in science and technology affect the earth's systems.

PERFORMANCE STANDARDS**By the end of grade 8 students will:**

- G.8.1 Identify* and investigate* the skills people need for a career in science or technology and identify the academic courses that a person pursuing such a career would need
- G.8.2 Explain* how current scientific and technological discoveries have an influence on the work people do and how some of these discoveries also lead to new careers
- G.8.3 Illustrate* the impact that science and technology have had, both good and bad, on careers, systems, society, environment, and quality of life
- G.8.4 Propose a design (or re-design) of an applied science model or a machine that will have an impact in the community or elsewhere in the world and show* how the design (or re-design) might work, including potential side-effects
- G.8.5 Investigate* a specific local problem to which there has been a scientific or technological solution, including proposals for alternative courses of action, the choices that were made, reasons for the choices, any new problems created, and subsequent community satisfaction
- G.8.6 Use current texts, encyclopedias, source books, computers, experts, the popular press, or other relevant sources to identify* examples of how scientific discoveries have resulted in new technology
- G.8.7 Show* evidence* of how science and technology are interdependent, using some examples drawn from personally conducted investigations*

H. SCIENCE IN SOCIAL AND PERSONAL PERSPECTIVES**Content Standard**

Students in Wisconsin will use scientific information and skills to make decisions about themselves, Wisconsin, and the world in which they live.

Rationale:

An important purpose of science education is to give students a means to understand and act on personal, economic, social, political, and international issues. Knowledge and methodology of the earth and space, life and environmental, and physical sciences facilitate analysis of topics related to personal health, environment, and management of resources, and help evaluate the merits of alternative courses of action.

PERFORMANCE STANDARDS

By the end of grade 8 students will:

- H.8.1 Evaluate* the scientific evidence* used in various media (for example, television, radio, Internet, popular press, and scientific journals) to address a social issue, using criteria of accuracy, logic, bias, relevance of data, and credibility of sources
- H.8.2 Present a scientific solution to a problem involving the earth and space, life and environmental, or physical sciences and participate in a consensus-building discussion to arrive at a group decision
- H.8.3 Understand* the consequences of decisions affecting personal health and safety

