

A. Science Connections

CONTENT STANDARD A: Students in the Union Grove area schools will understand that there are unifying themes: systems, order, organization, and interactions; evidence, models and explanations; constancy, change, and measurement; evolution, equilibrium and energy; form and function among scientific disciplines.

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.

A.8.1 Science Themes: *Develop their understanding of the science themes** by using the themes to frame questions about science-related issues and problems.

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- Define and explain how the following science themes can be applied to the natural world: **systems** (body systems), **order** (path of energy in food chain), **organization** (periodic table), and **interactions** (ecosystems); **evidence** (data), **models** (mini habitats) and explanations (lab write-ups); **constancy** (tides, water cycle), **change** (weather patterns), and **measurement** (temperature); **evolution** (plant succession), **equilibrium** (heart rate and exercise), and **energy** (light, sound, etc).

A.8.2 Science Systems and the Themes: *Describe* limitations of science systems* and give reasons why specific science themes* are included in or excluded from those systems.*

5:

- Describe limitations of science systems and give reasons why specific science themes are included in or excluded from those systems (i.e. data collection from an ecosystem can be limited by cost, time, technology and knowledge).

A.8.3 Defending and Critiquing Explanations: *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.*

5:

- Discuss the characteristics of a good explanation (use supporting evidence) and why models are used (i.e., economical and practical, less dangerous).

A.8.4 Evidence: *Collect evidence* to show* that models* developed as explanations* for events were (and are) based on the evidence available to scientists at the time.*

5:

- Know that models developed as explanations for events were (and are) based on the evidence available to scientists at the time, (i.e., the model of the atom).

A.8.5 New Evidence: *Show* [include the following themes when showing] 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).*

5:

- Understand that models will change over time as new evidence is collected.

A.8.6 Predicting with Models and Explanations: *Use models* and explanations* to predict* actions and events in the natural world.*

5:

- Use models and/or explanations to predict actions and events in the natural world (i.e., predict the effect of introducing a new species into ecosystem, zebra mussels and plant life in lake, predict what happens when you take one element out of a food chain).

A.8.7 **Models:** *Design real or thought investigations* to test the usefulness and limitations of a model*.*

5:

- Work as a group to identify the usefulness and limitations of a model (i.e., discuss limitations of a land biome model, terrariums, sound wave model (slinky)).

A.8.8 **Predicting with Themes:** *Use the themes* of evolution*, equilibrium*, and energy* to predict* future events or changes* in the natural world.*

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- Use the themes of evolution, equilibrium, and energy to predict future events or changes in the natural world (i.e., effects of climate changes on ecosystems).

B. Nature of Science

CONTENT STANDARD B: Students in the Union Grove area schools will understand that science is ongoing and inventive, and that scientific understandings have changed over time as new evidence is found. Students should develop an understanding of science as a human endeavor.

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 with experimental evidence. This knowledge is public, replicable, and undergoing revision and refinement based on new experiments and data.

B.8.1 Science Knowledge and Concepts: *Describe* how scientific knowledge and concepts have changed over time in the earth and space, life and environmental and physical sciences.*

- 5:**
- Describe how scientific knowledge and concepts have changed over time in the physical science (i.e., natural light to artificial light, naturally occurring elements to man made elements).

B.8.2 Change Over Time: *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.*

- 5:**
- Understand that the rules of science require us to use data without changing data to meet expected outcomes.

B.8.4 Reasoning: *Describe* types of reasoning and evidence* used outside of science to draw conclusions about the natural world.*

- 5:**
- Work as a group to identify examples of non-scientific reasoning being used to draw conclusions about the natural world (i.e., mythology, astrology).

B.8.5 Application of Science Knowledge: *Explain* ways in which scientific knowledge is shared, checked, and extended, and show* how these processes change over time.*

- 5:**
- Understand that much of today's scientific knowledge is based on previous scientific ideas that have changed over time (i.e., model of atom).

B.8.6 Uses and Limitations of Science: *Explain* the ways in which scientific knowledge is useful and also limited when applied to social issues.*

- 5:**
- Understand how scientific knowledge can be useful for making legislative decisions concerning pollution, recycling programs, introduction of foreign plants and animals into our country, etc.

C. Science Inquiry

CONTENT STANDARD C: Students in the Union Grove area schools will investigate questions using scientific methods and tools, revise their personal understanding to accommodate knowledge, and communicate these understandings to others. Students should develop abilities necessary to do scientific inquiry and an understanding about scientific inquiry.

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.

C.8.1 Questioning: *Identify* questions they can investigate** using resources and equipment they have available.
5:

- Working as a group, students will identify the questions they hope to answer while conducting their experiments.

C.8.2 Data and Information Sources: *Identify* data and locate sources of information* including their own records to answer the questions being investigated.

- 5:**
- Use the data collected during investigations to develop conclusions and report findings.
 - Make inferences and draw conclusions when given data from a study.

C.8.3 Conducting Investigations: *Design and safely conduct investigations* that provide reliable quantitative or qualitative data, as appropriate, to answer their questions.*

- 5:**
- Design and complete a science fair project that includes the elements of a scientific study.

C.8.4 Inferences: *Use inferences* to help decide possible results of their investigations, [and] use observations to check their inferences.*

- 5:**
- Understand what inferences are.

C.8.5 Explaining Results: *Use accepted scientific knowledge, models*, and theories* to explain* their results and to raise further questions about their investigations*.*

- 5:**
- Review a completed investigation and determine how the data supported the results.

C.8.6 Relating Inferences from Investigations: *State what they have learned from investigations*, relating their inferences* to scientific knowledge and to data they have collected.*

- 5:**
- Students will understand and give examples of inferences.

C.8.7 Explaining Conclusions: *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.*

- 5:**
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C.8.8 Using Technology: *Use computer software and other technologies to organize, process, and present their data.*

- 5:**
- Use computer software and other technologies to organize, process, and present their data (Power Point, Inspiration, Excel, internet, etc.).

C.8.9 Defending Validity: *Evaluate*, explain*, and defend the validity of questions, hypotheses, and conclusions to their investigations*.*

5:

- Share and defend data from an investigation with peers and teacher.

C.8.10 Realizing the Importance of Implications: *Discuss the importance of their results and implications of their work with peers, teachers, and other adults.*

5:

- Discuss the importance of data collected from investigations and its connections to real life situations.

C.8.11 Further Questioning: *Raise further questions which still need to be answered.*

5:

- Working as a group, raise further questions about investigations which still need to be answered.

D. Physical Science

CONTENT STANDARD D: Students in the Union Grove area schools 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. (See Appendix B for NSES details on these fundamental concepts and principles.)

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.

D.8.1 Physical and Chemical Properties: Physical and Chemical Properties: *Observe*, describe*, and introduce **physical** and **chemical properties** of elements and other substances to identify and group them according to properties such as **melting points, boiling points, conductivity, magnetic attraction, and reactions** to common physical and chemical tests.*

5:

- Identify the characteristics of chemical and physical changes and give examples of each.
- Know that matter is made up of small particles called atoms.
- Know that certain atoms combine to form molecules.

D.8.2 Chemical Interactions (Changes): Use the major ideas of atomic theory and molecular theory to *Describe* physical and chemical interactions* among substances*, including solids, liquids, and gases.

5:

- Know the three states of matter.
- Understand that substances can exist as different states of matter.
- Identify **physical and chemical changes** among substances.
- Illustrate the structure of an **atom (nucleus, proton, neutron, electron)**.
- Know the terms atom, molecule, element and compound and be able to give examples of each.
- Give examples of chemical changes.

D.8.3 New Substances: *Understand* how chemical interactions* (change) and behaviors lead to new substances with different properties.*

5:

- Identify examples of chemical and physical changes/**interactions**.
- Know that when a chemical change takes place a new substance is made.

D.8.4 Explaining Interactions: While conducting investigations*, *use the science themes* to Develop explanations* of physical and chemical interactions* and energy* exchanges.*

5:

- Carry out investigations of physical and chemical interactions, using the scientific rules (i.e., mystery solutions.)

D.8.5 Forces of Motion: While conducting investigations*, *Explain* the motion of objects by describing* the forces acting on them.*

5:

- This standard is not addressed at this grade level.

D.8.6 Explaining Motion: 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*

5:

- This standard is not addressed at this grade level.

D.8.7 Using Definitions and Ideas: 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.*

5:

- Give examples of different forms of energy.
- Give examples that the transfer of energy (i.e., through the consumption of food) and explain why this is essential to all living organisms.
- Know the organization of simple food chains and food webs and understand that energy is being transferred.

D.8.8 Interactions of Objects: *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.*

5:

- Explain and give examples of light, gravity, radio waves, electric fields and sound waves. WC, WGSD, D, NC
- Identify sources of light, gravity, radio waves, and sound waves. WGSD, D, NC
- Explain how light waves and sound waves travel.
- Know how the reflection, absorption and transmission of light affects an object's appearance.
- Know how flat and curved mirrors affect light.

D.8.9 Models of Energy Transmission: *Explain* the behaviors of various forms of energy* by using the models* of energy transmission, both in the laboratory and in real-life situations in the outside world.*

5:

- Explain and give examples of different forms of energy (sound, light, heat).
- Give examples of energy changing forms.
- Know an example of an ocean and land food chain.
- Demonstrate that the pitch of a sound depends on the frequency of the vibration producing it.

D.8.10 Models of Atomic Structure: *Explain* how models* of the atomic structure of matter have changed over time, including historical models and modern atomic theory.*

5:

- Identify and build a **model** of the current **atomic structure (electron cloud theory)**.
- Create a timeline showing how models of atomic structure have changed over time.
- Use periodic table to compare and build models of elements.
- Know how elements are on the periodic chart.
- Know that symbols represent atoms, atoms combine to form molecules and that a chemical formula is used to illustrate a chemical reaction.

E. Earth and Space Science

CONTENT STANDARD E: Students in the Union Grove area schools will demonstrate an understanding of the structure and systems of earth and other bodies in the universe and of their interactions. (See Appendix B for NSES details on these fundamental concepts and principles).

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. 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. Understanding these geologic, meteorological, astronomical and oceanographic processes allows students to make responsible choices and to evaluate the consequences of their choices.

E.8.1 Changes in Earth Features: Using the science themes*, ***Explain*** and **predict*** changes* in major features of land, water, and atmospheric systems.*

5:

- Explain and give examples of major land features (i.e. **biomes or topography**), and weather changes.
- Know how air flow and air pressure affects weather.
- Know that most of the Earth's surface is covered by water, that most of that water is salt water in oceans and that fresh water is found in rivers, lakes, underground sources and glaciers.
- Explain that air is a substance that surrounds us and takes up space.
- Know that wind is the movement of the air that surrounds us.

E.8.2 Underlying Structures of the Earth: *Describe* underlying structures of the earth that cause changes* in the earth's surface.*

5:

- Identify and describe structures on the inside of the earth.

E.8.3 Forces Acting on the Earth: Using the science themes* during the process of investigation*, *Describe* climate, weather, ocean currents, soil movements and changes* in the forces acting on the earth.*

5:

E.8.4 Influence of Living Organisms: 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.

5:

- Explain the role of decomposing organisms in the nitrogen cycle.

E.8.5 Evidence of Earth History: *Analyze* the geologic and life history of the earth*, including change* over time, using various forms of scientific evidence.

5:

- Explain the role of decomposing organisms in the nitrogen cycle.

E.8.6 Use of Resources: *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 non-renewable resources.

5:

- Give examples of current and past use of earth **resources**.

E.8.7 Celestial Models: *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.

5:

- Explain the role of decomposing organisms in the nitrogen cycle.

E.8.8 Cycles of the Earth: 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.

5:

- Explain the role of decomposing organisms in the nitrogen cycle.

F. Life and Environmental Science

CONTENT STANDARD F: Students in the Union Grove area schools 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. (See Appendix B for NSES details on these fundamental concepts and principles.)

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.

F.8.1 Structure and Function of Living Things: *Understand* the structure and function* of cells, organs, tissues, organ systems, and whole organisms.*

- 5:**
- Explain the function of the respiratory and circulatory systems of the human body.

F.8.2 Adaptation Structures: *Show* how organisms have adapted structures to match their functions*, providing means of encouraging individual and group survival within specific environments.*

- 5:**
- Define adaptation.
 - Give examples of adaptations in different organisms.

F.8.3 Single and Multi Celled Organisms: *Differentiate between single-celled and multiple-celled organisms (humans) through investigation, comparing the cell functions of specialized cells for each type of organism.*

- 5:**
- This standard is not addressed at this grade level.

F.8.4 Characteristic Traits: *Investigate* and explain* that heredity is comprised of the characteristic traits found in genes within the cell of an organism.*

- 5:**
- This standard is not addressed at this grade level.

F.8.5 Passing on Characteristics: *Show* how different structures both reproduce and pass on characteristics of their group.*

- 5:**
- This standard is not addressed at this grade level.

F.8.6 Internal and External Regulation: *Understand* that an organism is regulated both internally and externally.*

- 5:**
- Understand that a healthy lifestyle is important for the internal regulation of our respiratory and circulatory system (i.e., understand harmful effects of smoking, drugs or unhealthy lifestyle).

F.8.7 Behavior Adaptations: *Understand* that an organism's behavior evolves through adaptation to its environment.*

- 5:**
- This standard is not addressed at this grade level.

F.8.8 Population Balance: *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.*

- 5:**
- Define **populations** and **ecosystems**.
 - Define and give examples of **life cycles**.
 - Give examples of populations affecting (positive and negative) each other in an ecosystem.

- Distinguish between producers and consumers.
- Know the interdependence of a food chain and give examples of food chains.
- Know how energy flows through food chains and food webs.

F.8.9 Changes that Impact on the Survival and Growth of Certain Species: *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.*

5:

- Give examples of how changes in our environment have impacted on living things.

F.8.10 Human Influence on the Environment: *Project how current trends in human resource use and population growth will influence the natural environment, and show how current policies affect those trends.*

5:

- Give examples of influence that humans have on the natural environment.
- Explain how nature and people affect a food web.

G. Science Application

CONTENT STANDARD G: Students in the Union Grove area schools 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 compliment 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.

G.8.1 Careers: *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.*

5:

- Identify careers that involve science and technology.
- Identify skills one would need to have a career in a science field (i.e., making observations, strong sense of inquiry, patience, analyzing data, collecting information, communication skills, understanding tools and technology).

G.8.2 Influence of Discoveries: *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.*

5:

- Identify scientific and technological discoveries through discussion of current events.
- Discuss how scientific and technological discoveries have influenced careers (i.e., environmental science, space research, forensics, research, computer programming, transplant technology, gene therapy, water treatment, sanitation, bridge construction).

G.8.3 Impact of Science and Technology: *Illustrate* the impact that science and technology have had, both good and bad, on careers, systems, society, environment, and quality of life.*

5:

- Identify and explain positive and negative effects science and technology have had on society (i.e., faster pace, longer life expectancy, accessibility, invasion of privacy, loss/increase of jobs, organization, opportunities, internet usage, impact on environment, energy sources, energy consumption and costs).

G.8.4 Science Models/Machines: *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.*

5:

- Design applied science models or machines and explain how they could affect society (i.e., egg drop, design temperature control {insulation} containers, structural design, landscape design, living habitat design).

G.8.5 Science or Technology Solutions: *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.*

5:

- Identify local scientific or technological problems and their solutions.
- Investigate **processes** (methods) by which problems were solved.
- Analyze solutions and problems associated with the solutions.
- Impact of residential expansion. WGSD, NC

G.8.6 Discoveries Result in New Technology: *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.*

5:

- Gather information, using a variety of current and reliable resources, to identify scientific discoveries which have resulted in new technologies (Science in the News activity). (i.e., genetics and cloning, pacemakers, velcro, genetic engineering, laser eye surgery.)

G.8.7 Science and Technology Interdependence: *Show* evidence* of how science and technology are interdependent, using some examples drawn from personally conducted investigations*.*

5:

- Define technology.
- Describe how science and technology are **interdependent**

H. Science in Social and Personal Perspectives

CONTENT STANDARD H: Students in the Union Grove area schools will use scientific information and skills to make decisions about themselves, Wisconsin, and the world in which they live. Students should develop an understanding of personal health and science and technology in society.

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 environment, 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.

H.8.1 Evidence in Media: *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.*

- 5:**
- Analyze scientific evidence from various **media** sources or social issues.
 - Identify scientific and technological discoveries through discussion of current events.
 - Recognize what makes a source reliable.

H.8.2 Scientific Solution: *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.*

- 5:**
- Identify scientific problems and possible solutions.
 - Participate in class discussions regarding a local (school) environmental problem and **potential** solutions.
 - Participate in the practice of reaching a consensus regarding a scientific solution to a problem.

H.8.3 Consequences of Decisions on Health and Safety: *Understand* the consequences of decisions affecting personal health and safety.*

- 5:**
- Define consequences of decisions affecting personal health and safety (i.e., environmental consequences).
 - Identify choices and consequences regarding personal health and safety (i.e., DARE and guidance program).
 - Participate in the Science Safety Unit.