

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.4.1 **Science Themes:** When conducting science investigations*, *Ask and answer questions that will help decide the general areas of science being addressed.*

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- Understand how the following science themes can be applied to the natural world: measurement (weight, temperature), change (rock cycle), order (planetary order), energy (electricity), organization (properties of minerals), constancy (positive and negative charges, plant and animal needs), model (rock cycle), evidence (data), systems (digestive systems), interactions (magnetism, positive/negative charges), evolution (land form changes), **form** and **function** (plant and animal adaptations), **equilibrium** (phases of moon and tides).

A.4.2 **Applying Prior Knowledge:** When faced with a science-related problem, *Decide what evidence*, models*, or explanations* previously studied can be used to better understand* what is happening now.*

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- Decide what evidence, models, or explanations previously studied can be used to better understand what is happening now (i.e., our model and understanding of the solar system gives direction to those who are planning and developing our space program.)

A.4.3 **Collecting Data:** When investigating* a science-related problem, *Decide what data can be collected to determine the most useful explanations*.*

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- Decide what data will be important to collect when planning an investigation (i.e. parts of a circuit, plant growth, nutritional values).

A.4.4 **Connecting Themes:** When studying science-related problems, *Decide which of the science themes* are important.*

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- Recognize when measurement (weight, temperature), change (rock cycle), order (planetary order), energy (electricity), organization (properties of minerals), constancy (positive and negative charges, plant and animal needs), model (rock cycle), evidence (data), systems (digestive systems), interactions (magnetism, positive/negative charges), evolution (land form changes), **form** and **function** (plant and animal adaptations), and **equilibrium** (phases of moon and tides) themes apply.

A.4.5 **Change:** When studying a science-related problem, *Decide what changes* over time are occurring or have occurred.*

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- Identify things that change over time. (i.e. rock cycle, moon cycle, plant growth).

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.4.1 Using Sources: Use encyclopedias, source books, texts, computers, teachers, parents, other adults, journals, popular press, and various other sources, to help *Answer science-related questions and plan investigations.*

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- Use resources independently to answer science related questions and plan investigations (this benchmark can be emphasized anytime a student is expected to use resources).

B.4.2 Contributors to Science: *Acquire information about people who have contributed to the development of major ideas in the sciences and learn about the cultures in which these people lived and worked.*

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- Understand which individuals contributed to the topics being studied and the contributions they made.

B.4.3 Change in Scientific Knowledge: *Show* how the major developments of scientific knowledge in the earth and space, life and environmental, and physical sciences have changed over time.*

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- Recognize that there have been changes in scientific knowledge through classroom discussions. (i.e. agriculture - advances in production, space exploration - telescope vs. exploration of Mars, technology/communication - Pony Express vs. e-mail).

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.4.1 Language of Science: Use the vocabulary of the unifying themes* to *Ask questions about objects, organisms, and events being studied.*

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- Give examples of form, function and equilibrium in the topics being studied.

C.4.2 Using Science Content: Use the science content being learned to *Ask questions, plan investigations*, make observations*, make predictions*, and offer explanations*.*

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- Participate in the planning of an investigation, make predictions, make observations and offer explanations while solving science-related problems.

C.4.3 Using Information: Select multiple sources of information to help *Answer questions selected for classroom investigations**

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- Use technology to search (internet, CD-ROMs, etc.) for answers to questions.
- Use printed materials and audio-visual materials to answer questions.
- Evaluate resources to determine if the information being provided is correct (i.e. text that says there is no water on the moon).

C.4.4 Using Science Equipment: Use simple science equipment safely and effectively, including rulers, balances, graduated cylinders, hand lenses, thermometers, and computers, to *Collect data relevant to questions and investigations*.*

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- Use simple science equipment (balance scale, spring scale, hand lens, thermometer, graduated cylinder, standard and metric rulers, and computers) to collect data.
- Determine what science equipment is appropriate for use for a given science activity.

C.4.5 Using Data: Use data they have collected to *Develop explanations* and answer questions generated by investigations*.*

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- Use data gathered from nutrition labels to make decisions regarding the healthiness of special foods.
- Understand that data is used by scientists to develop explanations and answer questions.

C.4.6 Communicating Results: *Communicate the results of their investigations* in ways their audiences will understand by using* charts, graphs, drawings, written descriptions, and various other means, to display their answers.

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- Communicate the results of investigations by using age appropriate charts, graphs, drawings, verbal and written descriptions, and various other means, to display answers.

C.4.7 Supporting Conclusions: *Support their conclusions with logical arguments*

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- Independently support conclusions with logical arguments and explanations in verbal and written form.

C.4.8 **Further Questioning:** *Ask additional questions that might help focus or further an investigation**

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- Following an investigation, or when reviewing the investigative work of others, students will be able to generate additional questions that could be investigated further.

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 A 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.

Properties of Earth Materials

D.4.1 Physical and Chemical Properties: *Understand* that objects are made of more than one substance, by observing, describing and measuring the properties of earth materials, including properties of **size, weight, shape, color, temperature, and the ability to react with other substances.***

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- Use scientific tools to observe and measure earth materials.
- Collect, sort, and classify earth materials according to size, weight, shape and color. NC, WC, D

D.4.2 Grouping and Classifying: *Group* and/or classify objects and substances based on the properties of earth materials.*

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- Name properties of earth materials (rocks and minerals) that can be measured and described (hardness, weight, density, volume, mass).
- Classify objects according to their properties and give reasons for the groupings.

D.4.3 States of Matter: *Understand* that substances can exist in different states-**solid, liquid, gas.***

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D.4.4 Change: *Observe* and describe* changes* in form, **temperature, color, speed, and direction of objects** and construct* explanations* for the changes.*

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- Identify and describe a change related to temperature, color, speed or direction of travel within the scientific topics being studied.

D.4.5 Constructing Models of Change: *Construct* simple models* of what is happening to materials and substances undergoing change*, using simple instruments or tools to aid observations and collect data.*

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- Construct models that illustrate a substance undergoing changes.

Position and Motion of Objects

D.4.6 Objects at Rest or in Motion: *Observe* and describe* physical events in objects at rest or in motion.*

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D.4.7 Changes in Properties: *Observe* and describe* physical events involving objects and develop record-keeping systems to follow these events by measuring and describing changes in their properties, including position relative to another object, motion over time, and position due to forces.*

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- Observe and describe physical events involving objects and develop record-keeping systems to follow these events by measuring and describing changes in their properties, including position, relative to another object, motion over time and position due to forces.

Light, Heat, Electricity and Magnetism

D.4.8 **Differences in Substances:** *Ask questions and make observations to discover* the differences between substances that can be touched (matter) and substances that cannot be touched (forms of energy, light, heat, electricity, sound, and magnetism)*

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- Know that forms of matter can be touched and forms of energy cannot be touched and be able to give examples of both matter and energy.
- Explain the design of a simple electrical circuit and how it functions.

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 A 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.

Properties of Earth Materials

E.4.1 Rocks and Soils: *[Investigate **rocks, minerals, and soils** and use the scientific vocabulary for rocks, minerals and soils during these investigations.]* Investigate* that earth materials are composed of rocks and soils and correctly use the vocabulary for rocks, minerals, and soils during these investigations.

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- Describe differences between **metamorphic, igneous** and **sedimentary** rocks, identify examples of each and understand how they are formed.
- Understand that earth materials are composed of rocks and soils.
- Understand that rocks are made up of different combinations of minerals and give examples.

E.4.2 Physical and Chemical Properties of Earth Materials: *Show* that earth materials have different **physical and chemical properties**, including the properties of soils found in Wisconsin.*

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- Show that earth materials have different physical properties, including **cleavage, fracture, density, hardness, streak, luster**.
- Understand that earth materials undergo physical and chemical changes.

E.4.3 Describing the Earth: *Develop descriptions* of the **land and water masses** of the earth and of **Wisconsin's rocks and minerals**, using the common vocabulary of earth and space science.*

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- Be familiar with the land and water masses of Wisconsin. ✓
- Identify and describe Wisconsin's rocks and minerals. ✓
✓ In the WGSD these benchmarks are addressed in social studies.

Objects in the Sky

E.4.4 Celestial Objects: *Identify* celestial objects (**stars, sun, moon, planets**) in the sky, noting changes in patterns of those objects over time.*

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- Use a model to demonstrate how the earth moves around the sun (revolution, rotation, orbit, **axis**).
- Compare and contrast other planets with earth.
- Explain the relationship between the earth's rotation and night and day.

Changes in Earth and Sky

E.4.5 Wisconsin Weather: *Describe* the weather commonly found in Wisconsin in terms of **clouds, temperature, humidity, and forms of precipitation**, and the changes* that occur over time, including seasonal changes.*

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- Describe the seasonal changes in Wisconsin's weather. ✓
- Describe the weather in Wisconsin using terms like clouds, temperature, humidity and forms of precipitation. ✓
✓ In WGSD this benchmark is addressed in social studies.

E.4.6 **Earth Patterns and Cycles:** Using the science themes*, *Find patterns and cycles in **the earth's daily, yearly, and long-term changes****.

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- Explain the patterns that are taking place to cause daily (night and day) yearly (seasonal), and long term changes (glacial etc.) periods.

Use of Resources

E.4.7 **Use of Resources:** Using the science themes, *Describe* **resources used in the home, community, and nation as a whole**.*

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- Identify Wisconsin's natural resources and how they are used. ✓
✓ This benchmark is addressed in social studies.

E.4.8 **Human Resources:** *Illustrate* **resources humans use in mining, forestry, farming, and manufacturing in Wisconsin and elsewhere in the world**.*

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- Give examples of resources humans use in mining, forestry, farming, and manufacturing in WI and the world. ✓
✓ In the WGSD this benchmark is addressed in social studies.

F. Life and Environmental Sciences

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 A 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.

The Characteristics of Organisms

F.4.1 Survival Needs: *Discover* how each organism meets its **basic needs for water, nutrients, protection, and energy*** in order to survive.*

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- Explain how **adaptations** help organisms (plants and animals) meet their basic needs for water, **nutrients**, protection, and energy to survive.
- Understand the structure of the human digestive system and the functions of its parts.

F.4.2 Internal and External Cues: *Investigate* how organisms, especially plants, respond to **both internal cues (the need for water) and external cues (changes in the environment)***

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- Work as a group to plan plant-related investigations that illustrate the impact of internal and external cues.
- Understand how to design an investigation that includes the proper variables and controls.
- Understand that changes in the environment have different effects on different organisms.

Life Cycles of Organisms

F.4.3 Life Cycles of Organisms: *Illustrate* the different ways that **organisms grow through life stages and survive to produce new members of their type.***

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- Explain how plants progress through their life cycle (sprouting, growth and development, reproduction or death).
- Understand that reproduction is a characteristic of all living things.
- Identify the structures of plants (**stamen, pistil, etc.**), types of trees (**conifer, deciduous**) and way seeds are distributed.
- Describe the life cycle of a plant.

Organisms and Their Environment

F.4.4 Living and Non-living Things: *Using the science themes*, Develop explanations* for the **connections among living and non-living things in various environments.***

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- Describe ways that living things adapt to their environment. WGSD
- Give examples of connections between living and nonliving things in various environments.
- Understand that living organisms have distinct structures and body systems that serve specific functions in their growth and survival (digestive system).

F.4.5 Categorization of Living Things

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- Give examples of plant and animal categories and describe why the respective categories were grouped together.

G. Science Applications

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.4.1 Technology: *Identify* the technology used by someone employed in a job or position in Wisconsin and explain* how the technology helps.*

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- Explain how technology is used by people employed in Wisconsin and how technology has improved the Wisconsin workplace. ✓
✓ This benchmark is addressed in social studies.

G.4.2 Technology and Careers: *Discover* what changes in technology have occurred in a career chosen by a parent, grandparent, or an adult friend over a long period of time.*

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- Identify changes in technology that have occurred over time. ✓
✓ This benchmark is addressed in social studies.

G.4.3 Workplace Technology: *Determine what science discoveries have led to changes in technologies that are being used in the workplace by someone employed locally.*

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- Give an example of a scientific discovery that has lead changes in local workplaces. ✓
✓ This benchmark is addressed in social studies.

G.4.4 Simple Machines: *Identify* the combinations of simple machines in a device used in the home, the workplace, or elsewhere in the community, to make or repair things, or to move goods or people*

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G.4.5 Invention and Production: *Ask questions to find answers about how devices and machines were invented and produced.*

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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 the role of science and technology in local challenges.

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.4.1 Progress Through Science and Technology: *Describe* how science and technology have helped, and in some cases hindered, progress in providing better food, more rapid information, quicker and safer transportation, and more effective health care.*

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- Give examples of how technology has helped and hindered progress.

H.4.2 Science and Issues/Problems: *Using the science themes*, Identify* local and state issues that are helped by science and technology and explain* how science and technology can also cause a problem.*

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- Identify local and state issues that have been helped and hindered by science and technology.

H.4.3 Science and Personal Needs: *Show* how science has contributed to meeting personal needs, including hygiene, nutrition, exercise, safety, and health care.*

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- Give examples of how science has contributed to meeting personal needs, hygiene, nutrition, exercise, safety, and health care.

H.4.4 Science and Decision Making: *Develop* a list of issues that citizens must make decisions about and describe* a strategy for becoming informed about the science behind these issues.*

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- List science-related issues that citizens must make decisions about and strategies for becoming informed about the science behind those issues (i.e. mining issues).
This benchmark is also addressed in social studies (i.e. government, lumbering).