

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, change** (plant cycle, states of matter), **order** (patterning), **energy** (push and pull), **organization** (animal families/types, properties of rocks, sequencing), **constancy** (day and night), **model** (globe), **evidence** (observations), and **explanation** with teacher guidance.

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, observations, or previous experiences can be used to better understand what is happening now. (i.e. how simple machines help us improve our daily lives or make work easier).

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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- Work as a group to determine what data to collect when seeking an answer to a specific question. (i.e. food choices, weather, birthdays, lost teeth, favorites).

A.4.4 **Connecting Themes:** When studying science-related problems, *Decide which of the science themes* are important.*¹

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- Recognize when **measurement, change** (plant cycle, states of matter), **order** (patterning), **energy** (push and pull), **organization** (animal families/types, properties of rocks, sequencing), **constancy** (day follows night), **model** (globe), **evidence** (observations) and **explanation** 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. caterpillars to butterflies, seeds to plants, baby to adult, formation and weathering of rocks).

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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- Begin to transition from teacher guided to independent use of resources (i.e. books, web sites, videos, periodicals, encyclopedias, games/kits etc.)
- Work as a group to plan investigations.
- Participate in teacher guided investigations.
- Recognize that learning can come from careful observations and simple experiments.

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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- Learn about scientific contributors by sharing science-related current events from magazines, newspapers, television and hearing others talking about events. (George Washington Carver)
- Understand that in science it is helpful to work with a team and share your findings with others.

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 that have improved and influenced our lives (i.e. improved dental hygiene, environmental issues, fitness, medicine, Columbus [flat vs. round earth]).

B.4.4

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- Know that the same scientific investigations generally work the same way in different places and normally produce results that are the same.

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 an understanding of science as a human endeavor.

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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- Work as a group to identify examples of order, organization, form and function and equilibrium while studying grade level science topics (i.e. animal families - order and organization; animal structure - form and function; and plants and animals depending on each other - equilibrium).

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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- Work as a group to plan an investigation, record observations, make predictions and develop explanations. The focus could be on seasonal changes, states of matter, or plant growth.

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

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- Use printed materials, audio-visual materials and observations to answer questions related to science topics.
- Use technology to search (internet, CD-ROMs, etc.) for answers to questions.

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, hand lens, **thermometer, standard and metric rulers, and computers**) to collect data.
- Work as a group to determine what science equipment is necessary for an activity.

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

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- Work as a group to use weather data that has been graphed to develop explanations about weather patterns and seasonal changes.
- Work as a group to use data from a wind-related investigation to tell why certain objects move farther in the wind. (Huff and Puff activity.) WGSD
- Work as a group to use data to explain changes in the states of matter (Spaghetti Diver activity). WGSD

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 their answers.

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

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- Practice supporting conclusions with logical arguments.

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

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- Following an investigation, students will work as a group to develop 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.

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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- Collect, **sort**, and **classify** earth materials according to the **properties** of size, weight, shape, and color.
- Use equipment (e.g., **rulers, balances, and hand/magnifying lenses**) to collect information and make observations about earth materials.
- Know that objects are made up of many different types of materials and have many different observable properties.

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

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- Classify objects according to properties.

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

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- Identify and describe solids, liquids and **gases**.
- Identify three states of water.
- Know that water can be changed from a solid to a liquid and a gas and the amount of material remains the same.

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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- Observe, describe, and explain changes associated with seasons (temperature changes and changes in plants).

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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- Draw a picture or make a model to explain substances undergoing physical changes (i.e. water in 3 states of matter).

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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- Identify when an object is **in motion** or **at rest**.
- Explain the difference between **pushing** and **pulling** an object.
- Know that the position and motion of an object can change by pushing or pulling the object.

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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- Measure the **distance** an object has traveled, using a predetermined unit (i.e., simple machines use inclined planes of various heights to affect an object's speed).

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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- Identify substances that can be touched (i.e. five senses unit) and describe the substance.
- Work as a group to identify the human senses that could be used to identify differences in substances.

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.

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 the characteristics of **rocks** and **soil**.
- Describe the physical **properties** of a rock using the terms color, size, shape, texture, hardness, shiny, dull.
- Know that rocks come in many different shapes and sizes.

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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- Identify earth materials (rocks, soil, water, air).
- Describe differences between several earth materials (**rocks, water, soil**).
- Group rocks and minerals based on their properties.

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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- Explain the basic differences between bodies of water (**pond, lake, river, ocean**).
- Know that the earth is made up of land (mountains, plains and valleys) and water (ponds, lakes, rivers and oceans)

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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- Illustrate pictures of the sun, moon, and stars.√
 - Describe differences between day and night. √
- √ This benchmark is addressed in social studies.

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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- Collect data related to daily temperature, precipitation (snow, rain, **stormy**), and degree of cloudiness (cloudy, sunny, **partly cloudy**) and graph the data.
- Describe how the weather changes from **season** to season.

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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- Identify daily changes (light and dark) and **seasonal** changes in Wisconsin (i.e. calendar).

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 resources used by plants and animals to live. ✓
- Compare the needs of animals and plants to the needs of people. ✓
✓ 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 for farming ✓ (**Soil, water, fertilizer**).
✓ 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.

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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- Identify the functions of the human heart, bones and muscles.
- Describe the basic needs of plants and animals (e.g., air, water, nutrients, light or food, shelter).
- Describe the needs of plants and animals and how they differ.
- Know that plants and animals have characteristics that help them live in different environments.

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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- Observe the growth of a seed to a plant and illustrate the changes that take place with a drawing.
- Recognize that humans grow and change as they mature.
- Know that plants and animals need resources for energy and growth.

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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- Recognize that animals and plants closely resemble their parents.
- Give examples of adult animals and their offspring (i.e. calf & cow, piglet & sow).
- Describe life stages/life cycles that animals go through (i.e. caterpillar to butterfly, tadpole to frog).

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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- Identify differences between living and nonliving things.
- Know that living things eat and grow.
- Know that non-living things do not eat, move or grow.
- Be able to tell living and non-living things apart.

F.4.5 Categorization of Living Things

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- Know that there are similarities and differences in the appearance and behavior of plants and animals.
- Be able to put plants in groups by what they have in common.

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. Students should develop an understanding of personal health and the role of science and technology in local challenges.

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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- Give examples of tools that people use to do their jobs. √
√ 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 tools that are used in different careers. √
√ 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 how technology has changed the workplace. √
√ 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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- Identify **simple machines** and how they work (i.e. lever, inclined plane, pulley, wheel and axle, gears)
- Give examples of simple machines that assist us in the workplace.

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

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- Benchmarks begin at grade 3.

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.

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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- Describe changes in how people get food (farm unit) and health care (nutrition and dental health/social studies) today as compared to the past.

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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- Work as a group to identify how science and technology have affected different types of local and state issues (i.e. pollution, discoveries, environmental issues, etc.).

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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- Work as a group to identify examples of how our personal needs have benefited from 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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- (Benchmarks begin at grade 2).