

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: (weather), order (rock cycle), organization (rock and mineral classification, periodic table), and interactions (air and water); evidence (data), models (weather maps) and explanations (lab conclusions); constancy (seasons), change (river systems, weather, plate tectonics,) and measurement (mass, volume, density); evolution (weathering, aging of rivers, and rock cycle), equilibrium (acids and bases), and energy (geothermal), form (types of clouds) and function (clouds with certain forms generally result in rainfall).

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.*

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- Describe limitations of science systems and give reasons why specific science themes are included in or excluded from those systems (i.e., collecting data at ocean depths may 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.*

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- Explain the characteristics of a good explanation (use supporting evidence) and why models are used (i.e., economical and practical, less dangerous).
- Give examples of when using a model is a disadvantage.

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.*

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- Collect evidence to show that models developed as explanations for events were (and are) based on the evidence available to scientists at the time (i.e., atomic structure, continental drift). WGSD, WC, D, NC

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).*

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- 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.*

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- Use models and/or explanations to predict actions and events in the natural world, (i.e., stream table, glacial deposits, and weather patterns on society).

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

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- Work as a group to identify the usefulness and limitations of a model (i.e., discuss limitations of solar system model, groundwater model, stream table and earthquake waves (slinky). NC, D

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. global warming and effects on coastlines, effects of weathering/erosion on landforms.)

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.*

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- This standard is not addressed at this grade level.

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.*

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- This standard is not addressed at this grade level.

B.8.3 Rules of Science: *Explain* how the general rules of science apply to the development and use of evidence* in science investigations, model*-making, and applications*.*

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- 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.*

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- Provide examples of non-scientific reasoning 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.*

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- Know that much of today's scientific knowledge is based on previous scientific ideas that have changed over time (i.e., plate tectonics).

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.*

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- This standard is not addressed at this grade level.

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.
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- Before and after conducting an experiment in class, the students will identify questions that they have about the topic.

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

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- Use the data collected during investigations to develop conclusions and report findings.

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

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- This standard is not addressed at this grade level.

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

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- Hypothesize and then use data to determine the validity of an hypothesis.

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

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- This standard is not addressed at this grade level.

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.*

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- The students will respond back to the purpose statements of the investigation and explain how purposes were met and knowledge gained.

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.*

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- Use charts, graphs, spreadsheets, models, display boards to explain data and conclusions in a way that will allow an audience to understand the questions that were selected for investigation and the answers that were developed.

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

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- 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*.*

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- Evaluate, share, explain, 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.*

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- Discuss the importance of data collected from investigations and its implications in real life situations.

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

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- 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.

Properties and Changes of Properties in Matter

D.8.1 Physical and Chemical Properties: *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.***

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- This standard is not addressed at this grade level.

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.*

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- This standard is not addressed at this grade level.

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

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- This standard is not addressed at this grade level.

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

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- This standard is not addressed at this grade level.

Motions and Forces

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

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- 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.*

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- 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.*

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- This standard is not addressed at this grade level.

Transfer of Energy

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.*

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- This standard is not addressed at this grade level.

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.

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- This standard is not addressed at this grade level.

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.

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- This standard is not addressed at this grade level.

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.

Structures of the Earth System

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

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- This standard is not addressed at this grade level.

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

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- This standard is not addressed at this grade level.

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.*

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- This standard is not addressed at this grade level.

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.*

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- This standard is not addressed at this grade level.

Earth's History

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.*

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- This standard is not addressed at this grade level.

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.*

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- This standard is not addressed at this grade level.

Earth in the Solar System

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.*

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- This standard is not addressed at this grade level.

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.*

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- This standard is not addressed at this grade level.

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.

Structure and Function in Living Things

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

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- This standard is not addressed at this grade level.

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.*

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- This standard is not addressed at this grade level.

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.*

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- This standard is not addressed at this grade level.

Reproduction and Heredity

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.*

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- 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.*

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- This standard is not addressed at this grade level.

Regulation and Behavior

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

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- This standard is not addressed at this grade level.

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

8:

- This standard is not addressed at this grade level.

Populations and Ecosystems

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.*

8:

- This standard is not addressed at this grade level.

Diversity and Adaptations of Organisms

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.*

8:

- Identify local and global changes on the earth which have affected various species.

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.*

8:

- This standard is not addressed at this grade level.
- Study the living and non-living characteristics of the local environments.

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.*

8:

- Identify course work at the high school and college level required for specific careers in science.

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.*

8:

- Explain 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).
- Discuss and analyze ethical issues related to scientific and technological discoveries as they relate to new and evolving careers.

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.*

8:

- 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.*

8:

- This standard is not addressed at this grade level.

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.*

8:

- Identify local scientific or technological problems and their solutions and explain processes (methods) by which problems were solved.
- Analyze solutions and problems associated with the solutions. (i.e., agriculture, commercial, residential, recreation, landfill, reclamation.)

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.*

8:

- 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, Global Positioning System, 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*.*

8:

- Describe how science and technology are interdependent by citing examples and explaining the link between technology and science.

G.8.8 Understanding the Scientific Enterprise

8:

- Knows that people of all backgrounds and with diverse interests, talents, qualities and motivations engage in fields of science and engineering; some of these people work in teams and others work alone, but all communicate extensively with others.
- Knows that the work of science requires a variety of human abilities, qualities and habits of mind (e.g., reasoning, insight, energy, skill, creativity, intellectual honesty, tolerance of ambiguity, skepticism, openness to new ideas).
- Knows various settings in which scientists and engineers may work (e.g., colleges and universities, businesses and industries, research institutes, government agencies).
- Understands ethics associated with scientific study (e.g., potential subjects must be fully informed of the risks and benefits associated with the research and their right to refuse to participate; potential subjects must be fully informed of possible risks to community and property).
- Knows that throughout history, many scientific innovators have had difficulty breaking through accepted ideas of their time to reach conclusions that are now considered to be common knowledge.
- Knows ways in which science and society influence one another (e.g., scientific knowledge and the procedures used by scientists influence the way many individuals think about themselves, others and the environment; societal challenges often inspire questions for scientific research; social and economic forces strongly influence which science research programs are pursued and funded).

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.*

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- Analyze, and discuss scientific evidence from various media sources, for accuracy, logic, bias, relevance of data, and credibility of sources.
- Identify scientific and technological discoveries through discussion of current events.
- Understand and identify 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.*

8:

- Identify scientific problems and possible solutions.
- Participate in group discussions regarding problems and solutions of an environmental issue.
- Debate or discuss in small group or as a class the pros and cons of an environmental solution, backing up opinions with research and data, and reaching group consensus (i.e., watershed, development and construction).

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

8:

- Participate in the Science Safety Unit.
 - Identify safety issues associated with various careers.