

Ohio Academic Content Standards
The Mill Creek Restoration Project Environmental Education Program
Science, Social Studies and Math

Sixth Grade

Life Sciences (LS)

6.3 Identify how plant cells differ from animal cells (e.g., cell wall and chloroplasts).

Physical Sciences (PS)

6.2 Describe that in a chemical change new substances are formed with different properties than the original substance (e.g., rusting, burning).

6.3 Describe that in a physical change (e.g., state, shape and size) the chemical properties of a substance remain unchanged.

6.4 Describe that chemical and physical changes occur all around us (e.g., in the human body, cooking and industry).

6.5 Explain that the energy found in nonrenewable resources such as fossil fuels (e.g., oil, coal and natural gas) originally came from the sun and may renew slowly over millions of years.

6.6 Explain that energy derived from renewable resources such as wind and water is assumed to be available indefinitely.

Science and Technology (ST)

6.1 Explain how technology influences the quality of life.

6.2 Explain how decisions about the use of products and systems can result in desirable or undesirable consequences (e.g., social and environmental).

6.5 Design and build a product or create a solution to a problem given one constraint (e.g., limits of cost and time for design and production, supply of materials and environmental effects).

Scientific Inquiry (SI)

6.2 Choose the appropriate tools or instruments and use relevant safety procedures to complete scientific investigations.

6.3 Distinguish between observation and inference.

6.4 Explain that a single example can never prove that something is always correct, but sometimes a single example can disprove something.

Scientific Ways of Knowing (SWK)

6.1 Identify that hypotheses are valuable even when they are not supported.

6.2 Describe why it is important to keep clear, thorough and accurate records.

6.3 Identify ways scientific thinking is helpful in a variety of everyday settings.

6.4 Describe how the pursuit of scientific knowledge is beneficial for any career and for daily life.

Geography (GEO)

6.5 Describe ways human settlements and activities are influenced by environmental factors and processes in different places and regions including: Bodies of water; Vegetation.

6.7 Describe ways humans depend on and modify the environment and the positive and negative consequences of the modifications including: Dam building; urban growth.

Social Studies Skills and Methods (SM)

6.7 Work effectively to achieve group goals: Engage in active listening; provide feedback in a constructive manner; help establish group goals; take various roles within the group; recognize contributions of others.

Seventh Grade**Earth and Space Sciences (ESS)**

7.1 Explain the biogeochemical cycles which move materials between the lithosphere (land), hydrosphere (water) and atmosphere (air).

7.2 Explain that Earth's capacity to absorb and recycle materials naturally (e.g., smoke, smog and sewage) can change the environmental quality depending on the length of time involved (e.g. global warming).

7.3 Describe the water cycle and explain the transfer of energy between the atmosphere and hydrosphere.

7.4 Analyze data on the availability of fresh water that is essential for life and for most industrial and agricultural processes. Describe how rivers, lakes and groundwater can be depleted or polluted becoming less hospitable to life and even becoming unavailable or unsuitable for life.

7.8 Describe how temperature and precipitation determine climatic zones (biomes) (e.g., desert, grasslands, forests, tundra and alpine).

Life Sciences (LS)

7.1 Investigate the great variety of body plans and internal structure found in multicellular organisms.

7.3 Explain how the number of organisms an ecosystem can support depends on adequate biotic (living) resources (e.g., plants, animals) and abiotic (non-living) resources (e.g., light, water and soil).

7.4 Investigate how overpopulation impacts an ecosystem.

7.5 Explain that some environmental changes occur slowly while others occur rapidly (e.g., forest and pond succession, fires and decomposition).

7.6 Summarize the ways that natural occurrences and human activity affect the transfer of energy in Earth's ecosystems (e.g., fire, hurricanes, roads and oil spills).

7.7 Explain that photosynthetic cells convert solar energy into chemical energy that is used to carry on life functions or is transferred to consumers and used to carry on their life functions.

Science and Technology (ST)

7.1 Explain how needs, attitudes and values influence the direction of technological development in various cultures.

7.2 Describe how decisions to develop and use technologies often put environmental and economic concerns in direct competition with each other.

7.3 Recognize that science can only answer some questions and technology can only solve some human problems.

Scientific Inquiry (SI)

7.1 Explain that variable and controls can affect the results of an investigation and that ideally one variable should be tested at a time; however it is not always possible to control all variables.

7.2 Identify simple independent and dependent variables.

7.3 Formulate and identify questions to guide scientific investigations that connect to science concepts and can be answered through scientific investigations.

7.4 Choose the appropriate tools and instruments and use relevant safety procedures to complete scientific investigations.

7.5 Analyze alternative scientific explanations and predictions and recognize that there may be more than one good way to interpret a given set of data.

7.6 Identify faulty reasoning and statements that go beyond the evidence or misinterpret the evidence.

7.7 Use graphs, tables and charts to study physical phenomena and infer mathematical relationships between variables (e.g., speed and density).

Scientific Ways of Knowing (SWK)

7.1 Show that the reproducibility of results is essential to reduce bias in scientific investigations.

7.2 Describe how repetition of an experiment may reduce bias.

7.3 Describe how the work of science requires a variety of human abilities and qualities that are helpful in daily life (e.g., reasoning, creativity, skepticism and openness).

Geography (GEO)

7.3 Describe changes in the physical and human characteristics of regions that occur over time and identify the consequences of such changes.

Social Studies Skills and Methods (SM)

7.3 Establish guidelines, rules and time lines for group work.

7.4 Reflect on performance of a classroom group in which one has participated including the contribution of each member in reaching group goals.

Eighth Grade

Science and Technology (ST)

8.2 Examine how choices regarding the use of technology are influenced by constraints caused by various unavoidable factors (e.g., geographic location, limited resources, social, political and economic considerations).

8.3 Design and build a product or create a solution to a problem given more than two constraints (e.g., limits of cost and time for design and production, supply of materials and environmental effects).

8.4 Evaluate the overall effectiveness of a product design or solution.

Scientific Inquiry (SI)

8.1 Choose the appropriate tools or instruments and use relevant safety procedures to complete scientific investigations.

8.2 Describe the concepts of sample size and control and explain how these affect scientific investigations.

8.3 Read, construct and interpret data in various forms produced by self and others in both written and oral form (e.g., tables charts, maps graphs, diagrams and symbols).

8.4 Apply appropriate math skills to interpret quantitative data (e.g., mean, median and mode).

Scientific Ways of Knowing (SWK)

8.1 Identify the difference between description (e.g., observation and summary) and explanation (e.g., inference, prediction, significance and importance).

8.2 Explain why it is important to examine data objectively and not let bias affect observations.

History (HIS)

8.2d Describe the political, religious and economic aspects of North American colonization including: d. Indentured servitude and the introduction and institutionalization of slavery.

8.9e Explain causes of the Civil War with emphasis on: The abolitionist movement and the roles of Frederick Douglass and John Brown.

People in Societies (PS)

8.2 Describe and explain the social, economic and political effects of: Stereotyping and prejudice; racism and discrimination; institutionalized racism and institutionalized discrimination.

8.4 Analyze the economic, geographic, religious and political factors that contributed to: the enslavement of Africans in North America; resistance to slavery.

Citizenship Rights and Responsibilities (CRR)

8.1 Show the relationship between participating in civic and political life and the attainment of individual and public goals including: the Underground Railroad and the abolitionist movement/abolition of slavery.

Social Studies Skills and Methods (SM)

8.4 Organize and lead a discussion.

8.5 Identify ways to manage conflict within a group.

Ninth Grade**Physical Sciences (PS)**

9.8 Demonstrate that the pH scale (0-14) is used to measure acidity and classify substances or solutions as acidic, basic, or neutral.

Science and Technology (ST)

9.2 Identify a problem or need, propose designs and choose among alternative solutions for the problem.

Scientific Inquiry (SI)

9.1 Distinguish between observations and inferences given a scientific situation.

9.2 Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g., OSHA, Material Safety Data Sheets [MSDS], eyewash, goggles and ventilation).

9.4 Decide what degree of precision based on the data is adequate and round off the results of calculator operations to the proper number of significant figures to reasonably reflect those of the inputs.

9.5 Develop oral and written presentations using clear language, accurate data, appropriate graphs, tables, maps and available technology.

9.6 Draw logical conclusions based on scientific knowledge and evidence from investigations.

Scientific Ways of Knowing (SWK)

9.4 Explain how support of ethical practices in science (e.g., individual observations and confirmations, accurate reporting, peer review and publication) are required to reduce bias.

9.9 Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue.

People in Societies (PS)

9.2 Analyze the results of political, economic, and social oppression and the violation of human rights including: the exploitation of indigenous peoples; the Holocaust and other acts of genocide, including those that have occurred in Armenia, Rwanda, Bosnia and Iraq.

Geography (GEO)

9.4 Explain the causes and consequences of urbanization including economic development, population growth and environmental change.

9.5 Analyze the social, political, economic and environmental factors that have contributed to human migration now and in the past.

Citizenship Rights and Responsibilities (CRR)

9.1b Analyze and evaluate the influence of various forms of citizen action on public policy including: b. the international movement to abolish the slave trade and slavery.

Social Studies Skills and Methods (SM)

9.4 Develop and present a research project including: collection of data; narrowing and refining a topic; construction and support of the thesis.

Tenth Grade

Earth and Space Sciences

10.5 Explain how the acquisition and use of resources, urban growth and waste disposal can accelerate natural change and impact the quality of life.

10.6 Describe ways that human activity can alter biogeochemical cycles (e.g., carbon and nitrogen cycles) as well as food webs and energy pyramids (e.g., pest control, legume rotation crops vs. chemical fertilizers).

Life Sciences (LS)

10.16 Relate how distribution and abundance of organisms and populations in ecosystems are limited by the ability of the ecosystem to recycle materials and the availability of matter, space and energy.

10.18 Describe ways that human activities can deliberately or inadvertently alter the equilibrium in ecosystems. Explain how changes in technology/biotechnology can cause significant changes, either positive or negative, in environmental quality and carrying capacity.

10.19 Illustrate how uses of resources at local, state, regional, national, and global levels have affected the quality of life (e.g., energy production and sustainable vs. nonsustainable agriculture).

10.28 Analyze and investigate emerging scientific issues (e.g., genetically modified food, stem cell research, genetic research and cloning).

Science and Technology (ST)

10.2 Describe examples of scientific advance and emerging technologies and how they may impact society.

10.3 Explain that when evaluating a design for a device or process, thought should be given to how it will be manufactured, operated, maintained, replaced and disposed of in addition to who will sell, operate and take care of it. Explain how the costs associated with these considerations may introduce additional constraints on the design.

Scientific Inquiry (SI)

10.1 Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g. OSHA, MSDS, eyewash, goggles and ventilation).

10.2 Present scientific findings using clear language, accurate data, appropriate graphs, tables, maps and available technology.

Scientific Ways of Knowing (SWK)

10.7 Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue.

Eleventh Grade

Earth and Space Sciences (ESS)

11.12 Explain ways in which humans have had a major effect on other species (e.g., the influence of humans on other organisms occurs through land use, which decreases space available to other species and pollution, which changes the chemical composition of air, soil and water).

11.13 Explain how human behavior affects the basic processes of natural ecosystems and the quality of the atmosphere, hydrosphere and lithosphere.

Life Sciences (LS)

11.5 Investigate the impact on the structure and stability of ecosystems due to changes in their biotic and abiotic components as a result of human activity.

11.6 Predict some possible impacts on an ecosystem with the introduction of a non-native species.

11.9 Give examples of how human activity can accelerate rates of natural change and can have unforeseen consequences.

11.11 Investigate issues of environmental quality at local, regional, national and global levels such as population growth, resource use, population distribution, over-consumption, the capacity of technology to solve problems, poverty, the role of economics, politics and different ways humans view the earth.

11.12 Recognize that ecosystems change when significant climate changes occur or when one or more new species appear as a result of immigration or speciation.

Scientific Inquiry (SI)

11.3 Design and carry out scientific inquiry (investigation), communicate and critique results through peer review.

11.5 Summarize data and construct a reasonable argument based on those data and other known information.

Scientific Ways of Knowing (SWK)

11.11 Research the role of science and technology in careers that students plan to pursue.

Geography (GEO)

11.1 Explain how government decisions reflect a society's values about land use (e.g., zoning, park development or toxic waste disposal).

11.3 Compare and evaluate alternative public policies for the use of land and natural resources at all levels of government.

Twelfth Grade**Life Sciences (LS)**

12.3 Explain that the sun is essentially the primary source of energy for life. Plants capture energy by absorbing light and using it to form strong (covalent) chemical bonds between the atoms of carbon-containing (organic) molecules.

12.8 Based on the structure and stability of ecosystems and their nonliving components, predict the biotic and abiotic changes in such systems when disturbed (e.g. introduction of non-native species, climatic change, etc.)

Science and Technology (ST)

12.3 Research how scientific inquiry is driven by the desire to understand the natural world and how technological design is driven by the need to meet human needs and solve human problems.

Scientific Inquiry (SI)

12.3 Research and apply appropriate safety precautions when designing and / or conducting scientific investigations (e.g., OSHA, MSDS, eyewash, goggles and ventilation).

12.5 Use appropriate summary statistics to analyze and describe data.

Geography (GEO)

12.1 Explain how people create places that reflect culture, human needs, government policy, current values and ideals as they design and build specialized buildings, neighborhoods, shopping centers, urban centers and industrial parks.

12.4 Use appropriate data sources and tools to gather, manipulate, interpret and communicate geographic information related to civic/global issues.

Social Studies Skills and Methods (SM)

12.4 Develop a research project and make formal presentations to the class and / or community members using: key terms; support for main ideas; examples; statistics and other evidence; visual aids; formal citation of sources.

12.6 Build consensus within a group by: finding points of agreement; identifying points individuals are willing to concede; making sure that all voices are heard; attempting to understand the view of others.

Mathematics Benchmarks Grade 5-12**Number, Number Sense and Operations (NNSO)**

5-7 B Compare, order and convert among fractions, decimals and percents.

8-10 G Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.

Measurement (MEAS)

5-7 D Select a tool and measure accurately to a specified level of precision.

5-7 E Use problem solving techniques and technology as needed to solve problems involving length, weight, perimeter, area, volume, time and temperature.

8-10 B Use formulas to find surface area and volume for specified three-dimensional objects accurate to a specified level of precision.

Data Analysis and Probability (DAP)

5-7 B Interpret data by looking for patterns and relationships, draw and justify conclusions, and answer related questions.

5-7 E Collect, organize, display and interpret data for a specific purpose or need.

5-7 F Determine and use the range, mean, median and mode to analyze and compare data, and explain what each indicates about the data.

8-10 C Compare the characteristics of the mean, median and mode for a given set of data, and explain which measure of center best represents the data.

8-10 F Construct convincing arguments based on analysis of data and interpretation of graphs.

11-12 C Design and perform a statistical experiment, simulation or study; collect and interpret data; and use descriptive statistics to communicate and support predictions and conclusions.

Mathematical Processes (MP)

5-7 D Recognize whether an estimate or an exact solution is appropriate for a given problem situation.

5-7 I Select, apply and translate among mathematical representations to solve problems; e.g., representing a number as a fraction, decimal or percent as appropriate for a problem.

5-7 K Recognize and use mathematical language and symbols when reading, writing and conversing with others.

8-10 B Apply mathematical knowledge and skills routinely in other content areas and practical situations.

11-12 I Communicate mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience.