

# Norton City Schools Standards-Based Science Course of Study

## FOURTH GRADE

**NATURE OF SCIENCE-These scientific process skills should be integrated into the following grade level content units.**

**Science and Technology Standard (ST)**

**Scientific Inquiry Standard (SI)**

**Scientific Ways of Knowing Standard (SK)**

3-5 Benchmarks	Grade Level Indicators And Sub-Objectives	Teaching Strategies/Resources
<p>By the end of the 3-5 program the student will:</p> <p><b><u>Science and Technology</u></b></p> <ul style="list-style-type: none"> <li>★ Describe how technology affects human life. (ST-A)</li> <li>★ Describe and illustrate the design process. (ST-B)</li> </ul> <p><b><u>Scientific Inquiry</u></b></p> <ul style="list-style-type: none"> <li>★ Use appropriate instruments safely to observe, measure and collect data when conducting a scientific investigation. (SI-A)</li> <li>★ Organize and evaluate observations, measurements and other data to formulate inferences and conclusions. (SI-B)</li> <li>★ Develop, design and safely conduct scientific investigations and communicate the results. (SI-C)</li> </ul>	<p>By the end of Fourth Grade, the student will:</p> <p><b><u>Understanding Technology</u></b></p> <ul style="list-style-type: none"> <li>★ Explain how technology from different areas (e.g., transportation, communication, nutrition, healthcare, agriculture, entertainment and manufacturing) has improved human lives. (ST-4-1)</li> <li>★ Investigate how technology and inventions change to meet peoples' needs and wants. (ST-4-2)</li> </ul> <p><b><u>Abilities To Do Technological Design</u></b></p> <ul style="list-style-type: none"> <li>★ Describe, illustrate and evaluate the design process used to solve a problem. (ST-4-3)</li> </ul> <p><b><u>Doing Scientific Inquiry</u></b></p> <ul style="list-style-type: none"> <li>★ Select the appropriate tools and use relevant safety procedures to measure and record length, weight, volume, temperature and area in metric and English units. (SI-4-1)</li> <li>★ Analyze a series of events and/or simple daily or seasonal cycles, describe the patterns and infer the next likely occurrence. (SI-4-2)</li> <li>★ Develop, design and conduct safe, simple investigations or experiments to answer questions. (SI-4-3)</li> <li>★ Explain the importance of keeping conditions the same in an experiment. (SI-4-4)</li> <li>★ Describe how comparisons may not be fair when some conditions are</li> </ul>	

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<p><b><u>Scientific Ways of Knowing</u></b></p> <ul style="list-style-type: none"> <li>★ Distinguish between fact and opinion and explain how ideas and conclusions change as new knowledge is gained. (SK-A)</li> <li>★ Describe different types of investigations and use results and data from investigations to provide the evidence to support explanations and conclusions. (SK-B)</li> <li>★ Explain the importance of keeping records of observations and investigations that are accurate and understandable. (SK-C)</li> <li>★ Explain that men and women of diverse countries and cultures participate in careers in all fields of science. (SK-D)</li> </ul>	<p>not kept the same between experiments. (SI-4-5)</p> <ul style="list-style-type: none"> <li>★ Formulate instructions and communicate data in a manner that allows others to understand and repeat an investigation or experiment. (SI-4-6)</li> </ul> <p><b><u>Nature of Science</u></b></p> <ul style="list-style-type: none"> <li>★ Differentiate fact from opinion and explain that scientists do not rely on claims or conclusions unless they are backed by observations that can be confirmed. (SK-4-1)</li> <li>★ Record the results and data from an investigation and make a reasonable explanation. (SK-4-2)</li> <li>★ Explain discrepancies in an investigation using evidence to support findings. (SK-4-3)</li> </ul> <p><b><u>Ethical Practices</u></b></p> <ul style="list-style-type: none"> <li>★ Explain why keeping records of observations and investigations are important. (SK-4-4)</li> </ul>	
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### EARTH'S CHANGING SURFACE

#### Earth and Space Sciences Standard (ES)

3-5 Benchmarks	Grade Level Indicators and Sub-Objectives	Teaching Strategies/Resources
<p>By the end of the K-5 program, the student will:</p> <p><b><u>Earth and Space Sciences</u></b></p> <ul style="list-style-type: none"> <li>★ Summarize the processes that shape Earth's surface and describe evidence of those processes. (ES-B)</li> <li>★ Describe Earth's resources including rocks, soil, water, air, animals and plants and the ways in which they can be conserved. (ES-C)</li> </ul>	<p>By the end of Fourth Grade, the student will:</p> <p><b><u>Earth Systems</u></b></p> <ul style="list-style-type: none"> <li>★ Describe how wind, water and ice shape and reshape Earth's land surface by eroding rock and soil in some areas and depositing them in other areas producing characteristic landforms (e.g., dunes, deltas and glacial moraines). (ES-4-8)</li> <li>★ Identify and describe how freezing, thawing and plant growth reshape the land surface by causing the weathering of rock. (ES-4-9)</li> <li>★ Describe evidence of changes on Earth's surface in terms of slow processes (e.g., erosion, weathering, mountain building and deposition) and rapid processes (e.g., volcanic eruptions, earthquakes and landslides). (ES-4-10)</li> </ul> <p><b><u>Sub-Objectives to Meet Indicators:</u></b></p> <ul style="list-style-type: none"> <li>• Diagram and describe the characteristics of the layers of the earth.</li> <li>• Compare and contrast how sedimentary, metamorphic, and igneous rocks are formed, i.e., the rock cycle.</li> <li>• Compare and contrast physical (e.g., roots, freezing/thawing, etc.) and chemical weathering (e.g., acid rain, oxidation/rusting, etc.).</li> <li>• Compare and contrast the causes of changes in the earth's surface; including:               <ul style="list-style-type: none"> <li>◦ Wind</li> <li>◦ Water</li> <li>◦ Glaciers</li> <li>◦ Gravity</li> </ul> </li> </ul>	

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	<ul style="list-style-type: none"><li>◦ Plant or animal activity (e.g., farming, overgrazing, earthworm activity, plant roots, etc.)</li><li>• Identify evidence of changes in the earth’s surface from analyzing:<ul style="list-style-type: none"><li>◦ “Before and after” illustrations of the earth’s surface</li><li>◦ Descriptions of events that would cause erosion, deposition, change in position, or other changes</li><li>◦ Fossil record</li></ul></li><li>• Observe and identify the effects of weathering, erosion, and geological activity in their immediate world (e.g., buildings, sidewalks, cemeteries, playgrounds, etc.) as well as in the reports of events such as storms, floods, droughts, or earthquakes.</li><li>• Explore the impact of human activity on the earth (e.g., housing/commercial land development, strip mining, deforestation, farming, acid rain, soil pollution, insecticides/pesticides in the food chain, etc.).</li><li>• Recognize relationships between human activity and the environment, in terms of:<ul style="list-style-type: none"><li>◦ Pollution (air, water, soil)</li><li>◦ Conservation of resources (including plant and animal species)</li><li>◦ Erosion</li><li>◦ Agricultural activities</li></ul></li></ul>	
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### MATTER: PHYSICAL AND CHEMICAL CHANGE

#### Physical Sciences Standard (PS)

3-5 Benchmarks	Grade Level Indicators and Sub-Objectives	Teaching Strategies/Resources
<p>By the end of the 3-5 program, the student will:</p> <p><u>Physical Sciences</u></p> <ul style="list-style-type: none"> <li>★ Compare the characteristics of simple physical and chemical changes. (PS-A)</li> <li>★ Identify and describe the physical properties of matter in its various states. (PS-B)</li> <li>★ Summarize the way changes in temperature can be produced and thermal energy transferred. (PS-D)</li> </ul>	<p>By the end of Fourth Grade, the student will:</p> <p><u>Nature of Matter</u></p> <ul style="list-style-type: none"> <li>★ Identify characteristics of a simple physical change (e.g., heating or cooling can change water from one state to another and the change is reversible). (PS-4-1)</li> <li>★ Identify characteristics of a simple chemical change. When a new material is made by combining two or more materials, it has chemical properties that are different from the original materials (e.g., burning paper, vinegar and baking soda). (PS-4-2)</li> <li>★ Describe objects by the properties of the materials from which they are made and that these properties can be used to separate or sort a group of objects (e.g., paper, glass, plastic and metal). (PS-4-3)</li> <li>★ Explain that matter has different states (e.g., solid, liquid and gas) and that each state has distinct physical properties. (PS-4-4)</li> </ul> <p><u>Nature of Energy</u></p> <ul style="list-style-type: none"> <li>★ Compare ways the temperature of an object can be changed (e.g., rubbing, heating and bending of metal). (PS-4-5)</li> </ul> <p><u>Sub-Objectives to Meet Indicators:</u></p> <ul style="list-style-type: none"> <li>• Identify properties of gases (e.g., take up space, have volume, have weight, exert pressure, etc.).</li> <li>• Identify properties of liquids (e.g., take the shape of their containers, are fluids, etc.).</li> <li>• Identify properties of solids (e.g., have their own shape, etc.).</li> </ul>	

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	<ul style="list-style-type: none"><li>• Prepare and use a key to classify various kinds of matter (e.g., physical properties of solids, liquids, and gases, etc.).</li><li>• Conduct experiments that illustrate physical and chemical changes in matter.</li><li>• Infer characteristics of physical and chemical changes from experiments/inquiry investigations.</li><li>• Determine the following characteristics of simple physical changes through experimentation:<ul style="list-style-type: none"><li>◦ May change in size</li><li>◦ May change in shape (configuration)</li><li>◦ May change in the state of matter of a substance</li><li>◦ Do not involve permanent changes in properties of a material</li><li>◦ Does not produce or become a new substance</li></ul></li><li>• Determine the following characteristics of chemical changes through experimentation:<ul style="list-style-type: none"><li>◦ Difficult to reverse</li><li>◦ Involve permanent change in the properties of the substance</li><li>◦ Often give off heat on their own</li></ul></li><li>• Distinguish between changes that are physical only versus changes that are both chemical as well as physical:<ul style="list-style-type: none"><li>◦ Physical Only (e.g., salt dissolved in water, ripping paper, condensation of water, breaking glass, evaporation of water, etc.)</li><li>◦ Chemical As Well As Physical (e.g., recycling objects, lighting a match, digesting food, indicator solutions used to identify acids and bases, etc.)</li></ul></li><li>• Describe the energy flow or force that can cause a physical change (e.g., breaking a substance, melting with heat, dissolving in a liquid, freezing water, etc.).</li><li>• Identify properties of the different states of matter (gases, liquids and solids) that indicate physical and chemical change.</li><li>• Explore real-world examples of physical changes (e.g., evaporation, condensation, melting, change in volume due to temperature, etc.).</li><li>• Explore real-world examples of chemical changes (e.g., burning, cooking, digestion, rusting, rotting, etc.).</li></ul>	
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## FOURTH GRADE ENVIRONMENTS AND ADAPTATIONS OF PLANTS Life Sciences Standard (LS)

3-5 Benchmarks	Grade Level Indicators and Sub-Objectives	Teaching Strategies/Resources
<p>By the end of the 3-5 program, the student will:</p> <p><b><u>Life Sciences</u></b></p> <ul style="list-style-type: none"> <li>★ Differentiate between the life cycles of different plants and animals. (LS-A)</li> <li>★ Analyze plant and animal structures and functions needed for survival and describe the flow of energy through a system that all organisms use to survive. (LS-B)</li> <li>★ Compare changes in an organism's ecosystem/habitat that affect its survival. (LS-C)</li> </ul>	<p>By the end of Fourth Grade, the student will:</p> <p><b><u>Heredity</u></b></p> <ul style="list-style-type: none"> <li>★ Compare the life cycles of different plants including germination, maturity, reproduction and death. (LS-4-1)</li> </ul> <p><b><u>Diversity and Interdependence of Life</u></b></p> <ul style="list-style-type: none"> <li>★ Relate plant structures to their specific functions (e.g., growth, survival and reproduction). (LS-4-2)</li> <li>★ Classify common plants according to their characteristics (e.g., tree leaves, flowers, seeds, roots and stems). (LS-4-3)</li> <li>★ Observe and explore that fossils provide evidence about plants that lived long ago and the nature of the environment at that time. (LS-4-4)</li> <li>★ Describe how organisms interact with one another in various ways (e.g., many plants depend on animals for carrying pollen or dispersing seeds). (LS-4-5)</li> </ul> <p><b><u>Sub-Objectives to Meet Indicators:</u></b></p> <ul style="list-style-type: none"> <li>• Recognize characteristics that can identify a thing as living:               <ul style="list-style-type: none"> <li>◦ Ability to grow and change</li> <li>◦ Ability to react to its environment</li> <li>◦ Need for food or another source of energy</li> <li>◦ Take in gases for respiration</li> <li>◦ Ability to reproduce</li> <li>◦ Made up of cells</li> </ul> </li> </ul>	

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	<ul style="list-style-type: none"><li>• Identify a living organism's need for:<ul style="list-style-type: none"><li>◦ Source of food or energy</li><li>◦ Water</li><li>◦ Gases to take in</li><li>◦ Environment that will allow for survival (e.g., protection, light, temperature, etc.)</li></ul></li><li>• Clarify the components of plant habitats (i.e., food, water, shelter, and space in a suitable arrangement/amount).</li><li>• Diagram plant structures, including:<ul style="list-style-type: none"><li>◦ Stems</li><li>◦ Roots</li><li>◦ Leaves</li><li>◦ Stamens</li><li>◦ Trunks</li><li>◦ Filaments</li><li>◦ Pistils</li><li>◦ Flowers</li><li>◦ Ovaries</li><li>◦ Sepals</li><li>◦ Petals</li></ul></li><li>• Describe the reproductive process of plants, i.e. pollination, including:<ul style="list-style-type: none"><li>◦ Flowering plants must be pollinated in order to produce seeds.</li><li>◦ Many plants are pollinated by bees.</li><li>◦ A flower's pollen sticks to a bee, but some runs off when the bee feeds at other flowers.</li><li>◦ One seed produces one plant; but one plant can produce many seeds.</li></ul></li><li>• Investigate the physical adaptations of plants (e.g., coloration, covering, capacity for water, leaf size and structure, poisons, etc.).</li><li>• Investigate the behavioral adaptations of plants (e.g., losing leaves during seasons, dormancy, cactus roots spreading out to receive water, phototropism, etc.).</li><li>• Describe how a certain characteristics or behaviors help a plant meet its basic needs and identify what basic needs are being met by these characteristics or behaviors.</li><li>• Distinguish between absolutely necessary conditions for growth or survival from conditions that are not necessary.</li></ul>	
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	<ul style="list-style-type: none"><li>• Compare and contrast how certain conditions can prevent organisms from surviving.</li><li>• Compare and contrast how organisms, at a population level or an individual level, react to major environmental changes that are daily or seasonal and regular (e.g., temperature, nutrient availability, water availability, soil quality, seasonal change, etc.).</li></ul>	
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# Norton City Schools Standards-Based Science Course of Study

## FOURTH GRADE WEATHER PREDICTION

### Earth and Space Sciences Standard (ES)

3-5 Benchmarks	Grade Level Indicators and Sub-Objectives	Teaching Strategies/Resources
<p>By the end of the 3-5 program the student will:</p> <p><u>Earth and Space Sciences</u>            ★ Analyze weather and changes that occur over a period of time. (ES-D)</p>	<p>By the end of Fourth Grade, the student will:</p> <p><u>Earth Systems</u>            ★ Explain that air surrounds us, takes up space, moves around us as wind, and may be measured using barometric pressure. (ES-4-1)            ★ Identify how water exists in the air in different forms (e.g., in clouds, fog, rain, snow and hail). (ES-4-2)            ★ Investigate how water changes from one state to another (e.g., freezing, melting, condensation and evaporation). (ES-4-3)            ★ Describe weather by measurable quantities such as temperature, wind direction, wind speed, precipitation and barometric pressure. (ES-4-4)            ★ Record local weather information on a calendar or map and describe changes over a period of time (e.g., barometric pressure, temperature, precipitation symbols and cloud conditions). (ES-4-5)            ★ Trace how weather patterns generally move from west to east in the United States. (ES-4-6)            ★ Describe the weather which accompanies cumulus, cumulonimbus, cirrus and stratus clouds. (ES-4-7)</p> <p><u>Sub-Objectives to Meet Indicators:</u></p> <ul style="list-style-type: none"> <li>• Make measurements using standard units (e.g., degrees Celsius, degrees Fahrenheit, inches of rain, inches of snow, etc.) through the use of weather instruments (e.g., barometers, anemometers, weathervanes, rain gauges, thermometers, etc.).</li> <li>• Record weather data through charts, graphs, computer programs, etc.</li> <li>• Investigate relationships between air pressure, temperature, and volume</li> </ul>	

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	<p>that correspond to weather changes, as well as other daily life occurrences.</p> <ul style="list-style-type: none"><li>• Describe the water cycle (i.e., evaporation, condensation, and precipitation).</li><li>• Determine the effect of air temperature in and below clouds on what form precipitation will take (i.e., snow, hail, sleet, and rain).</li><li>• Associate high-pressure systems with clear skies (symbol “H” on a weather map means “high pressure” which indicates “clear skies”).</li><li>• Associate low-pressure systems with cloudy or stormy skies (symbol “L” on a weather means “low pressure” which indicates “stormy skies”).</li><li>• Recognize relationships between colliding warm and cold fronts and how they cause storms, precipitation, or cloudy skies.</li><li>• Determine the relationship between latitude and general temperature or weather patterns (e.g., changing seasons in different states, weather near equator versus Arctic zone, etc.).</li><li>• Interpret weather maps and reports from daily newspapers using a key (weather symbols).</li><li>• Describe general west-to-east movement of weather in the continental United States.</li><li>• Interpret information from a weather map and key (weather symbols), consistently observed phenomena, or from stated conditions (e.g., time, temperature, etc.) to make observations and predictions about the weather.</li><li>• Classify severe weather conditions (e.g., floods, tornadoes, lightning, hurricanes, etc.) and communicate safety precautions to be implemented during these storms.</li></ul>	
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